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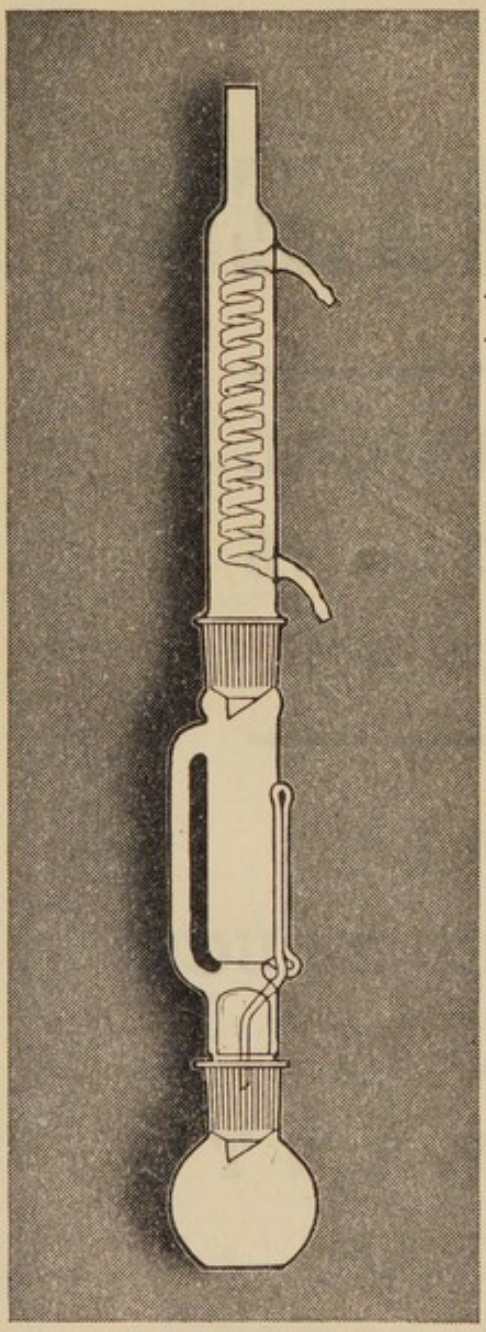
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INTRODUCTION

This manual has been compiled in its present form so as to provide an official publication which summarizes the information required by candidates of the Royal Army Medical Corps undergoing the course of instruction for the army qualification of dispenser.

The contents cover subjects " A " and " C " of Part " A " and subjects " E," " F " and " G " of Part " B " of the syllabus of training for dispenser :—

Weights and Measures.
Poisons.
The Corrosive Poisons.
The Irritant Poisons.
The Systemic Poisons.
Gaseous Poisons.
Materia Medica.
Official Preparations of the Pharmacopœia.
Compounds of the Metals.
Practical Dispensing and Pharmacy.

It will be seen that special attention has been given to the symptoms and treatment of poisoning, although this subject is covered to a certain degree in Royal Army Medical Corps Training. To facilitate immediate reference, the pages dealing with this subject have been edged in black.

Short monographs have been added on the Dangerous Drugs Acts and the Poisons and Pharmacy Act to explain the instructions for the custody and dispensing of the special drugs which are detailed in Regulations for the Medical Services of the Army and Standing Orders for the Royal Army Medical Corps.

In addition to sub-headings, the manual has been provided with a concise and comprehensive index.

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WEIGHTS AND MEASURES

The dispenser of medicines requires to be thoroughly conversant with the following systems of weights and measures:—

(1) The Imperial system, including Avoirdupois and Apothecaries' tables.

(2) The Metric system.

The Imperial System

This system comprises both measures of weight and capacity, and is in general use throughout the British Isles and the Colonies for the weighing and measuring of all classes of commodities except precious stones.

Pharmacopœias before 1914 made sole use of this system, and it is only since that year that the metric system has come into official use. An Act of Parliament of 1878 permitted drugs to be sold by Apothecaries' weight, and in 1897 a further Act authorized the metric system for the retailing of drugs.

Measures of Weight (Avoirdupois)

	Symbol.	Latin.
The pound	lb.	libra
The ounce	oz.	uncia
The grain	gr.	granum

Table:—1 pound = 16 ounces = 7,000 grains
1 ounce = 437·5 grains

Measures of Capacity

	Contraction.	Symbol.	Latin.
The gallon	gall.	C	congius
The pint	pt.	O	octarius
The fluid ounce ..	fl. oz.	℥	uncia
The fluid drachm ..	fl. dr.	ʒ	drachma
The minim	min.	♏	minimum

Table:—1 gallon (Cj) = 8 pints (Oviij)
1 pint (Oj) = 20 fluid ounces (℥xx)
1 fluid ounce (℥j) = 8 fluid drachms (ʒviij)
1 fluid drachm (ʒj) = 60 minims (♏LX)

In general practice the dispenser uses the Imperial measures of weight in his retail business, and also at the dispensing counter for weighing amounts of an ounce or more ; Imperial measures of capacity are used for the measuring of volumes, both large and small, under all conditions.

There is no direct relationship between the Imperial measures of weight and capacity except in the case of the ounce (oz.) and the fluid ounce (fl. oz.). One fluid ounce is the volume occupied by one ounce of distilled water, and consequently 480 minims (1 fl. oz.) is the equivalent of 437·5 grains (1 oz.) of distilled water. Here is established a very important relationship :

480 minims = 437·5 grains.

It is important to remember this relationship between the grain and the minim as it forms the basis of calculation in the preparation of solutions.

Another important equivalent derived from the above figures is, 110 minims = 100 grains. The figure 110 is an approximation ; more accurately it is 109·7143 minims, but 110 is sufficiently accurate for all practical purposes.

The Pharmacopœia does not recognize any division between the grain and the ounce weight of 437·5 grains, and as the dispenser usually requires to work in comparatively small amounts, these weights are not very suitable for his needs. The necessity for additional small weights brings us to the subject of the Apothecaries' system.

The Apothecaries' System

This is a system of weights only, and is used solely at the dispensing counter. Attention has already been drawn to the fact that in the Imperial system there is no intermediate weight between the grain and the ounce ; furthermore, the ounce cannot be subdivided into smaller values containing an even number of grains. It was to overcome this difficulty that the Apothecaries' system was evolved.

If the dispenser has to weigh out 120 grains of a drug, with the Imperial weights alone, it would be necessary to have a large number of 1-grain weights, and to count out 120 of these before the operation of weighing the drug can be performed ; but the Apothecaries' system contains a number of weights equal to 10, 30, 60 or more grains each, which greatly facilitates the operation.

It must be clearly understood that the grain weight of the Apothecaries' system is the same 1-grain weight as in the Imperial system ; it is only the multiples of the grain that differ.

The Apothecaries' weights usually to be found at the dispensing counter are as follows :—

(*a*) ½, 1, 2, 3, 4, 5 and 6 grain weights made of thin sheet metal.

(*b*) 10, 20, 30, 40, 60 and 120 grain weights made of stouter metal.

Occasionally it is convenient to use both Imperial and Apothecaries' weights together at one time. For example, if 800 grains of a drug were required, the weights could be as follows :

1 ounce Imperial	=	437·5 grains
3 × 120 grain Apothecaries' weights	=	360 ,,
1 × 2 ,, ,, weight	=	2 ,,
1 × ½ ,, ,, ,,	=	0·5 ,,
Total		800·0 grains

The weights of the Apothecaries' system are :

	Symbol.	Latin.
The ounce ..	℥	uncia
The drachm ..	ℨ	drachma
The scruple ..	℈	scrupulum
The grain ..	gr.	granum

Table :—

20 grains (gr. xx) = 1 scruple (℈j)
3 scruples (℈iij) = 1 drachm (ℨj)
8 drachms (ℨviij) = 1 ounce (℥j)

Note 1.—The 1 ounce Apothecaries' weight contains 480 grains.

Note 2.—The 1 pound Apothecaries' weight, containing 12 ounces, is now no longer used.

It is particularly unfortunate that when symbols for the above weights were introduced, the same symbol (℥) ounce, and (ℨ) drachm, were employed for the Apothecaries' weights as for the Imperial fluid ounce and fluid drachm, and it has led to considerable confusion. No difficulty would be experienced if the physician would prescribe solid drugs in grains only, for instance, 120 grains instead of the more usual ℨij, but the practice of using symbols is of such long standing that it is doubtful if it will ever be entirely eradicated. The onus lies, therefore, with the dispenser to make himself

perfectly acquainted with the various symbols used and with their equivalents. In this connection the B.P. (British Pharmacopœia) states: "In prescriptions the symbol ℥j is often used to represent 60 grains and also to represent 1 fluid drachm, and the symbol ℥j to represent sometimes 480 grains, sometimes 437·5 grains and also to represent 1 fluid ounce. As these symbols are apt to be misleading it is recommended that prescribers should cease to employ them. Instead of them, when the Imperial system is employed, solids should be prescribed in grains (gr.) and ounces (oz.=437·5 grains), and liquids in minims (m.) and fluid ounces (fl. oz.); and the quantities should be written in Arabic numerals. In order to avoid the possibility of confusion between gramme and grain, the symbol **G** should be used in prescriptions as the contraction for gramme."

The fluid ounce contains 480 minims and the Apothecaries' ounce 480 grains, yet these measures are **not** equivalent to one another, and it cannot be stressed too strongly that the equivalent of the fluid ounce (480 minims) is the Imperial ounce (oz.) of 437·5 grains.

Careful observation of the following points should make the matter quite clear:

(*a*) The grain weight of the Apothecaries' system is the same as the grain weight of the Imperial system.

(*b*) Do not think of the Apothecaries' system as a completely separate system, but simply as a means of obtaining easy multiples of the grain weight, devised to give the dispenser more convenient weights for his work.

(*c*) The Imperial ounce contains 437·5 grains, is written oz., is seldom used in prescription writing, and is the grain equivalent of the fluid ounce of 480 minims.

(*d*) The Apothecaries' ounce contains 480 grains, is written ℥j, and has no other equivalent in the Imperial system.

The Metric System

This system was first introduced into the British Pharmacopœia in 1914, but it cannot be said that much headway has been made with regard to its general adoption in prescribing.

The system is decimal throughout. The unit of weight is the gramme, of volume the litre, and other units are obtained from these by multiplication or division by powers of 10. The names of the units are denoted by prefixes.

Greek prefixes denote the multiples of grammes :

deka means 10 times, and a **dekagramme** is therefore 10 grammes.

hecto means 100 times, and a **hectogramme** is therefore 100 grammes.

kilo means 1000 times, and a **kilogramme** is therefore 1000 grammes.

Latin prefixes denote divisions of the gramme :

deci means 1/10th, and a **decigramme** is therefore 0·1 gramme.

centi means 1/100th, and a **centigramme** is therefore 0·01 gramme.

milli means 1/1000th, and a **milligramme** is therefore 0·001 gramme.

The same prefixes are used for the measures of capacity. Thus, kilolitre, hectolitre, dekalitre, decilitre, centilitre and millilitre.

A number of grammes may be expressed in terms of any other unit of the metric weight system by moving the decimal point a number of places to right or left, each step being equivalent to dividing or multiplying by 10. For example, 1·56 grammes may be expressed as :

0·00156	0·0156	0·156	1·56	15·6	156·0	1560·0
kilo-gramme	hecto-gramme	deka-gramme	grammes	deci-grammes	centi-grammes	milli-grammes

The above are different ways of expressing the same weight in terms of different units.

In the metric system a whole number is not regarded as being finite, and we must imagine any such number to be preceded and followed by an unlimited number of noughts. Thus the figure 8 is to be regarded as..... 000000000008·0000000000.....

The following examples should be sufficient to demonstrate the working of the method :

Example 1.—To express 1·43 decigrammes in hectogrammes.

Referring to the above table we find that hectogrammes are three places to the left of decigrammes, and, therefore, the decimal point of the number must also be moved three places to the left. Thus, 1·43 decigrammes becomes 0·00143 hectogrammes.

Example 2. To express 0·005 dekalitres in millilitres.

For each step to the right from dekalitres to millilitres, *i.e.* four steps, move the decimal point a corresponding number of

places to the right also. Then 0·005 dekalitres is expressed as 50·0 millilitres.

The B.P., 1932, uses very few of the metric units of weight and volume, all weights being given in multiples or decimals of a gramme or milligramme—such terms as dekagramme, centigramme, etc., are not used. For measuring volumes the litre (1·7598 pints) is much too large for dispensing purposes, and the B.P. has fixed upon the millilitre (16·9 minims) as being more appropriate, and all B.P. volumes are stated as multiples or decimals of a millilitre. The Board of Trade (May 1908), recognized "**mil.**" as an official contraction for the term "millilitre," and mil. is used throughout the Pharmacopœia and this book in stating metric liquid measures and doses.

The unit of volume, cubic centimetre, or c.c., used so much in scientific work, differs from the mil. by such a small amount that the difference may be disregarded for all practical purposes. One mil. is approximately equal to 1·000028 c.c.

Conversion from Metric to Imperial.

The only equivalents it is necessary to remember are those for the gramme and mil. A gramme is the weight of a mil. of distilled water measured under certain specified conditions. **One gramme is represented by 15·432 grains, and one mil. by 16·9 minims.** As the gramme and mil. are equivalent, then their respective equivalents in the Imperial system must also be equal. Therefore 15·432 grains are equal to 16·9 minims. This is the same equivalent as 437·5 grains equals 480 minims in a different guise. If the proportions of both series of equivalents are worked out, the following results are obtained :

15·432 : 16·9 as 1 : 1·0951
437·5 : 480 as 1 : 1·0971

The reason for the very small difference between the two proportions is that the equivalents 15·432 and 16·9 are only approximations.

From the equivalents 15·432 grains = 1 gramme, and 16·9 minims = 1 mil., any conversion of metric to Imperial, or vice versa, may be calculated.

Example 1. To convert 1 ounce into decigrammes.

1 ounce = 437·5 grains.

Divide 437·5 by 15·432 to convert to grammes :

15·432) 437·5 (= 28·35 grammes.

From grammes to decigrammes is one step to the right, and by moving the decimal point one place to the right we obtain the answer of 283·5 decigrammes.

Example 2. To convert 7 milligrammes to grains.

Firstly, express 7 milligrammes in terms of grammes by moving the decimal point three places to the left, thus 0·007 grammes.

Multiply 0·007 by 15·432 to convert grammes to grains—

$15{\cdot}432 \times 0{\cdot}007 = 0{\cdot}108024$ grains, or $\frac{1}{10}$ grain approximately.

Example 3. To convert 25·4 decilitres to fluid ounces, etc.

We have not learned the conversion equivalent of decilitres to fluid ounces, so our first step is to express 25·4 decilitres in terms of mils. by moving the decimal point two places to the right, which gives us 2540·0 mils.

Multiply by 16·9 to convert mils. to minims—

$$16{\cdot}9 \times 2540{\cdot}0 = 42{,}926 \text{ minims.}$$

Divide by 480 to reduce to fluid ounces, and we obtain the final answer—89 fl. ounces, and 206 minims.

Example 4. To convert 20 minims to metric and express the answer in terms of centilitres.

Divide 20 minims by 16·9 to convert minims to mils.—

$$16{\cdot}9)\ 20{\cdot}0\ (= 1{\cdot}183 \text{ mils.}$$

Move the decimal point one place to the left to obtain the answer in centilitres, and the result is 0·1183 centilitres.

Domestic Measures

The patient for whom a medicine is prescribed will not usually be familiar with the measures "fluid ounce" and "fluid drachm," and it is general practice to label medicines for internal use in doses of common domestic measures. Such measures are by no means accurate and the medicine should be measured in a graduated medicine glass, or if that is not available a graduated bottle might be used. It must be remembered, however, that the graduations on a bottle are by no means accurate.

The domestic measures commonly used are :

Domestic Measure	Latin	Imperial Equivalent
Teaspoonful	Cochleare infantis ,, minimum ,, parvum	1 fluid drachm.
Dessertspoonful or Two teaspoonfuls	Cochleare medium ,, modicum	2 fluid drachms.
Tablespoonful	Cochleare amplum ,, magnum	4 fluid drachms or ½ fluid ounce.
Two tablespoonfuls ..	Cochlearia magna duo.	1 fluid ounce.
Wineglassful	Cyathus vinarius.	2½ fluid ounces.
Tumblerful	Cyathus magnus.	8–10 fluid ounces.

Drops. Latin—gutta ; plural—guttæ.

A drop is a very indefinite measure, the volume depending on the character of the liquid and of the vessel from which the liquid is dropped. A fluid drachm of water yields about 45 drops, whereas a spirit preparation will give 100 or more. If the medicine is of a potent nature, an accurate minim measure should invariably be used.

PERCENTAGE AND PROPORTIONAL PART SOLUTIONS

In analytical processes and other scientific operations, true percentage solutions are frequently required. Such solutions contain either (*a*) a definite weight of active ingredient in 100 parts by weight of the solution, or (*b*) a definite volume of active substance in 100 parts by volume of the solution. For example, a true 1 per cent. solution of zinc sulphate is one in which 100 parts by weight of the solution contain 1 part by weight of the sulphate.

Such solutions as the above are rarely called for in dispensing, and the so-called percentage solutions ordered by the physician generally consist of a definite weight of the active substance in a given volume of the solution. In B.P. solutions of this type the expression "per cent." is qualified by the words "weight in volume," or simply "w/v." The difference between a true percentage solution and a w/v solution is shown in the following examples.

Let us suppose that it is required to prepare (*a*) 16 fluid ounces of 1 per cent. solution of potassium iodide in water, and (*b*) 16 fluid ounces of 1 per cent. solution of the same drug in glycerin.

Case (a). 16 fluid ounces of distilled water weigh $16 \times 437{\cdot}5$, or 7,000 grains.

Then the quantity of potassium iodide required for a 1 per cent. solution is $\frac{7{,}000 \times 1}{100} = 70$ grains.

This is a true percentage solution because both the active ingredient and the solvent are calculated weight for weight.

Case (b). 16 fluid ounces of glycerin weigh $7{,}000 \times 1{\cdot}26 = 8{,}820$ grains.

This is so because, volume for volume, glycerin is heavier than water in the ratio of 1·26 to 1·0. In other words, the specific gravity of glycerin is 1·26 and of distilled water 1·0.

The weight of potassium iodide required for 16 fluid ounces of a true 1 per cent. solution is, therefore, $\frac{8{,}820 \times 1}{100} = 88{\cdot}2$ grains.

It is extremely probable that a physician prescribing two such solutions would expect the same weight of potassium iodide in each, and therefore the varying specific gravities of liquids are ignored, and such solutions worked out on a w/v basis. Sixteen fluid ounces of 1 per cent. solution of a solid active ingredient will always contain 70 grains of the drug no matter what the solvent may be.

No difficulty is experienced in preparing w/v percentage solutions in the measures of the metric system, because 1 gramme of water measures exactly 1 mil. under standard conditions, and, therefore, the gramme and mil. are interchangeable weight and measure. In metric, it is only necessary to weigh out in grammes the required percentage of the active substance, dissolve it in some of the solvent, and make the product up to 100 mils. by the further addition of solvent.

A certain amount of difficulty is met with when calculating in the Imperial system, because 480 minims are equal to 437·5 grains, and, therefore, 1 minim and 1 grain are not interchangeable weight and measure. This important relationship must be borne in mind when calculating the weight of drug required for solutions of various strengths. A very simple rule which has done much to simplify these calculations is: "If the answer is to be a number of grains, calculate on the basis of 437·5 grains to the ounce: if the answer is to be a number of minims, calculate on the basis of 480 minims to the ounce."

The following examples will show the operation of the rule:

(*a*) How much chloroform is required to make 10 fluid ounces of solution, strength 3 per cent. ?

(*b*) How much acid boric is required to make 10 fluid ounces of solution, strength 3 per cent. ?

Case (a). Here we are dealing with liquids only, and the basis of calculation is therefore 480 minims to the ounce.

The amount of chloroform required is:

$$\frac{480 \times 10 \times 3}{100} = 144 \text{ minims.}$$

Case (b). Acid boric is a solid, and the calculation must be based on the equivalent of 437·5 grains to the ounce.

The weight required is $\frac{437{\cdot}5 \times 10 \times 3}{100} = 131{\cdot}25$ grains.

Strengths of solutions are frequently expressed as proportional parts, thus 1 in 8, 1 in 12, and 1 in 1,000. Quantities for these are calculated in a similar manner to the examples given above, using the same equivalents.

Example 1. How much potassium permanganate (solid) is required to make 2 pints of a 1 in 1,000 solution ?

The number of grains in 2 pints is $437{\cdot}5 \times 40 = 17{,}500$ grains, and the weight of active substance required is, therefore :

$$\frac{17{,}500 \times 1}{1{,}000} \text{ or } \frac{437{\cdot}5 \times 40 \times 1}{1{,}000} = 17{\cdot}5 \text{ grains.}$$

Example 2. Make a gallon of peppermint water of strength 1 in 400.

The oil used for the preparation of this water is a fluid, and therefore the calculation must be made on the basis of 480 minims to the ounce, as follows :

$$\frac{160 (\text{ounces in 1 gallon}) \times 480 \times 1}{400} = 192 \text{ minims.}$$

Example 3. Make 8 fl. oz. of solution of mercuric chloride (solid) so that $\frac{1}{2}$ fl. oz. diluted to 1 pint with water gives a 1 in 5,000 solution.

One pint of 1 in 5,000 solution contains $\frac{437{\cdot}5 \times 20}{5{,}000}$ grains, and this quantity is required to be contained in each $\frac{1}{2}$ fl. oz. of the original solution. The required amount for 8 fl. oz. will be

$$\frac{437{\cdot}5 \times 20 \times 16}{5{,}000} = 28 \text{ grains.}$$

Occasionally the dispenser will meet prescriptions written in the form of proportional parts or percentages.

Example 1.

℞

Camphor	.. ..	1 per cent.
Zinc Oxide	.. ..	$\frac{1}{2}$,,
Paraffin molle up to 4 oz.		M.Ft. Ungt.

The ingredients of the ointment are all solid, and each quantity is to be worked out as a separate calculation :

Camphor 1 per cent. : $\frac{437{\cdot}5 \times 4 \times 1}{100} = 17{\cdot}5$ grains.

Zinc oxide $\frac{1}{2}$ per cent. : $\frac{437{\cdot}5 \times 4 \times 0{\cdot}5}{100} = 8{\cdot}75$ grains.

The balance of the ointment is vaselin, and the weight of this substance required is $437{\cdot}5 \times 4 = 1{,}750 - 26{\cdot}25$ grains. $= 1{,}723{\cdot}75$ grains.

Example 2.

℞

Boracic Acid	.. ..	4 per cent.
Zinc Sulphate	.. ..	½ ,,
Cherrylaurel Water	..	3 ,,
Rose Water up to	..	℥ vi. M.Ft. Lotio.

All these quantities are to be worked out as separate calculations :

Boracic Acid, 4 per cent. : $\frac{437{\cdot}5 \times 6 \times 4}{100} = 105$ grains.

Zinc Sulphate, ½ per cent. : $\frac{437{\cdot}5 \times 6 \times 0{\cdot}5}{100} = 13\frac{1}{8}$ grains.

Cherrylaurel Water, 3 per cent. : $\frac{480 \times 6 \times 3}{100} = 86\frac{2}{5}$ minims.

Rose Water up to a volume of 6 fluid ounces.

B.P. FORMULÆ—CONVERSION TO IMPERIAL

Example A. To calculate the quantities required for 6 fluid ounces of Tinctura Opii Camphorata, B.P.

The recipe for this tincture as given in the B.P. is :

℞

Tincture of Opium	..	50 mils.
Benzoic Acid	.. ..	5 grammes.
Camphor	.. ..	3 grammes.
Oil of Anise	.. ..	3 mils.

Alcohol (60 per cent.) sufficient to produce 1,000 mils.

The obvious method of converting this formula into Imperial is to multiply the gramme amounts by 15·432, and the mils. by 16·9, to convert to grains and minims respectively, and then to decrease these quantities to obtain the measures for 6 fluid ounces. This method entails considerable calculation which greatly increases the possibility of error. A much simpler way of working is to cross out grammes and mils. in the B.P. formula, substitute grains and minims without altering the figures, and then by a simple calculation the required figures are obtained. The manner of calculation is shown in detail below :

B.P. Formula.		Imperial Formula.	
Tincture of Opium	50 mils.	50 m.	$\frac{480 \times 6 \times 50}{1{,}000}$ = 144 m.
Benzoic Acid	5 grammes	5 grs.	$\frac{437{\cdot}5 \times 6 \times 5}{1{,}000}$ = 13·125 grs.
Camphor ..	3 grammes	3 grs.	$\frac{437{\cdot}5 \times 6 \times 3}{1{,}000}$ = 7·875 grs.
Oil of Anise ..	3 mils.	3 m.	$\frac{480 \times 6 \times 3}{1{,}000}$ = 8·64 m.
Alcohol (60 per cent.) sufficient to produce 1,000 mils.			Sufficient to produce 6 fluid ounces.

Example B. To calculate the quantities required for 4 ounces of Pulvis Glycyrrhizæ Compositus, B.P.

B.P. Formula.			Imperial Formula.
Senna Leaves	160 grammes	160 grs.	$\frac{437{\cdot}5 \times 4 \times 160}{1{,}000}$ = 280 grs.
Liquorice ..	160 grammes	160 grs.	As above = 280 grs.
Fennel ..	80 grammes	80 grs.	$\frac{437{\cdot}5 \times 4 \times 80}{1{,}000}$ = 140 grs.
Sublimed Sulphur	80 grammes	80 grs.	As above = 140 grs.
Sucrose ..	520 grammes	520 grs.	$\frac{437{\cdot}5 \times 4 \times 520}{1{,}000}$ = 910 grs.
	1,000	1,000 grs.	1,750 grs.

Note the absence of the phrase " sufficient to produce " in the final line of the recipe. The total weight made by the B.P. recipe is not indicated, but if we add up the weights we find that the product is 1,000 grammes. As before, change grammes to grains, and calculate the new quantities on the basis of 437·5 grains to the ounce.

The proof of correct calculation is that the new amounts, in grains, total $437{\cdot}5 \times 4 = 1{,}750$ grains.

Should a prescription for ℥iv (*i.e.* 4 Apothecaries' ounces) of this preparation be given, the Apothecaries' equivalent of 480 grains to the ounce may be used, as all the ingredients are solids. The weight of each ingredient required would then be, $307\frac{1}{5}$ grains, $307\frac{1}{5}$ grains, $153\frac{3}{5}$ grains, $153\frac{3}{5}$ grains, and $998\frac{2}{5}$ grains, respectively. These total to $480 \times 4 = 1{,}920$ grains, or ℥iv.

Example C. To make 36 four-grain mercury pills.

In this case we have to calculate for 36 pills, each weighing 4 grains; that is, we must have $36 \times 4 = 144$ grs. of the pill mass. The total of the B.P. quantities, in grains, is exactly 100, and, therefore, the weight of each ingredient must be increased in the direct proportion of 144 to 100. As a check on correct working, the new weights should total exactly 144 grains.

B.P. Formula.			Imperial Formula.
Mercury ..	33 grammes	33 grs.	$\frac{33 \times 144}{100}$ = 47·52 grs.
Syrup ..	14 grammes	14 grs.	$\frac{14 \times 144}{100}$ = 20·16 grs.
Liquid glucose	15 grammes	15 grs.	$\frac{15 \times 144}{100}$ = 21·60 grs.
Glycerin ..	5 grammes	5 grs.	$\frac{5 \times 144}{100}$ = 7·20 grs.
Liquorice ..	33 grammes	33 grs.	$\frac{33 \times 144}{100}$ = 47·52 grs.
	100 grammes	100 grs.	144·00 grs.

Example D. To calculate the quantities required for one pound of Cataplasma Kaolini, B.P.

The conversion of this formula to Imperial presents several interesting features. It should be noted that the B.P. formula in grammes and mils. adds up to 1,000. It is not strictly accurate to state that the total weight made by the B.P. formula is 1,000 grammes, as the weight of 2 mils. of Methyl Salicylate (specific gravity 1·186 to 1·191) is not exactly 2 grammes, and the weight of 0·5 mils. of Oil of Peppermint (sp. gr. 0·902 to 0·910) is not exactly 0·5 grammes. However, these preparations are present in such small quantities that the question of specific gravity may be ignored altogether, and the new quantities calculated according to the general rule.

B.P. Formula.		Imperial Formula.
Kaolin .. 527 grammes	527 grs.	$\frac{437{\cdot}5 \times 16 \times 527}{1{,}000} = 3{,}689$ grs.
Boric Acid .. 45 grammes	45 grs.	$\frac{437{\cdot}5 \times 16 \times 45}{1{,}000} = 315$ grs.
Methyl Salicylate .. 2 mils.	2 m.	$\frac{480 \times 16 \times 2}{1{,}000} = 15{\cdot}36$ m.
Oil of Peppermint .. 0·5 mils.	0·5 m.	$\frac{480 \times 16 \times 0{\cdot}5}{1{,}000} = 3{\cdot}84$ m.
Thymol .. 0·5 grammes	0·5 grs.	$\frac{437{\cdot}5 \times 16 \times 0{\cdot}5}{1{,}000} = 3{\cdot}5$ grs.
Glycerin .. 425 grammes	425 grs.	$\frac{437{\cdot}5 \times 16 \times 425}{1{,}000} = 2{,}975$ grs.
1,000		

Note 1. Glycerin, although a fluid, is to be weighed out, and is, therefore, calculated on a basis of 437·5 grains to the ounce.

Note 2. The new quantities, in grains and minims, total to slightly more than 437·5 times 16=7,000. This is because the relationship between grains and minims has already been taken into account during conversion, by using the equivalent 437·5 for grains and 480 for minims. Without taking specific gravity into account, 15·36 minims of Methyl Salicylate are equal to 14 grains, and 3·84 minims of Oil of Peppermint are equal to 3½ grains. If these weights of liquid ingredients are substituted for the fluid equivalents in the Imperial formula, then the new quantities, in grains, do total to 7,000.

THE CALCULATION OF DOSES IN PRESCRIPTIONS

Two forms of setting out a prescription are commonly used ; one giving the weight or measure of each drug to be taken in a single dose of the preparation, and the other giving the total weight or measure required for a number of doses.

Examples of both types are given below :

A.

℞

Bism. Carb	.. .. ..	gr. v
Sod. Bicarb.	.. .. ..	gr. x
Mag. Carb. Levis.	.. ..	gr. ij
Tinct. Rhei Co.	.. .. ..	m. x
Syrup Zingib.	.. .. ..	m. xxx
Aq.	.. .. ..	ad ℥j

M.Ft. mist. mitte ℥viij.
Sig. One ounce twice daily after meals.

℞

Calomel	.. ..	gr. ¼
Lactose	.. ..	gr. ij

M.Ft. pulv. mitte tales vj.
Sig. One to be taken at bedtime every night.

B.

℞

Ammon. Chlorid.	.. ..	℥j
Vin. Ipecac.	.. .. ..	℥ij
Ext. Glycyrrhiz. Liq.	.. ..	℥jss
Tinct. Opii Camph.	.. ..	℥ss
Syrup Tolu.	.. .. ..	℥j
Aq. Chlorof.	.. .. ad	℥vj

M.Ft. mist.
Sig. Half an ounce every four hours.

℞

Aloin.	.. ..	gr. ij
Ext. Bellad. Sicc.	.. ..	gr. j
Ext. Colocynth Co.	.. ..	gr. xij

M.Ft. mass. Divid. in pil. vj.
Sig. One at bedtime when necessary.

In the " A " type of prescription the dose of each drug can be seen at a glance and can readily be checked. The dose of each ingredient as stated in the recipe for the mixture is contained in 1 fluid ounce of the medicine, and the directions to

the dispenser indicate that 8 fluid ounces are to be made. Before the dispenser begins to weigh or measure any ingredient he must multiply each quantity by 8 in order to ascertain how much is required for the total volume of the mixture. Similarly, in the prescription for powders under "A," the ingredients shown are for one powder only, and the dispenser is directed to "send six of such." He will, therefore, require 1½ grs. of calomel, and 12 grs. of lactose to be mixed and divided into six powders.

In the "B" type of prescription, the weight or measure noted against each drug is the total amount required for the whole bottleful of mixture or for the six pills. The dose of each drug is found by dividing the weight or measure of each by the number of doses in the bottle or by the total number of pills to be made. In the case of the mixture, the total volume is 6 fluid ounces of which the patient is to take half an ounce at each dose; *i.e.* the bottle contains 12 doses. The dose of each ingredient, therefore, will be:

Ammon. Chlorid., ℥j, *i.e.* 60 grains ÷ 12 = 5 grs. in each dose.

Vin. Ipecac., ℥ij, *i.e.* 120 minims ÷ 12 = 10 m. in each dose.

Ext. Glycyrr. Liq., ℥iss. *i.e.* 90 minims ÷ 12 = 7½ m. in each dose.

Tinct. Opii Camph., ℥ss, *i.e.* 240 minims ÷ 12 = 20 m. in each dose.

Syrup Tolu, ℥i, *i.e.* 480 minims ÷ 12 = 40 m. in each dose.

In the "B" prescription for pills, the weights shown are to be made into a mass which is to be divided into six pills of equal weight. The dose of each drug is, therefore:

Aloin, gr. ij ÷ 6 = ⅓ gr. in each pill.

Ext. Bellad., gr. i ÷ 6 = ⅙ gr. in each pill.

Ext. Coloc. Co., gr. xij ÷ 6 = ij grs. in each pill.

THE PRESCRIPTION

The parts of a model prescription are as follows, but the various subdivisions of the inscription are not always present.

Superscription	.. ..	℞
Inscription — Basis	.. ..	Potass. Iodid., ℥ij.
Adjuvant	..	Tinct. Scillæ., ℥iss.
Corrective	..	Glycerin, ℥ss.
Vehicle	..	Aq. Anisi ad, ℥iv.
Subscription	.. ..	Misce fiat mistura.
Signature	.. .. ..	Half an ounce three times a day.

The "**Superscription,**" in olden times, consisted of a symbol, sign, or Latin phrase invoking the aid of some deity; but now consists of a capital "R," which is taken to be an abbreviation for the Latin word "recipe," meaning "take thou."

The "**Inscription,**" or body of the prescription, gives the names of the drugs to be employed and the quantity of each. One or more of the subdivisions may be missing, and in its simplest form a medicine may consist of basis and vehicle only. On the other hand an elaborate prescription may contain more than one drug under each division of the Inscription. The "Basis," of course, is the most important drug in the preparation; the "Adjuvant" is a substance which supplements the action of the former. The "Corrective," at one time, was a preparation added to the medicine to "correct" any unpleasant action on the part of one of the principal drugs, but is now only added as a sweetening or flavouring agent. The "Vehicle" is the name given to that part of the preparation which gives form or consistence to the other ingredients. In most mixtures the vehicle is either plain or a medicated water.

The "**Subscription,**" or direction to the dispenser, is an indication of the nature or form of the medicine, and is usually written in the form of contracted Latin phrases, such as "M.Ft. Mist" for "Misce fiat mistura."

The direction to the patient regarding how and when the medicine will be taken, or the preparation used, constitutes the "**Signature.**" The word is derived from the Latin "signetur," meaning "let it be signed" or "let it be labelled." The Regulations for the Medical Services of the Army lay down that the directions to the dispenser shall be written in English, but they are frequently appended in the contracted Latin form.

The following is an example of a prescription written in the full Latin and abbreviated Latin forms, together with the English translation.

Full Latin Form

Recipe
Potassii Iodidi .. .. drachmas duas
Tincturæ Scillæ .. .. drachmas tres
Syrupi Tolutani .. semiunciam
Infusi Senegæ ad uncias quatuor.
Misce, fiat mistura, cujus capiat cochlearia magna ter in die post cibos.

Contracted Latin Form

℞

Pot. Iod. . .	. .	. . ℥ij
Tr. Scill. . .	. .	. . ℥iij
Syr. Tolu.	. .	. . ℥ss
Inf. Seneg. ad	. .	. . ℥iv
M.Ft. Mist.	. .	. . ℥ss. t.i.d.p.c.

English Translation

Take thou (of)

Potassium Iodide	. .	two drachms.
Tincture of Squills	. .	three drachms.
Syrup of Tolu . .	. .	half an ounce.
Infusion of Senega	. .	up to four ounces.

Mix and make a mixture of which take (literally " let the patient take ") a tablespoonful three times daily after meals.

It is highly improbable that the dispenser will ever be called upon to dispense a prescription written in full Latin ; the contracted form is invariably used, and the dispenser only needs to be conversant with the names of the drugs and the contracted Latin terms to be able to make a satisfactory translation.

The Numerals

It will be noticed that Roman numerals are invariably used in conjunction with symbols to denote the weight or volume of the ingredients in prescriptions. A table of numerals showing the Latin names and the Roman symbols is given below :—

Number	Roman Symbol	Latin Name
1	i	unus
2	ii	duo
3	iii	tres
4	iv	quatuor
5	v	quinque
6	vi	sex
7	vii	septem
8	viii	octo
9	ix	novem
10	x	decem
11	xi	undecim
12	xii	duodecim
13	xiii	tredecim
14	xiv	quatuordecim
15	xv	quindecim
16	xvi	sedecim

Number	Roman Symbol	Latin Name
17	xvii	septemdecim
18	xviii	duodeviginti
19	xix	undeviginti
20	xx	viginti
30	xxx	triginta
40	xl	quadraginta
50	l	quinquaginta
60	lx	sexaginta
70	lxx	septuaginta
80	lxxx	octoginta
90	xc	nonaginta
100	c	centum
200	cc	ducenti
500	D	quingenti
1000	M	mille

LATIN WORDS AND PHRASES USED IN PRESCRIPTIONS

Latin	Contracted Form	English Translation
Absente febri	abs. feb.	In the absence of fever.
Ad	ad	Up to.
Ad duas vices	ad 2 vic.	For two times.
Ad tertiam vicem	ad 3 vic.	For three times.
Ad libitum	ad lib.	At pleasure. As much as you please.
Ad partem affectum	ad part. affect.	To the affected part.
Adde	add.	Add.
Addendus	add.	To be added.
Admove	admov.	Apply (thou).
Admoveatur	admov.	Let it be applied.
Adstante febri	ads. feb.	While the fever lasts.
Adversum	adv.	Against.
Alternis horis	alt. hor. or A.H.	Every other hour.
Alternis diebus	alt. die.	Every other day.
Ana	aa.	Of each.
Ante	—	Before.
Ante cibos	a.c.	Before food.
Ampulla	amp.	An ampoule.
Aqua ad	aq. ad	Water up to.
Auristillæ	auristill.	The ear drops.
Balneum	bal.	A bath.
Balneum calidum	bal. cal.	A warm bath.
Bene	—	Well.
Bibe	bib.	Drink.
Bis	—	Twice.
Bis in die	b.i.d.	Twice a day.
Bis die	b.d.	Twice a day.
Bis terve in die	b.t.i.d.	Two or three times a day.
Brachium	brach.	The arm.
Bulliens	bull.	Boiling.
Capiat	cap. or cpt.	Let the patient take (take).
Capsula	caps.	A capsule.
Capsula amylacea	caps. amyl.	A cachet.
Capsula vitrea	caps. vit.	A glass capsule.
Capsula gelatina	caps. gel.	A gelatin capsule.
Cataplasma	cataplasm.	A poultice.
Charta	chart.	A paper.
Charta cerata	chart. cerat.	Waxed paper.
Charta sinapis	chart. sinap.	A mustard leaf.
Cibus	cib.	Food.
Collyrium	coll.	An eye-wash.
Collunarium	collun.	A nasal-douche.
Collutorium	collut.	A mouth wash.
Compositus	comp.	Compound.
Confectio	conf.	A confection.
Congius	cong. or C.	A gallon.
Coque	coq.	Boil.
Cortex	cort.	A bark.
Cras	—	Early.
Cras mane	c.m.	To-morrow morning.
Cras vespere	c.v.	To-morrow evening.
Cum	c.	With.

Latin	Contracted Form	English Translation
Cujus	cuj.	Of which.
Cyathus	cyath.	A glass.
Cyathus vinarius	cyath. vin.	A wineglass.
Da, detur	—	Give (thou), let it be given.
Decoctum	dec.	A decoction.
Decubitus	decub.	Lying down.
Decubitus hora	decub. hor.	At bedtime.
De die in diem	de. d. in d.	From day to day.
Destillata	dest.	Distilled.
Diebus alternis	dieb. alt.	Every other day.
Dimidium	dimid.	One half.
Dividatur in partes æquales	div. in part æq.	Divide into equal parts.
Dolor	dol.	Pain.
Dolore urgente	dol. urg.	While the pain is severe.
Donec	—	Until.
Dosis	dos.	A dose.
Dulcis	dulc.	Sweet.
Durante dolore	dur. dol.	While the pain lasts.
Durus	dur.	Hard.
Emplastrum	empl.	A plaster.
Emplastrum lyttæ	empl. lytt.	A blister.
Emulsio	emuls.	An emulsion.
Ex aqua	ex aq.	With water.
Ex aquæ cyatho vinario	ex aq. cyath. vin.	In a wineglass of water.
Extractum	ext.	An extract.
Fac, fiat	F. or ft.	Make, let it be made.
Folium	fol.	A leaf.
Fortis	fort.	Strong.
Frigidus	frig.	Cold.
Gargarisma	garg.	A gargle.
Gradatim	grad.	Gradually—by degree.
Gutta, guttæ	gtt.	A drop, drops.
Guttatim	guttat.	Drop by drop.
Hac nocte	hac noct.	Tonight.
Haustus	haust.	A draught.
Hebdomedo	hebdom.	A week.
Hora	H. or hor.	An hour.
Hora somni sumendus	H.S.S.	To be taken at bedtime.
Hirudo, hirudines	hirud.	A leech, leeches.
Idem	id.	The same.
Infusum	inf.	An infusion.
Inhalatio	inhal.	An inhalation.
Injectio	inj.	An injection.
Injectio hypodermica	inj. hypod.	An hypodermic injection.
Inter	—	Between.
Inter cibos	int. cib.	Between meals.
Instillandus	instill.	To be dropped in.
Jentaculum	jentac.	Breakfast.
Lac	—	Milk.
Latus	lat.	The side.
Lateri dolenti	lat. dol.	To the affected (painful) side.
Lignum	lig.	A wood.
Linctus	linct.	A linctus.

Latin	Contracted Form	English Translation
Linimentum	lin.	A liniment.
Liquor	liq.	A solution.
Lotio	lot.	A lotion.
Mane	—	Morning.
Mane primo	M.P. or man. prim.	Early in the morning.
Mane et vespere	M. et V.	Morning and evening.
Misce	M.	Mix.
Misce fiat mistura	M. ft. mist.	Mix and let a mixture be made.
Mitte	—	Send.
Mitte tales	—	Send of such.
Mitis	mit.	Weak, mild.
Mollis	moll.	Soft.
More dicto	m.d.	In the manner directed.
More dicto utendum	m.d.u.	To be used as directed.
More dicto applicandum	m.d. app.	To be applied as directed.
More solito	m. sol.	In the usual manner.
Nebula	neb.	A spray.
Niger, nigra.	nig.	Black.
Nocte	noct.	Night.
Nocte et mane	n. et m.	Night and morning.
Nocte maneque	n. mque.	Night and morning.
Nux, nucis	—	A nut.
Omne nocte	o.n.	Every night.
Omne quadrante hora	om. quad. hor.	Every quarter of an hour.
Omne tertia hora	om. tert. hor.	Every three hours.
Ovum	ov.	An egg.
Ovi vitellus	ov. vit.	Yolk of egg.
Partes æquales	part. æq.	Equal parts.
Parti dolenti	part. dol.	To the painful part.
Pectus	pect.	The chest.
Pessus	pess.	A pessary.
Phiala	—	A phial or bottle.
Phiala prius agitata	p.p.a.	The bottle having previously been shaken.
Pigmentum	pigm.	A paint.
Pilula	pil.	A pill.
Poculum	poc.	A cup.
Ponderosus	pond.	Heavy.
Pone aurem	pon. aur.	Behind the ear.
Post cibos	p.c.	After meals.
Prandium	prand.	Dinner.
Prima luce	prim. luc.	Early in the morning.
Pro dosi	—	For a dose.
Pro re nata	p.r.n.	Occasionally.
Pro rationæ aetatis	pro. rat. aet.	According to age.
Pulvis	pulv.	A powder.
Quaque	qq.	Each, or every.
Quaque quarta hora	q.q.h.	Every fourth hour.
Quaque hora	qq.h.	Every hour.
Quartis horis	q.h.	Every four hours.
Quantum sufficiat	q.s.	A sufficient quantity.
Quantum libet	q.l.	As much as you please.
Quotidie	quotid.	Daily.
Radix	rad.	A root.

Latin	Contracted Form	English Translation
Recipe	℞	Take (thou).
Repetatur	rept.	Let it be repeated.
Scatula	scat.	A box.
Secundum artem	sec. art.	According to custom.
Secundis horis	sec. hor.	Every two hours.
Semis	ss.	A half.
Sextis horis	sex. hor.	Every six hours.
Signa, signetur.	s. or sig.	Label, let it be labelled.
Sine	—	Without.
Si opus sit.	s.o.s.	If there be need. If necessary.
Somnus	—	Sleep.
Statim	stat.	Immediately.
Subinde	subind.	Frequently.
Sumat	sum.	Let him take.
Supra	—	Above.
Tabella	tab.	A tablet.
Talis	tal.	Of such.
Ter	—	Three times.
Ter in die	t.i.d.	Three times a day.
Ter die sumendus	t.d.s.	To be taken three times a day.
Ter quaterve die	t.q.d.	Three or four times a day.
Tinctura	tinct. or Tr.	A tincture.
Trochiscus	troch.	A lozenge.
Tussis	tuss.	A cough.
Tussi urgente	tuss. urg.	When the cough is troublesome.
Unguentum	ungt.	An ointment.
Utendus	utend.	To be used.
Ut dictum	ut dict.	As directed.
Vespere	vesp.	Evening.

LIST OF THE NAMES OF B.P. PREPARATIONS WITH THEIR ENGLISH TRANSLATIONS AND SYNONYMS

B.P. Name	English Translation	Synonyms
Acacia.	Gum Acacia.	Gum Arabic.
Acetarsol.	Acetarsol.	Acetarsone. Stovarsol.
Acetum Scillæ.	Vinegar of Squill.	—
Acidum Aceticum Glaciale.	Glacial Acetic Acid.	—
Acidum Acetylsalicylicum.	Acetylsalicylic Acid.	Aspirin.
Acidum Ascorbicum.	Ascorbic Acid.	Vitamin C.
Acidum Boricum.	Boric Acid.	Boracic Acid. Boric Powder.
Acidum Hydrocyanicum Dilutum.	Dilute Hydrocyanic Acid.	Dilute Prussic Acid.
Acidum Nitricum.	Nitric Acid.	Aqua Fortis.
Acidum Sulphuricum.	Sulphuric Acid.	Oil of Vitriol.
Acidum Tannicum.	Tannic Acid.	Tannin.
Acidum Trichloraceticum.	Trichloracetic Acid.	—
Aconitum.	Aconite Root.	Monkshood.
Adeps.	Lard.	—
Adeps Lanæ.	Wool Fat.	Anhydrous Lanolin.
Adeps Lanæ Hydrosus.	Hydrous Wool Fat.	Lanolin.
Adrenalina	Adrenaline.	Epinephrine.
Æther Anæstheticus	Anæsthetic Ether.	Purified Ether.
Æthylis Chloridum.	Ethyl Chloride.	—
Agar	Agar.	—
Alcohol Dehydratum.	Dehydrated Alcohol.	Absolute Alcohol.
Aloe.	Aloes.	Bitter Aloes.
Amidopyrina.	Amidopyrine.	Pyramidon.
Amylocainæ Hydrochloridum.	Amylocaine Hydrochloride.	Stovaine.
Amylum.	Starch.	—
Anethum.	Dill.	Dill Fruit.
Antimonii et Potassii Tartras.	Potassium Antimonyltartrate.	Tartar Emetic, Antimonium Tartaratum.
Aqua Menthæ Piperitæ.	Peppermint Water.	—
Argenti Nitras.	Silver Nitrate.	Lunar Caustic.
Argenti Nitras Induratus	Toughened Silver Nitrate.	Toughened Caustic.
Argentoproteinum.	Silver Protein.	Protargol.
Arsenii Triiodidum.	Arsenic Triiodide.	Arsenious Iodide.
Arsenii Trioxidum.	Arsenic Trioxide.	Arsenious Acid. Arsenious Anhydride.
Aurantii Cortex Recens.	Fresh Bitter-Orange Peel.	—
Aurantii Cortex Siccatus.	Dried Bitter-Orange Peel.	—
Balsamum Peruvianum.	Balsam of Peru.	—
Balsamum Tolutanum.	Balsam of Tolu.	—
Barbitonum.	Barbitone.	Veronal, Malonurea.
Barbitonum Solubile.	Soluble Barbitone.	Medinal.
Belladonna Pulverata.	Powdered Belladonna Leaf.	—

B.P. Name	English Translation	Synonyms
Belladonnæ Folium.	Belladonna Leaves.	Deadly Nightshade Leaves.
Benzocaina.	Benzocaine.	Anæsthesin.
Betanaphthol.	Betanaphthol.	Naphthol.
Bismuthi Carbonas.	Bismuth Carbonate.	Bismuth Oxycarbonate, Bismuth Subcarbonate.
Bismuthi Oxychloridum.	Bismuth Oxychloride.	Bismuth Subchloride.
Bismuth Præcipitatum.	Precipitated Bismuth.	—
Borax.	Borax.	Sodium Biborate.
Calcii Carbonas.	Calcium Carbonate.	Precipitated Chalk.
Calcii Hydroxidum	Calcium Hydroxide.	Slaked Lime.
Calcii Gluconas.	Calcium Gluconate.	—
Calx Chlorinata.	Chlorinated Lime.	Chloride of Lime, Bleaching Powder.
Capsicum.	Capsicum.	Chillies.
Carbromalum.	Carbromal.	Uradal.
Carum.	Caraway.	Caraway Seeds.
Caryophyllum.	Cloves.	—
Cascara Sagrada.	Cascara Sagrada.	Sacred Bark.
Cassia.	Cassia.	Cassia Pulp.
Cataplasma Kaolini.	Poultice of Kaolin.	Antiphlogistine.
Cera Alba.	White Beeswax.	—
Cera Flava.	Yellow Beeswax.	—
Chiniofonum.	Chiniofon.	Yatren. Loretin. Quinoxyl.
Chloramina.	Chloramine.	Chloramine—T.
Chlorbutol.	Chlorbutol.	Chloretone.
Chromii Trioxidum.	Chromium Trioxide.	Chromic Acid, Chromic Anhydride.
Cinchona.	Cinchona.	Red Cinchona Bark.
Cinchophenum.	Cinchophen.	Atophan. Quinophan.
Cinnamomum.	Cinnamon.	Cinnamon Bark.
Coccus.	Cochineal.	—
Collodium Flexile.	Flexible Collodion.	—
Colocynthis.	Colocynth.	Bitter Apple.
Colophonium.	Colophony.	Resin.
Confectio Sennæ.	Confection of Senna.	Lenitive Electuary.
Coriandrum.	Coriander.	Coriander Fruit.
Creosotum.	Creosote.	—
Creta.	Chalk.	Prepared Chalk.
Cupri Sulphas.	Copper Sulphate.	Blue Vitriol.
Dextrosum.	Dextrose.	—
Diamorphinæ Hydrochloridum.	Diamorphine Hydrochloride.	Heroin.
Digitalis Folium.	Digitalis Leaf.	Foxglove Leaf.
Emplastrum Cantharidini.	Plaster of Cantharidis.	Blistering Plaster.
Emplastrum Colophonii.	Plaster of Colophony.	Resin Plaster. Adhesive Plaster.
Emplastrum Plumbi.	Plaster of Lead.	Diachylon Plaster.
Ergota.	Ergot.	Ergot of Rye.
Ergotoxinæ Æthanosulphonas.	Ergotoxine Ethanesulphonate.	—
Eucalyptol.	Eucalyptol.	Cineole.
Extractum Colocynthidis Compositum.	Compound Extract of Colocynth.	—

B.P. Name	English Translation	Synonyms
Extractum Fellis Bovini.	Extract of Ox Bile.	—
Extractum Filicis.	Extract of Male Fern.	—
Extractum Hepatis Liquidum.	Liquid Extract of Liver.	—
Extractum Malti cum Oleo Morrhuæ.	Extract of Malt with Cod Liver Oil.	—
Ferri Carbonas Saccharatus.	Saccharated Iron Carbonate.	—
Ferri et Ammonii Citras.	Iron and Ammonium Citrate.	—
Ferri et Quininæ Citras.	Iron and Quinine Citrate.	—
Ferri Sulphas.	Ferrous Sulphate.	Green Vitriol.
Ferrum.	Iron.	—
Ferrum Redactum.	Reduced Iron.	—
Filix Mas.	Male Fern.	Aspidium.
Fluoresceinum Solubile.	Soluble Fluorescein.	—
Fœniculum.	Fennel.	Fennel Fruit.
Gelatinum Zinci.	Gelatin of Zinc.	Unna's Paste.
Glycyrrhiza.	Liquorice.	Liquorice Root.
Hamamelis.	Hamamelis.	Hamamelidis, Witch Hazel Leaves.
Hexamina.	Hexamine.	Urotropine.
Hydrargyri Iodidum Rubrum.	Red Mercuric Iodide.	Biniodide of Mercury.
Hydrargyri Oxidum Flavum.	Yellow Mercuric Oxide.	—
Hydrargyri Oxycyanidum.	Mercuric Oxycyanide.	—
Hydrargyri Perchloridum.	Mercuric Chloride.	Corrosive Sublimate, Perchloride of Mercury.
Hydrargyri Subchloridum.	Mercurous Chloride.	Calomel, Subchloride of Mercury.
Hydrargyrum.	Mercury.	Quicksilver.
Hydrargyrum Ammoniatum.	Ammoniated Mercury	White Precipitate.
Hydrargyrum cum Creta.	Mercury with Chalk.	Grey Powder.
Hydrargyrum Oleatum.	Oleated Mercury.	
Hyoscinæ Hydrobromidum.	Hyoscine Hydrobromide.	Scopolamine.
Ichthammol.	Ichthammol.	Ichthyol.
Indicarminum.	Indigo Carmine.	—
Infusum Digitalis Recens.	Fresh Infusion of Digitalis.	—
Injectio Bismuthi.	Injection of Bismuth.	Bismostab.
Injectio Hydrargyri.	Injection of Mercury.	Mercurial Cream.
Injectio Hydrargyri Subchloridi.	Injection of Mercurous Chloride.	Injection of Calomel.
Iodum.	Iodine.	Resublimed Iodine.
Ipecacuanha.	Ipecacuanha.	Ipecacuanha Root.
Ipomœa.	Ipomœa.	Mexican Scammony Root.
Krameria.	Krameria.	Krameria Root, Rhatany Root.
Lactosum.	Lactose.	Milk Sugar, Saccharum Lactis.

B.P. Name	English Translation	Synonyms
Lævulosum.	Lævulose.	Fructose.
Limonis Cortex.	Lemon Peel.	—
Linimentum Camphoræ.	Liniment of Camphor	Camphorated Oil.
Linimentum Camphoræ Ammoniatum.	Ammoniated Liniment of Camphor.	Compound Camphor Liniment.
Linimentum Saponis.	Liniment of Soap.	Opodeldoc.
Linimentum Terebinthinæ.	Liniment of Turpentine.	—
Linum.	Linseed.	Flax Seed.
Linum Contusum.	Crushed Linseed.	Linseed Meal.
Liquor Ammonii Acetatis Dilutus.	Dilute Solution of Ammonium Acetate.	Mindererus' Spirit.
Liquor Arsenicalis.	Arsenical Solution.	Fowler's Solution.
Liquor Arseni et Hydrargyri Iodidi.	Solution of Arsenious and Mercuric Iodides.	Donovan's Solution.
Liquor Calcii Hydroxidi.	Solution of Calcium Hydroxide.	Liquor Calcis, Lime Water, Solution of Lime.
Liquor Cresolis Saponatus.	Solution of Cresol with Soap.	Lysol.
Liquor Epispasticus.	Blistering Liquid.	—
Liquor Ferri Perchloridi.	Solution of Ferric Chloride.	—
Liquor Formaldehydi.	Solution of Formaldehyde.	Formalin.
Liquor Glycerylis Trinitratis.	Solution of Glyceryl Trinitrate.	Solution of Trinitrin, Solution of Nitroglycerin.
Liquor Iodi Aquosus.	Aqueous Solution of Iodine.	Lugol's Solution.
Liquor Iodi Fortis.	Strong Solution of Iodine.	Strong Tincture of Iodine.
Liquor Iodi Mitis.	Weak Solution of Iodine.	Weak Tincture of Iodine.
Liquor Magnesii Bicarbonatis.	Solution of Magnesium Bicarbonate.	Fluid Magnesia.
Liquor Picis Carbonis.	Solution of Coal Tar.	—
Liquor Plumbi Subacetatis Dilutum.	Dilute Solution of Lead Subacetate.	Goulard's Lotion.
Liquor Plumbi Subacetatis Fortis.	Strong Solution of Lead Subacetate.	Goulard's Extract.
Liquor Potassii Hydroxidi.	Solution of Potassium Hydroxide.	Solution of Potash, Liquor Potassæ.
Liquor Quininæ Ammoniatus.	Ammoniated Solution of Quinine.	Ammoniated Tincture of Quinine.
Liquor Sodæ Chlorinatæ Chirurgicalis.	Surgical Solution of Chlorinated Soda.	Dakin's Solution.
Liquor Sodii Chloridi Physiologicus.	Physiological Solution of Sodium Chloride.	Normal Saline.
Lotio Hydrargyri Nigra.	Black Mercurial Lotion.	Black Wash.
Magnesii Carbonas Levis.	Light Magnesium Carbonate.	—
Magnesii Oxidum Leve.	Light Magnesium Oxide.	Light Magnesia.

B.P. Name	English Translation	Synonyms
Magnesii Oxidum Ponderosum.	Heavy Magnesium Oxide.	Heavy Magnesia.
Magnesii Sulphas.	Magnesium Sulphate.	Epsom Salts.
Mel Boracis.	Honey of Borax.	Borax and Honey.
Mel Depuratum.	Purified Honey.	—
Mersalylum.	Mersalyl.	Salyrgan.
Methylis Salicylas.	Methyl Salicylate.	Artificial Oil of Wintergreen.
Methylsulphonal.	Methylsulphonal.	Trional.
Methylthioninæ Chloridum.	Methylene Blue.	—
Mistura Magnesii Hydroxidi.	Mixture of Magnesium Hydroxide.	Cream of Magnesia.
Mistura Sennæ Composita.	Compound Mixture of Senna.	Black Draught.
Myristica.	Nutmeg.	—
Neoarsphenamina.	Neoarsphenamine.	Neosalvarsan.
Nitrogenii Monoxidum.	Nitrous Oxide.	Laughing Gas.
Oleum Abietis.	Oil of Siberian Fir.	Oil of Pine.
Oleum Amygdalæ.	Almond Oil.	—
Oleum Anethi.	Oil of Dill.	—
Oleum Anisi.	Oil of Anise.	Oil of Aniseed.
Oleum Arachis.	Arachis Oil.	Nut Oil, Pea-nut Oil, Ground-nut Oil.
Oleum Cadinum.	Oil of Cade.	Juniper Tar Oil.
Oleum Carui.	Oil of Caraway.	—
Oleum Chenopodii.	Oil of Chenopodium.	Oil of American Worm-seed.
Oleum Eucalypti.	Eucalyptus Oil.	—
Oleum Gossypii Seminis.	Cottonseed Oil.	—
Oleum Hydnocarpi.	Hydnocarpus Oil.	—
Oleum Iodisatum.	Iodised Oil.	—
Oleum Lini.	Linseed Oil.	—
Oleum Menthæ Piperitæ.	Oil of Peppermint.	—
Oleum Morrhuæ.	Cod Liver Oil.	—
Oleum Ricini.	Castor Oil.	—
Oleum Santali.	Oil of Sandal Wood.	Santal Wood Oil.
Oleum Terebinthinæ.	Oil of Turpentine.	Turpentine.
Oleum Theobromatis.	Oil of Theobroma.	Cocoa Butter, Cacao Butter.
Paraffinum Molle Album.	White Soft Paraffin.	White Vaseline.
Paraffinum Molle Flavum.	Yellow Soft Paraffin.	Vaseline.
Pasta Zinci Oxidi Composita.	Compound Paste of Zinc Oxide.	—
Phenazonum.	Phenazone.	Antipyrine.
Phenol.	Phenol.	Carbolic Acid.
Phenol Liquefactum.	Liquified Phenol.	Liquified Carbolic Acid.
Phenobarbitonum.	Phenobarbitone.	Luminal.
Phenobarbitonum Solubile.	Soluble Phenobarbitone.	Sodium Luminal.
Physostigminæ Salicylas.	Physostigmine Salicylate.	Eserine Salicylate.
Pilula Ferri Carbonatis.	Pill of Iron Carbonate.	Blaud's Pill, Pilula Ferri.
Pilula Hydrargyri.	Pill of Mercury.	Blue Pill.
Pilula Rhei Composita.	Compound Rhubarb Pill.	—

B.P. Name	English Translation	Synonyms
Pix Carbonis Præparata.	Prepared Coal Tar.	—
Pix Liquida.	Tar.	Wood Tar, Stockholm Tar.
Plumbi Acetas.	Lead Acetate.	Sugar of Lead.
Plumbi Monoxidum.	Lead Monoxide.	Litharge. Lead Oxide.
Podophylli Resina.	Podophyllum Resin.	Podophyllin.
Potassa Sulphurata.	Sulphurated Potash.	Liver of Sulphur.
Potassii Carbonas.	Potassium Carbonate.	Salt of Tartar.
Potassii Hydroxidum.	Potassium Hydroxide.	Caustic Potash.
Potassii Nitras.	Potassium Nitrate.	Nitre, Saltpetre.
Potassii Tartras Acidus.	Potassium Acid Tartrate.	Cream of Tartar.
Procainæ Hydrochloridum.	Procaine Hydrochloride.	Novocaine, Ethocaine. Planocaine.
Prunus Serotina.	Wild Cherry Bark.	—
Pulvis Cretæ Aromaticus.	Aromatic Powder of Chalk.	—
Pulvis Effervescens Compositus.	Compound Effervescent Powder.	— Seidlitz Powder.
Pulvis Ipecacuanhæ et Opii.	Powder of Ipecacuanha and Opium.	Dover's Powder, Pulv. Ipecac. Comp.
Pulvis Rhei Compositus.	Compound Powder of Rhubarb.	Gregory's Powder.
Quassia.	Quassia.	Quassia Chips.
Quillaia.	Quillaia.	Soap Bark, Panama Bark.
Quininæ Bisulphas.	Quinine Bisulphate.	Quinine Acid Sulphate.
Quininæ Dihydrochloridum.	Quinine Dihydrochloride.	Quinine Acid Hydrochloride.
Quininæ et Æthylis Carbonas.	Quinine Ethyl Carbonate.	—
Resorcinol.	Resorcinol.	Resorcin.
Rheum.	Rhubarb.	Rhei Rhizoma.
Saccharinum Solubile.	Soluble Saccharin.	—
Sapo Animalis.	Curd Soap.	—
Sapo Durus.	Hard Soap.	—
Sapo Mollis.	Soft Soap.	—
Scilla.	Squills.	—
Sennæ Fructus.	Senna Fruit.	Senna Pods.
Sevum.	Suet.	—
Sodii et Potassii Tartras.	Sodium Potassium Tartrate.	Rochelle Salt.
Sodii Hydroxidum.	Sodium Hydroxide.	Caustic Soda.
Sodii Sulphas.	Sodium Sulphate.	Glauber's Salt.
Sodii Thiosulphas.	Sodium Thiosulphate.	Hypo.
Spiritus Ætheris Nitrosi.	Spirit of Nitrous Ether.	Sweet Spirits of Nitre.
Spiritus Ammoniæ Aromaticus.	Aromatic Spirit of Ammonia.	Sal Volatile.
Spiritus Chloroformi.	Spirit of Chloroform.	Chloric Ether.
Strophanthus.	Strophanthus.	Kombe Seeds.
Styrax.	Storax.	—
Sucrosum.	Sucrose.	Refined Sugar. Cane Sugar.
Sulpharsphenamina.	Sulpharsphenamine.	Sulpharsenol.

B.P. Name	English Translation	Synonyms
Sulphur Præcipitatum.	Precipitated Sulphur.	Milk of Sulphur.
Sulphur Sublimatum.	Sublimed Sulphur.	Flowers of Sulphur.
Syrupus Ferri Phosphatis Compositus.	Compound Syrup of Ferrous Phosphate.	Parrish's Food, Chemical Food.
Syrupus Ferri Phosphatis cum Quinina et Strychnina.	Syrup of Ferrous Phosphate with Quinine and Strychnine.	Easton's Syrup.
Theobromina et Sodii Salicylas.	Theobromine and Sodium Salicylate.	Diuretin.
Theophyllina et Sodii Acetas.	Theophylline and Sodium Acetate.	Theocin.
Tinctura Benzoini Composita.	Compound Tincture of Benzoin.	Friar's Balsam.
Tinctura Opii.	Tincture of Opium.	Laudanum.
Tinctura Opii Camphorata.	Camphorated Tincture of Opium.	Paregoric, Tinct. Camph. Comp.
Tinctura Zingiberis Fortis.	Strong Tincture of of Ginger.	Essence of Ginger.
Trinitrophenol.	Trinitrophenol.	Picric Acid.
Unguentum Capsici.	Capsicum Ointment.	Chillie Paste.
Unguentum Hydrargyri.	Mercury Ointment.	Blue Ointment.
Unguentum Hydrargyri Nitratis Forte.	Strong Ointment of Mercuric Nitrate.	Citrine Ointment.
Unguentum Hydrargyri Ammoniati.	Ointment of Ammoniated Mercury.	White Precipitate Ointment.
Unguentum Hydrargyri Compositum.	Compound Ointment of Mercury.	Scott's Dressing.
Unguentum Hydrargyri Subchloridi.	Ointment of Mercurous Chloride.	Calomel Ointment.
Unguentum Zinci Oxidi.	Ointment of Zinc Oxide.	Zinc Ointment.
Zinci Sulphas.	Zinc Sulphate.	White Vitriol.
Zingiber.	Ginger.	—

POISONS

Definition.

It is exceedingly difficult to give a satisfactory definition of a poison and, indeed, the Pharmacy and Poisons Act does not attempt to do so. The Concise Oxford Dictionary defines a poison as " A substance that when introduced into or absorbed by a living organism destroys life by rapid action and when taken in small quantity." This definition is rather constricted and excludes numerous compounds the poisonous properties of which cannot be disputed. A more comprehensive and possibly more accurate definition is " A substance which, by direct action on the tissues or by absorption into the blood, interferes with some vital function of the body sufficiently to cause injury to health or to destroy life."

There is no definite line of distinction between a poisonous substance and a non-poisonous one ; the quantity taken and the general circumstances under which a drug is taken, are the deciding factors.

The popular conception of a poison is a substance which destroys life or seriously affects health when taken in **small quantity ;** but there are many drugs, commonly regarded as harmless, which may cause poisoning if taken in **large doses.** It might be as well here to draw attention to the meaning of the word drug which is defined as " any substance used medicinally " and is not necessarily a poison.

Certain substances are scheduled in the Pharmacy and Poisons Act as being definite poisons, and the indiscriminate sale of such drugs is restricted by law. These same drugs, however, are possessed of important medicinal virtues when prescribed and administered under proper medical supervision. Further statutes, *i.e.* the Dangerous Drugs Acts, imposed special restrictions upon the possession and sale of certain drugs of the narcotic and hypnotic class, with the view to putting down the illicit traffic in such drugs and keeping their use entirely under the control of the medical profession.

Such drugs as strychnine, arsenic, opium, prussic acid, etc., have long been recognized as being well-defined poisons, and their sale and administration is controlled accordingly ; but alarming symptoms and even death has followed too large a dose of such common substances as Epsom salts, turpentine, nitre, eucalyptus oil, etc., which are not classified as poisons.

It is evident then, that the circumstances under which a drug is administered, may be of great importance in deciding whether or not it is likely to prove poisonous. Let us consider further what these conditions may be. Firstly, there is the question of **dosage,** which is always a factor of the greatest

importance. The B.P. indicates a maximum and a minimum dose for all drugs intended for internal use, and these doses may safely be given to persons in normal health. In this connection the Pharmacopœia states " It must be clearly understood that the ' doses ' mentioned in the Pharmacopœia are not authoritatively enjoined, as binding upon prescribers. They are intended merely for general guidance and represent the average range of quantities which are generally regarded as suitable for adults when administered by mouth. The maximal doses mentioned may, as a rule, be repeated three or four times in twenty-four hours, but it must not be assumed that they indicate the greatest amounts of drugs that may be given by repeated administration. The medical practitioner will exercise his own judgment and act on his own responsibility in respect of the amount of any therapeutic agent he may prescribe or administer." This clearly indicates the responsibility of the physician as regards dosage, and he will modify the range of dosage according to the special circumstances of each case.

The manner in which a drug is taken or used also influences its poisonous properties ; soluble preparations of a drug are usually considerably more toxic than insoluble ones. The most active form of a volatile drug is its vapour which, when inhaled, is taken directly into the lungs whence it is speedily absorbed into the blood and carried away in the blood stream to all parts of the body. It is the volatile nature of prussic acid which makes it such a speedy and deadly poison.

Drugs given by injection, or applied to a serous or mucous membrane in solution, are absorbed more rapidly than when given by mouth, and rapid absorption means a relatively stronger action. When a drug is administered hypodermically it passes into the blood stream without passing through the digestive organs, in which its action may be modified, and the concentrated effect of the drug is exerted upon the system in a short time.

Interference with the normal excretion of a drug causes a prolongation of its action and has been a source of danger in many cases.

The state of health and age of the patient must also be taken into account ; a dose which would have little effect on a normal adult person may easily prove fatal if given to the very young, the aged, or the infirm.

It will readily be realized then, that there is danger in taking **any** drug except under medical supervision, and that a poisonous substance given with due precaution may exercise a beneficial influence in disease, whilst misuse of a comparatively harmless substance may cause poisoning.

Cumulative Action.

When poisoning results from the ingestion of a single dose of a drug the poisoning is said to be **acute,** to distinguish it from another form known as **chronic** or slow-poisoning. Many drugs, administered in sub-normal doses, have a tendency to accumulate in certain organs of the body, and if the administration of such doses is not checked, poisonous symptoms will certainly develop. Arsenic, lead, mercury, digitalis, and many other drugs exhibit this cumulative action to a more or less marked degree.

The symptoms exhibited in certain types of chronic poisoning frequently bear a strong resemblance to conditions caused by natural disease, and advantage has been taken of this fact to administer small but frequent doses of a drug with criminal intent. Such cases are extremely difficult to detect and instances have occurred in which a patient has been under treatment in hospitals without the true cause of the symptoms being suspected.

Chronic poisoning may also occur through the absorption of minute quantities of poisons during manufacturing processes, and special precautions are enforced by law in industries in which the workers are exposed to such dangers. The absorption may occur as a result of handling poisonous substances, by inhaling noxious fumes, or by breathing in tiny solid particles of the poison in the form of dust. Protective measures include proper washing arrangements, facilities for change of clothing or provision of special clothing in which to work, adequate ventilation and air filtration, and frequent medical examination.

Further references to chronic poisoning will be made under the headings of the individual poisons concerned.

The Pharmacy and Poisons Act, 1933

This Act, which supersedes all previous legislation on the subject, came into force on May 1, 1936. It regulates the manufacture, sale, supply, storage and transport of poisons.

The Poisons List.

Although the Act does not define the word poison a list of substances which it is desired to control has been drawn up, and is referred to as the Poisons List (Parts I and II). The distinction between the two parts is purely an arbitrary one and is not based upon the relative toxicity of the poisons. The poisons named in Part I of the List are pharmaceutical

preparations, whilst those in Part II are in general use for other purposes, *e.g.* sheep dips, weed killers, horticultural sprays, disinfectants, etc.

Retail Sale of Poisons.

The retail sale of poisons does not concern the Service dispenser and it will be sufficient for him to know that the sale of Part I poisons is restricted to registered pharmacists, but that Part II poisons may also be sold by dealers registered for the purpose with the local authorities.

The Poison Schedules.

For the purpose of administering the many provisions and exemptions of the Act the poisons named in the Poisons List (Parts I and II) are regrouped into various Schedules known as First Schedule, Second Schedule, and so on.

The First Schedule is the most important from the point of view of the dispenser since it contains the poisons to which special restrictions apply in respect of storing, dispensing and labelling, in addition to the general regulations dealing with poisons as a whole.

The Second Schedule is a list of substances which, for special reasons, are exempt from the provisions of the Act although they are, strictly speaking, poisonous.

The Third Schedule gives a short list of dangerous preparations liable to be self prescribed with fatal results, the retail sale of which is forbidden. The most important group contained in this Schedule is that of the barbiturates.

The other Schedules do not concern us.

R.A.M.C. Regulations in relation to the Pharmacy and Poisons Act.

The various Schedules have not been printed in the Regulations, but two modified schedules have been drawn up from them and these are the Sections I and II of paragraph 297, Standing Orders, R.A.M.C., 1937.

The substances in both sections are poisons within the meaning of the Act, but Section I contains the more poisonous items which must be stored under lock and key in a cupboard set apart for that purpose, whether in the dispensary (para. 297, Standing Orders) or in other parts of the hospital (Regulations for the Medical Services of the Army, 1938, para. 388). Other regulations regarding the labelling of containers, etc., apply equally to both sections. When the word poison is used and no section is specifically mentioned, it means an item in either Section I or Section II.

Regulations concerning Dispensaries and Hospitals.

Some of the provisions of the Poisons Act are relaxed in respect of hospitals and similar institutions provided that certain conditions are complied with.

(1) **Out-patients' Prescriptions.**

The conditions relating to these are :

(i) Poisons must not be supplied to persons outside the hospital **except by, or on and in accordance with the prescription of,** a duly qualified medical practitioner for the purposes of medical treatment, or a registered dentist for the purpose of dental treatment (para. 302, Standing Orders, R.A.M.C.).

(ii) A record must be kept on the premises of each supply of any **First Schedule** poison in such a way that there can readily be traced at any time during a period of two years after the date on which the substance was supplied, the following particulars :

(*a*) Name and quantity of substance supplied.
(*b*) Date supplied.
(*c*) Name and address of person to whom supplied.
(*d*) Name of person who supplied the substance or who gave the prescription upon which it was supplied.

(Provided for in the general instructions relating to the copying and keeping of prescriptions—para. 302, Standing Orders.)

(iii) The container of the medicine (containing any substance named in the Poison List whether **First Schedule** or not) must be labelled :

(*a*) With a name and address sufficient to identify the hospital or dispensary from which it was supplied.
(*b*) Except in the case of a medicine made up ready for treatment, with the word **" poison."**
(*c*) In the case of an embrocation, liniment, lotion, liquid antiseptic, or other liquid medicine for external application, with the name of the article (*e.g.* " The Liniment ") and the words " For external use only " (para. 304, Standing Orders).

(2) **Supplies and Storage of Poisons within Hospitals.**

(i) **Hospitals with a special dispensing department.** A poison may not be issued from the dispensary (except in case of emergency) for use in the wards, operating theatre, or other department, except upon a written order signed by a duly qualified medical practitioner, registered dentist, or by a

sister or nurse in charge of a ward, etc. (Note that para. 299, Standing Orders and Regulations for the Medical Services of the Army, 1938, para. 129, requires all requisitions to be signed by the medical officer in charge of the ward or department concerned.)

The container must be labelled with the words describing its contents and, in the case of **First Schedule** substances (Section I of para. 297, Standing Orders) with a distinguishing mark indicating that it is to be stored in a cupboard reserved solely for the storage of poisons (para. 297, Standing Orders).

(ii) **Ward Cupboards**. All **First Schedule** poisons must be stored in a cupboard reserved solely for the storage of poisons (Regulations for the Medical Services of the Army, 1938, para. 388).

All places in which poisons are stored must be inspected at regular intervals of time, not exceeding three months, by some authorized person. In a military hospital the commanding officer, or another officer deputed by him, will carry out this inspection.

In all cases the poison must be stored in a container impervious to the poison and sufficiently stout to prevent leakage from the container arising from the ordinary risks of handling.

Dangerous Drugs

A dangerous drug is a drug within the meaning of the Dangerous Drugs Acts. A list of these drugs is detailed in Regulations for the Medical Services of the Army, 1938, para. 130, and in para. 307, Standing Orders R.A.M.C., 1937.

These drugs are not selected on account of their toxicity, but because of their habit-forming properties. Many of the poisons listed in para. 297, Standing Orders, are much more toxic, but as they do not possess this habit-forming character they do not come under the provisions of the Dangerous Drugs Acts.

A number of preparations containing morphine and other "Dangerous Drugs" are exempt from the provisions of the Acts (Regulations for the Medical Services of the Army, 1938, para. 130), but it must not be overlooked that these drugs also come within the Pharmacy and Poisons Act and should be dealt with as Section I poisons.

The Dangerous Drugs Acts

The Dangerous Drugs Acts (commonly referred to as the D.D.A.) first came into force in 1920 and are designed to prohibit the use of certain habit-forming drugs except under proper medical supervision. The best known dangerous

drugs are **cocaine, morphine** and **heroin.** Very stringent rules are laid down to control the manufacture and sale of such drugs. For example, the manufacture of the drugs is confined to a few selected firms and must be carried out under the supervision of Home Office inspectors. For any breach of the Acts the manufacturer is liable to severe penalties and the loss of his licence to manufacture.

The distribution of the drugs to hospitals, doctors and chemists is carefully controlled, and each transaction must be recorded down to the dispensing of a single morphia tablet.

It is an offence under the Acts for an unauthorized person **to be in possession of any of these drugs.** A patient to whom the drugs have been properly prescribed is, of course, an authorized person so far as his own prescription is concerned. A dispenser who would lawfully be in possession of dangerous drugs whilst engaged in his duties, would be breaking the law if he had any of these drugs in his possession whilst off duty and would be liable to very severe penalties.

The supply of drugs to and the dispensing of drugs by hospitals is governed by the " Dangerous Drugs (Hospital General Exemption Order (1924))." The rules may be summarized as follows :

(1) Hospitals in which drugs are dispensed by a medical practitioner, pharmacist or (in certain special cases) a dispenser whose qualifications and appointment are approved by the Ministry of Health.

(i) Orders for dangerous drugs must bear the signature of a medical officer or pharmacist attached to the hospital.

(ii) Supplies to be kept in charge of the dispenser.

(iii) The medicine to be for the sole use of the patient for whom it is prescribed.

(iv) Records to be kept and the prescription marked at the time of dispensing.

(v) Prescriptions to be kept for a period of two years.

(vi) Stock preparations for use in the wards, etc., only to be supplied on the requisition of the sister in charge and to be kept under lock and key. (Note : Regulations for the Medical Services of the Army, 1938, para. 129, requires all prescriptions and requisitions to be signed by a medical officer.)

(vii) The requisition, marked to show that it has been complied with, to be kept by the dispenser and a copy or note of the requisition kept by the sister in charge.

(viii) Precautions to be taken against theft.

(2) Hospitals where there is no dispenser (*e.g.* nursing homes, etc.) :

Orders for dangerous drugs must be signed by a medical practitioner attached to the hospital who must certify that they are necessary for the treatment of the patients. The matron is responsible for the safe custody of the drugs and for administering them, and they are only to be used as directed by the physician.

The requirements of the Dangerous Drugs Acts are closely followed in Regulations for the Medical Services of the Army, 1938, paras. 129, 130, and 388.

Emetics

Emetics are substances which cause vomiting. Apomorphine hydrochloride is probably the most rapid and certain of all emetics, acting as it does on the vomiting centre of the brain. Its only drawback is that it is very depressant. When given by hypodermic injection, this drug affords the best means of emptying the stomach in cases where the patient is found already unconscious and remedies cannot be given by mouth.

Other emetics act by causing irritation of the muscular lining of the stomach. They require to be absorbed before they can act, and in consequence vomiting is not nearly so rapid or certain.

In most cases, copious draughts of warm water assist the action of emetics.

In the absence of drugs, vomiting may usually be induced by introducing the fingers into the back of the throat.

The safest emetic for children is some liquid preparation of Ipecacuanha, such as the liquid extract or tincture, well diluted.

Table of Emetics

Emetic	Adult Dose and Method of Administration
Apomorphine hydrochloride	$\frac{1}{32}$ to $\frac{1}{8}$ gr. by injection ; $\frac{1}{10}$ to $\frac{1}{4}$ gr. by mouth. Repeat in half an hour if necessary.
Zinc sulphate	30 grains in a tumbler of warm water. Repeat in 15 minutes if necessary, but if vomiting does not occur it will be absorbed and may give rise to irritant symptoms.
Ipecacuanha	15 to 30 grs. of the powder ; 10 to 30 minims of the liquid extract, or $\frac{1}{2}$ to 1 fluid ounce of the tincture may be given diluted, and repeated if necessary.

Table of Emetics—*continued*

Emetic	Adult Dose and Method of Administration
Mustard	One tablespoonful stirred into a tumbler of warm water.
Salt	One tablespoonful dissolved in a tumbler of warm water.
Tartar emetic. (Antimonii et Potassii Tartras.)	½ to 1 grain dissolved in a tumbler of warm water. Very depressant, and not to be used if other emetics are available.
Copper sulphate	5 to 10 grains in a tumbler of warm water. Same remarks apply as for tartar emetic.
For Children	
Ipecacuanha	A teaspoonful of the tincture or 5 to 10 minims of the liquid extract well diluted with warm water.

The Stomach Tube

Stomach washing (lavage) is carried out by introducing warm water (or a warm antidotal solution) into the stomach by means of a flexible rubber tube, and then emptying that organ by a system of suction or syphonage. The operation is repeated as often as may be necessary.

The stomach tube outfit consists of a stout-walled rubber tube terminating in a catheter end, connected to an enamelled-iron funnel. A mouth gag is also included. In the case of children a rubber catheter, passed nasally, may be employed in place of the thicker syphon tube.

In order to pass the tube the patient should be in the recumbent position with the head and shoulders well raised. The gag is placed in position and tied, and the tube thoroughly lubricated with oil, liquid paraffin or glycerin. Thread the tube through the hole in the gag, allow it to pass over the back of the tongue and gently force it down the throat. A choking sound may be heard as the end of the tube passes over the glottis, but this ceases as the tube enters the stomach. Elevate the funnel and pour warm water or warm solution of an antidote down the tube until both stomach and tube are filled. Now pinch the tube immediately below its point of attachment to the funnel, lower the end below the level of the patient's stomach, release the grip on the tube, and at the same time invert the funnel. The stomach contents will now syphon over and should be collected in a clean vessel for future

inspection or analysis. The operation should be repeated until the stomach washings return clear, and then that organ may be filled with a warm antidotal solution or restorative.

There are a number of instances in which the stomach tube is either of no value or is definitely contra-indicated. They are briefly summarized as follows :

(i) The tube must **not** be used in cases of known corrosive poisoning, or whenever there are signs of blistering. It must be used with great caution in cases of severe irritant poisoning.

(ii) In poisoning by strychnine and other drugs, when convulsions are a feature, use of the tube is limited to that period before convulsions begin. If the tube is being used and convulsions appear, it must be withdrawn at once.

(iii) If poisoning is caused by injection, absorption from skin or mucous surfaces, or inhalation of gases, the stomach tube is of no value whatever as the poison does not lie in the stomach, and valuable time may be lost in using it. (An exception should, however, be made in case of poisoning by morphine. This drug, after absorption, is excreted into the stomach, and may cause further symptoms unless removed by lavage.)

(iv) Do not use the stomach tube if the patient is already unconscious.

Demulcents

These are thick liquids of an oily or mucilaginous nature, given by mouth to form a coating over injured surfaces and protect them from further corrosion and inflammation.

Demulcents form part of the routine treatment of corrosive and irritant poisons, in which membranes are inflamed, ulcerated, or even partially destroyed.

Demulcents of an oily nature are **not** to be used in cases of **cantharidin** and **phosphorus** poisoning as these substances are soluble in oils and the result would be to bring the poison into contact with a larger area of tissue and thus promote absorption.

Milk, olive or salad oil, almond oil, glycerin, liquid paraffin, or white of eggs may be administered in copious draughts and a thick gruel made by boiling 1 oz. of oatmeal with 10 oz. of water is also of value as a demulcent.

Stimulants

Stimulants are administered to counteract the general symptoms of shock and collapse, which symptoms are nearly always present in cases of poisoning. Stimulants may be administered in various ways; as a vapour by inhalation, by mouth, or injection. Others are applied externally as local stimulants.

Except for the more simple remedies, the dispenser should only prepare such drugs for use by the physician if he so desires.

Stimulant	Amount Given
Brandy	½ oz. diluted with 2 oz. of water.
Strychnine hydrochloride ..	$\frac{1}{60}$ gr. by injection.
Ether	30 to 60 minims by mouth or injection.
Spirit ammon. aromat. (sal. volatile)	60 minims freely diluted with water.
Coffee	2 oz. boiled with ½ pint of water.
Smelling salts	As ammonia inhalations.
Mustard leaves	To be moistened with tepid water before application as local stimulants.

Evidence of Poisoning

In certain cases it may be exceedingly difficult to diagnose poisoning with any degree of certainty, as some poisons give rise to symptoms closely resembling those of disease.

Inference of poisoning may be drawn from the following points of evidence. None of the points are conclusive in themselves, but a combination of two or more would be very suspicious of poisoning.

If there is any doubt as to whether poison has been taken or not, there can be no harm done by carrying out the routine treatment of emetics, stomach tube, etc.

(i) In acute poisoning, alarming symptoms develop suddenly which cannot be ascribed to any natural cause.

(ii) Symptoms usually appear soon after food or drink has been taken.

(iii) Staining or blistering of the mouth or lips, or the presence of an unnatural odour in the breath.

(iv) The presence of a poison container on or near by a person found in a collapsed or unconscious condition.

(v) The story of the patient or some onlooker.

Poisoning of an Unknown Nature

Symptoms of poisoning are frequently conflicting, and occasionally it may be impossible to ascertain what kind of poison has been taken. This is likely to be the case when some rarely used poison has been taken, or when some commercial compound or drug, symptoms of poisoning by which are not well known, has been swallowed. Again, in the very early stages of poisoning, it may be difficult to recognize the poison by the uncertain symptoms shown ; indulgence in alcoholic liquor may cloak the symptoms and hinder diagnosis. In such circumstances it is useful to have at hand a general antidote which is calculated to do good whatever the poisoning may be.

A recipe for such an antidote is :

Calcined Magnesia
Powdered Charcoal } Equal parts of each.
Hydroxide of Iron

Half an ounce (one tablespoonful) of each should be stirred into a tumbler of water and administered as a draught. The dose may be repeated at intervals of half an hour until three doses have been given.

The iron hydroxide should be freshly precipitated by mixing a solution of ferric chloride (Liquor Ferri Perchloridi) with lime water or a solution of ammonia, and shaking. A thick precipitate is obtained which should be strained or filtered out and washed, before mixing with the other ingredients. A suitable method of obtaining the precipitate quickly is to pour the mixed solutions into a large handkerchief and, when the fluid portion has drained away, hold the handkerchief under a running tap for a minute or two to wash the sediment.

Each of the ingredients of the antidote has its own particular part to play in counteracting poisoning. The calcined magnesia (magnesium oxide) has a threefold action : (i) it is alkaline, and is capable of neutralizing free acids ; (ii) it will interact with many soluble metallic salts and render them insoluble ; (iii) it tends to render alkaloidal preparations insoluble, and so prevents, or at any rate retards, absorption.

Charcoal is completely insoluble and, being in a very finely divided state, adheres closely to the lining of the stomach and hinders absorption of the poison. At the same time finely powdered charcoal has that property (known as **adsorption**) of condensing certain toxic substances on the surface of its particles and rendering them temporarily inactive.

Hydroxide of iron is the specific antidote for arsenical poisoning.

Combining these properties together it will be seen that, in the absence of well-defined symptoms, the administration of this antidote can only be a power for good, and is no bar to further antidotal treatment being given at such time as a definite diagnosis is established. The treatment has proved of value in poisoning by free acids, salts of zinc, mercury and arsenic, and certain alkaloids, but is no protection against alkali, phosphorus, or prussic acid poisoning.

The Duties of the Dispenser in Poisoning Cases

It is a matter of considerable difficulty to define the duties of the dispenser in cases of poisoning, or to set any limit of treatment beyond which he must not proceed. A method of treatment which would be permitted in one case would be completely ruled out under different conditions. The dispenser must possess a sound knowledge of the various methods of treatment and of the special antidotes employed, but he must also discriminate between that portion of the treatment which may be carried out by himself and that which properly comes within the sphere of the physician. Under hospital conditions the dispenser need only put into practice simple first-aid measures, pending the arrival of the medical officer. Under the direction of the latter he will prepare emetic and antidotal solutions, and lend such assistance as is required. At outstations where a medical officer cannot always be obtained at short notice, or whenever a poisoning case occurs remote from medical assistance, much greater scope for treatment is granted. The dispenser would be censured, and rightly, if he did not do everything within his knowledge to combat the poisoning. In such circumstances he would need to carry out the complete routine treatment of emptying the stomach, administration of antidotes, restoratives, etc. The greatest asset to the dispenser in such difficult circumstances is calm judgment and a liberal amount of common sense.

The various stages of treatment in cases of poisoning are briefly summarized as follows :

(1) **Empty the Stomach.** The stomach may be emptied by the use of the stomach tube or by giving an emetic. With the exception of apomorphine, emetics take some little time to act and may, due to the presence of food in the stomach or to an anæsthetic effect of the poison, be uncertain in action. Even when vomiting does occur one can never be sure that all the poison has been removed. On the other hand if the stomach tube is handy it can be placed in position within a

few minutes and thorough washing out of the stomach performed. The efficacy of repeated lavage cannot be too greatly stressed, and in some cases, little further treatment may be required.

(2) **Administer the Antidote.** In addition to the general antidote which may be given when the cause of poisoning is obscure, nearly every poison has one or more drugs which act as specific antidotes. These may act chemically by rendering the poison insoluble or by decomposing it into less toxic compounds, or physiologically by acting upon certain organs or tissues in the opposite manner to that in which the poison acts. As an example of the former type of antidote we may instance **chalk,** used in cases of oxalic acid poisoning. The chalk reacts with the acid and converts it into insoluble calcium oxalate, which is comparatively innocuous. For an example of the physiological or therapeutic type of antidote we may take strychnine, itself a dangerous poison which is administered hypodermically in morphine and opium poisoning. One of the important symptoms of morphine poisoning is acute depression of the respiratory centres ; strychnine, on the other hand, is a respiratory stimulant, and acts as an antagonist to the poison.

(3) **General Measures of First-Aid to overcome Shock and Collapse.** If a patient can only be kept alive until the peak point of the poisoning has been passed he will have a fair chance of recovery because, as time passes, the poison will gradually be eliminated through the normal channels of excretion. Shock and collapse may be treated by giving stimulants, application of warmth, and inhalations of either oxygen, or better still of oxygen with 5 per cent. carbon dioxide.

(4) Demulcents may be used to soothe inflamed parts and anodynes may be given by mouth or injection to calm the patient and to relieve pain.

The duties of the dispenser, therefore, are :

(1) At once make every possible endeavour to get in touch with medical assistance.

(2) Whilst waiting for the doctor, give a simple emetic or, if there are no signs of blistering or corrosion, begin stomach lavage. Avoid administration of emetics by injection.

(3) If the poisoning can be definitely diagnosed, administer the specific antidote. If in doubt, give the general antidote.

(4) Treat symptoms of shock and collapse by warmth and stimulation.
(5) Artificial respiration if necessary.
(6) Treat any special symptom as it arises.

ACUTE POISONING

Summary of Poisons and their Antidotes

Poison	Antidote
Acids—	
Hydrochloric, Nitric, Sulphuric	Lime water. Magnesia.
Oxalic	Chalk.
Chromic	Lime water. Magnesia.
Carbolic	Sodium or magnesium sulphate.
Prussic	Adrenalin. Hydrogen peroxide.
Aconite	Digitalis. Strychnine. Atropine.
Accumulator fluid	Lime water. Magnesia.
Alcohol	Strychnine.
Alkaloids (generally)	Potassium permanganate.
Alkalies—	
Caustic soda, Caustic potash, Ammonia Solutions	Lemon juice. Weak vinegar.
Antimony	Tannic acid (strong tea or coffee).
Arsenic	Freshly precipitated hydroxide of iron.
Aspirin	Strychnine.
Atropine	Morphine. Pilocarpine.
Barium	Magnesium or sodium sulphate.
Barbitone	Strychnine.
Belladonna	Morphine. Pilocarpine.
Camphor	Atropine. Strychnine.
Carbon monoxide	Oxygen and CO_2 mixture.
Chloral hydrate	Strychnine.
Chloroform	Adrenalin. Atropine.
Coal gas	Oxygen and CO_2 mixture.
Cocaine	Strychnine. Digitalis.
Copper	Washing soda. Sodium bicarbonate.
Creosote	Sodium or magnesium sulphate.
Digitalis	Atropine. Strychnine. Tannic acid.
Hydrocyanic acid	Adrenalin. Hydrogen peroxide.
Iodine	Sodium thiosulphate (hypo). Starch.
Lead	Magnesium or sodium sulphate.
Luminal	Strychnine.
Lysol	Magnesium or sodium sulphate.
Mercury	White of eggs.
Morphine	Atropine. Strychnine.
Nicotine	Strychnine.
Nux vomica	Chloral hydrate. Physostigmine.
Opium	Atropine. Strychnine.
Paraffin, petrol, benzene	Strychnine. Alcohol.
Paraldehyde	Strychnine.
Phenacetin, phenazone	Strychnine.
Phenobarbitone	Strychnine.

Poison	Antidote
Phenol	Magnesium or sodium sulphate.
Phosphorus	Potassium permanganate. Copper sulphate.
Potassium chlorate	Digitalis. Strychnine.
Potassium permanganate ..	Charcoal.
Sewer gas	Oxygen and CO_2 mixture.
Silver nitrate	Common salt.
Strychnine	Chloral hydrate. Physostigmine.
Sulphonal	Strychnine.
Trional	Strychnine.
Turpentine	Magnesium sulphate.
Veronal	Strychnine.
Zinc	Washing soda. Sodium bicarbonate.

PRELIMINARY POISON TABLES

There are objections to every method of classification of poisons, but for reasons of convenience they have been grouped into four classes, namely :

Corrosive, Irritant, Systemic and **Gaseous**.

Although a poison may be grouped as corrosive or irritant its action may not necessarily be limited to any one group, and some poisons might easily be classified under more than one heading. There are typical members of each group, but there is a gradual fading of one group into another amongst the less typical members. The same tendency is exhibited by individual poisons. Phenol, for example, in strong solution is definitely a **corrosive** poison, in weak solution it acts as an **irritant,** while if it be absorbed into the general circulation **systemic** symptoms are produced.

These preliminary tables are of great importance, and the student should not proceed to a study of individual poisons in greater detail until he has thoroughly mastered the preliminary groupings.

Corrosive Poisons.

The typical members of this group are the strong acids and alkalis. They act by burning and destroying the tissues with which they come into contact. In many cases only a small amount of the poison reaches as far as the stomach, and practically no absorption takes place ; the action is one of destruction of the tissues by direct chemical activity. When a person takes a quantity of one of these poisons by mouth, the burning is instantaneous and the pain so acute that it is almost an involuntary action to eject it. Very grave damage

may be caused in a few seconds, and if the poison reach the back of the throat, or is swallowed, immediate swelling and blistering of the parts occurs, together with at least partial destruction of the tissues. These symptoms are attended by severe shock and collapse, and it may not be out of place to deal briefly with the symptoms which we may expect to find.

Shock. Surface of the body cold, and covered with a clammy sweat.

Respirations shallow and of a sighing character.

Pulse rate rapid but very feeble.

There may be nausea and vomiting and loss of muscular power.

The patient shows extreme anxiety.

Collapse. This is really the sequel to the condition of shock.

The circulation is almost stagnant and the pulse is scarcely perceptible at the wrist.

Respirations drawn at prolonged intervals, and the normal functions are reduced to such a low ebb as to be almost suspended altogether.

A number of metallic salts also possess a corrosive action, but only when swallowed in solid form or in a **concentrated** solution. It is important to note that corrosive poisoning depends not only on the nature of the substance, but even more on the degree of concentration of the solution taken. Only **concentrated** solutions of acids, alkalis, and salts can be corrosive, and the more concentrated the preparation taken the more severe the symptoms. Weaker solutions are local irritants or may be absorbed and give rise to systemic symptoms.

General Table of Corrosive Poisons

Examples	General Symptoms	General Treatment
Strong acids as sulphuric, nitric, hydrochloric. Strong alkalis as ammonia solution, caustic soda and potash. Oxalic acid and its salts.	1. Symptoms develop at once. 2. Violent pain in mouth, throat and stomach. 3. Swelling of mouth and throat; blistering of lips. 4. Difficulty in breathing and speaking.	1. **Do not give emetics or use stomach tube.** 2. Promptly neutralize poison by giving one of the following antidotes: For **acid** poisoning neutralize with **lime water, magnesia** in water, **washing soda,** or other **alkali.**

Examples	General Symptoms	General Treatment
Soldering fluid. Carbolic acid, lysol, cresol and creosote. Battery fluids. Accumulator fluids.	5. Retching and vomiting. Vomit contains shreds of detached mucous membrane and may be blood-stained. 6. In alkali poisoning there may be distressing diarrhœa. 7. Severe shock and collapse; surface cold and covered with a clammy sweat; pulse very feeble and irregular; temperature subnormal.	For **alkaline poisoning** neutralize with weak **acids,** either **lemon juice** or **vinegar** and water. 3. In either case give plenty of demulcent drinks to soothe affected parts. 4. Morphine by injection, or opium by mouth, to calm patient and relieve pain. 5. Normal saline intravenously to replace lost fluids. 6. Treat symptoms of shock and collapse by warmth and stimulation.

Notes on List of Examples. Soldering fluid usually consists of spirits of salts (commercial hydrochloric acid) which has been "killed" by the addition of metallic zinc. The fluid is therefore a concentrated solution of zinc chloride.

Battery fluid may be a strong solution of potassium bichromate and sulphuric acid.

Accumulator fluid is a strong solution of sulphuric acid.

Notes on the General Treatment. (1) Use lime water, or magnesia and water, as the antidote to acid poisoning in preference to washing or baking soda, or other carbonates and bicarbonates. The latter compounds neutralize acids with liberation of large volumes of carbon dioxide gas which cause dangerous distension and may rupture the already weakened stomach wall.

(2) In grave cases, when the patient is in danger of suffocation by reason of the swelling of the tongue and throat, the physician will need to perform the operation of tracheotomy. The dispenser should bear this in mind and have the necessary instruments ready.

Irritant Poisons.

This group consists mainly of the metals and their salts, together with a few non-metallic elements.

Such poisons, when taken into the stomach, either as solids or in solution, must be absorbed before their poisonous action can develop. At least a short interval, therefore, will elapse

between the act of swallowing the poison and the onset of symptoms. This interval of time must be turned to good advantage and, without waiting for symptoms to develop, emetics and antidotes should be administered. If the major portion of the poison can be recovered in a short time by the use of the stomach tube or by giving an emetic, or if the poison can be rendered insoluble while it still lies in the stomach, then absorption is limited and the symptoms developed are likely to be of a mild character. It is to be noted that the severity of irritant poisoning does not greatly depend upon the degree of concentration of the solution taken as is the case with corrosives, but rather upon the **quantity** of poison taken. In general, the larger the dose taken, the more severe are the symptoms.

Most of the antidotes for this group react with the poison to form insoluble compounds ; these cannot be permitted to remain in the stomach and intestines for an indefinite period, otherwise the digestive juices will redissolve them, and absorption will begin once more. It is, therefore, a routine practice in irritant poisoning, to give a large dose of castor oil or other purgative to eliminate such insoluble compounds from the tract.

Irritant poisons are absorbed both in the stomach and intestines, and cause intense irritation and acute inflammation of the whole tract. In fatal cases death usually results from extreme exhaustion.

General Table of Irritant Poisons

Examples	General Symptoms	General Treatment
Arsenic compounds. Antimony compounds. Mercury compounds. Lead compounds. Copper compounds. Zinc compounds. Tin compounds. Silver compounds. Phosphorus. Iodine. Cantharidin. Croton oil.	1. An interval of time varying from 10 minutes to an hour or more, elapses before symptoms develop. 2. Burning pains, originating in the region of the stomach and rapidly spreading over the entire abdominal area. 3. Violent vomiting and purging. Vomit and stools may be bloodstained. 4. Intense thirst caused by withdrawal of fluids from the tissues. 5. Symptoms of profound collapse and exhaustion.	1. Wash out the stomach by means of the stomach tube, or give an emetic. 2. Administer the special antidote. 3. Give a purging dose of castor oil. 4. Draughts of suitable demulcents. 5. Morphine or opium to calm patient and relieve pain. 6. Treat symptoms of collapse. N.B.—Do not give **oily** demulcents or purgatives in **cantharidin** or **phosphorus** poisoning.

Systemic Poisons.

These poisons are chiefly of an organic nature, such as, vegetable crude drugs, alkaloids, glucosides, and various synthetic compounds. They may be administered by inhalation, by injection or by mouth, and only act after absorption into the general circulation has taken place.

General Table of Systemic Poisons

Examples	General Symptoms	General Treatment
Opium and morphine. Belladonna and atropine. Nux vomica and strychnine. Aconite and aconitine. Hyoscyamus. Cocaine. Hydrocyanic acid. Digitalis. Sulphonal. Alcohol. Chloroform.	No general symptoms can be given as these depend entirely on the nature of the poison taken and the organs which are affected.	1. In alkaloidal poisoning, if the patient is seen soon after taking the poison and before symptoms develop, give 5 to 10 grains of potassium permanganate in solution, or hot strong tea or coffee. 2. Use the stomach tube or give an emetic. 3. Administer suitable chemical or physiological antidotes. 4. Artificial respiration if necessary. 5. Treat symptoms of shock and collapse. 6. Treat any special symptom as it arises.

Notes on the General Treatment. In poisoning by alkaloids, alkaloidal salts, or preparations of crude drugs containing such, the immediate administration of potassium permanganate or tannin (strong tea or coffee) solution has been found to be of great value. The permanganate has the property of decomposing alkaloids, and tannin combines with alkaloids forming insoluble alkaloidal tannates. If one of these antidotes be given in the early stages, the poison may be rendered harmless before any great absorption has occurred, or at least the rate of absorption is retarded sufficiently for other antidotal measures to be undertaken with a fair chance of success.

Gaseous Poisons.

The group consists of those substances which are gaseous under ordinary conditions, but does not include such drugs as chloroform which normally exist in the fluid state, although administered in the form of a vapour. Neither does the group include purely negative gases, like nitrogen, which is

not toxic in itself and is only injurious because it deprives the tissues of oxygen.

Some gases act chiefly by causing local irritation in the lungs (chlorine), others act as poisons only after absorption into the circulation. Of the latter class, some combine with the hæmoglobin of the blood and interfere with the oxygenation of the tissues (carbon monoxide) ; others are carried in the blood stream to various organs where a more specifically toxic action is demonstrated (sulphuretted hydrogen).

General Table of Gaseous Poisons

Examples	General Symptoms	General Treatment
Sulphuretted hydrogen. Chlorine. Carbon dioxide. Coal gas. Carbon monoxide. Sewer gas. Arseniuretted hydrogen.	No general symptoms are given as these vary with the nature of the gas.	1. Remove patient to an atmosphere of pure air. 2. Artificial respiration. 3. Inhalations of oxygen. 4. Intravenous injections of normal saline. 5. Treat symptoms of collapse.

THE CORROSIVE POISONS

The Mineral Acids

Preparation	Dose	Strength
Sulphuric Acid (H_2SO_4)		Per cent.
Acidum Sulphuricum (Oil of vitriol) ..	No dose.	95
Acidum Sulphuricum Dilutum	5 to 60 m.	10
Nitric Acid (HNO_3)		
Acidum Nitricum	No dose.	70
Hydrochloric Acid (HCl)		
Acidum Hydrochloricum	No dose.	32
Acidum Hydrochloricum Dilutum ..	5 to 60 m.	10

The mineral acids are used extensively in the arts and industries, and cases of poisoning by them are fairly common. In some cases these acids have been taken with suicidal intent, and there are numerous instances of one of them being swallowed in mistake for some other fluid.

Most cases of corrosive poisoning are very severe, and the percentage of deaths is high. Less severe symptoms will develop if no attempt has been made to swallow the poison, but the patient may still die from the local effects.

As has already been stated these acids act as corrosive poisons in **concentrated solution only**—weak solutions are generally irritant.

In severe cases death usually results in from 18 to 24 hours, but it may take place much more rapidly. Should the patient recover from the primary acute symptoms, death may still result weeks or even months afterwards from the formation of ulcers or strictures in the stomach.

Fatal doses of the mineral acids have been : sulphuric, 1 drachm ; nitric, 2 drachms ; hydrochloric, 4 drachms. Much smaller amounts have been fatal to young children.

Poisoning has also occurred from the fumes given off from nitric and hydrochloric acids (sulphuric is not volatile) ; causing serious injury to the mucous membranes of the air passages and acute bronchial symptoms.

Symptoms	Treatment
1. Symptoms develop at once, even during the act of swallowing the poison. 2. There is immediate intense pain in mouth and throat, rapidly spreading to the abdomen. 3. Staining of lips and clothing : Sulphuric, dark brown ; Nitric, yellow ; Hydrochloric, greyish-white. 4. Parts with which the acid comes into contact will be blistered, greatly swollen, and the mucous membrane will slough away. 5. Mouth filled with a thick, frothy mucous. 6. Swelling of tongue and throat make breathing and swallowing difficult and painful. Life endangered by suffocation. 7. Painful retching and vomiting of dark coloured fluid containing blood and pieces of separated membrane. Vomiting is incessant. 8. Exhaustion accompanied by great weakness and collapse. Livid face due to restricted breathing. Pulse small and feeble. Surface of body cold and clammy. 9. Great thirst due to removal of of body fluids. 10. Death results from destruction of the parts and prostration.	1. Chemical antidotes : **Lime water** or **magnesia** and water. 2. Do not attempt to use the stomach tube or to give emetics. 3. Promptly neutralize the poison by one of the above alkaline antidotes. The antidote can only be administered with difficulty owing to the great pain occasioned by swallowing, and it will almost certainly increase vomiting for a time. Nevertheless, administration of the antidote must be persevered with. 4. If alkaline antidote is not available, give plenty of water to drink—this will dilute the acid. 5. Tracheotomy instruments to be ready for use—they will almost certainly be required for young children. 6. Morphine or opium to relieve the pain. 7. Intravenous injection of saline to replace lost body fluids. 8. After-treatment of rest, warmth, stimulants to counteract shock, rectal feeding. N.B.—Do not give carbonates or bicarbonates (chalk, washing soda, etc.) as alkaline antidotes unless unavoidable. They are better than nothing at all, but large volumes of carbon dioxide gas are evolved causing dangerous distension or even rupture of the weakened stomach wall.

Oxalic Acid (Not Official)

Oxalic acid is a solid and, together with its compounds—salts of lemon and salts of sorrel—is corrosive in concentrated, and irritant in dilute solution. These substances are in common use for cleaning metals, removing stains and bleaching straw. Although there are restrictions on the sale of these substances, cases of poisoning are not infrequent.

When a concentrated solution is swallowed, all the usual signs and symptoms of corrosive poisoning are exhibited, and death may take place very rapidly. In a number of cases crystals of oxalic acid have been swallowed in mistake for Epsom salts. The adult fatal dose is about half an ounce.

In dilute solution the poison acts as an irritant, with only minor corrosive features, and no outward signs of blistering. In such cases the careful use of the stomach tube is advocated.

In all cases, unless the poison is removed from the stomach or is rendered insoluble by the action of the antidote, it will be absorbed into the general circulation and give rise to symptoms of a systemic character. These include spasmodic twitchings of the muscles, convulsions, and acute nephritis.

Whatever the type of poisoning, the special antidote to be used is some form of calcium, such as **chalk** or **lime water**. Alkaline salts of sodium or potassium must not be given as antidotes, as the oxalates formed are soluble and are themselves very poisonous. The oxalate of calcium, formed when either chalk or lime water is administered, is quite insoluble and, if removed from the intestinal tract within a reasonable time, cannot give rise to further symptoms.

Chromic Acid (Chromii Trioxidum B.P.)

This is a powerful corrosive poison in concentrated solution. In addition to the usual symptoms, the lips and mouth are stained red, and the vomit is correspondingly coloured. There is no specific antidote, but the free acid should be neutralized by alkaline solutions, and then removed from the stomach as speedily as possible. The stomach tube may be used if the signs of corrosion are not severe.

Phenol (Carbolic Acid)

Preparation	Dose	Strength
Phenol	1–3 grs.	—
Phenol Liquefactum	1–3 m.	80 per cent.
Glycerinum Phenolis	5–15 m.	16 per cent.
Suppositorium Phenolis	No dose.	1 gr. in each.
Trochiscus Phenolis	No dose.	½ gr. in each.
Unguentum Phenolis	No dose.	3 per cent.

Phenol poisoning may result either from the intentional or accidental swallowing of the acid itself, or from the taking of commercial disinfectants, such as **Lysol, Izal, Cyllin, Creolin** and **Jeyes' Fluid,** which contain either phenol itself or an allied compound such as cresol.

Poisoning by disinfectants is on the increase, and 350 deaths from lysol poisoning alone, occurred in England and Wales during the year 1932.

Phenol is not a true acid and does not redden blue litmus, but it is powerfully corrosive in concentrated solutions. Like other corrosives, weak solutions may be irritant or systemic.

Phenol is absorbed from all mucous surfaces and even through the unbroken skin, and chronic poisoning may result from the too lavish use of lotions, ointments, or washes containing it. The symptoms of chronic poisoning are marked by a gradual condition of collapse, and a greenish colour of the urine. When the urine is first passed the colour may not be very evident, but on exposure to air a distinctive smoky appearance with dark olive-green coloration develops.

Sixty grains of the solid acid have been fatal.

Death occurs occasionally within a few minutes and usually within six hours.

Symptoms	Treatment
1. Burning pains in mouth, throat, and stomach, beginning during the act of swallowing the poison. 2. Tissues hardened and blanched white where the acid has touched. 3. Definite odour of phenol in the breath and stomach washings. 4. Vomiting is not always a symptom. 5. Rapid collapse of the patient ; he may become unconscious in a short time. 6. Pulse very feeble and irregular ; surface of body cold. 7. Respirations slow and laboured and of a snorting (stertorous) character. 8. Contraction of the pupils of the eyes. 9. Characteristic dark olive-green colour of the urine. N.B.—Pain noted as a preliminary symptom may quickly pass away as phenol acts as an anæsthetic to sensory nerve endings, and there may be diminished sensibility locally.	1. Chemical and special antidotes : **Magnesium sulphate** (Epsom salts) or **glycerin.** 2. The soft rubber stomach tube may be used with great caution ; then wash out the stomach with successive quantities of glycerin until the stomach washings no longer smell of phenol. 3. Magnesium or sodium sulphates in solution act as chemical antidotes by converting the poison into less toxic sulphocarbolates. Excess of the antidote acts as a purge and helps to eliminate the products formed by the action of the antidote. 4. White of eggs, milk, olive oil or liquid paraffin as demulcents. 5. Injection of $\frac{1}{60}$ gr. atropin sulphate as respiratory stimulant. 6. Alcoholic stimulants and warmth are indicated.

Phenol—Allied Compounds

Preparation	Dose	Strength
Cresol	1–3 m.	—
Liquor Cresolis Saponatus (Lysol) ..	No dose.	50 per cent.
Creosotum	2–10 m.	—

The symptoms and treatment of poisoning by the above are similar to those described for phenol.

Corrosive Alkalis

Preparation	Dose	Strength
Potassii Hydroxidum (Caustic potash)	No dose.	—
Liquor Potassii Hydroxidi	No dose.	5 per cent.
Sodii Hydroxidum (Caustic soda) ..	No dose.	—

In addition to the hydroxides noted above, the carbonates of sodium and potassium are also corrosive when taken in large quantity in concentrated solution. The 5 per cent. solution referred to in the above table acts as a severe irritant with minor corrosive symptoms, and may cause death months afterwards from delayed action.

Corrosive alkalis are just as dangerous poisons as corrosive acids, but their effect on the tissues is rather different. The alkalis tend to dissolve tissues and are able to penetrate deeply into the walls of the gullet and stomach. Deep scarring, and considerable constriction is caused and may be sufficient to prevent entry into or exit from the stomach. This is the great danger if the patient should survive the acute symptoms, and death eventually takes place from virtual starvation.

Symptoms	Treatment
1. Burning pains in mouth, throat, and stomach. 2. Mouth and throat much swollen ; lining membranes become soft and translucent owing to the solvent action of the alkali. 3. Breathing laboured ; difficulty in swallowing. 4. Vomiting does not always occur but when it does the vomit is alkaline and may contain blood and shreds of detached membrane. 5. Diarrhœa accompanied by great tenderness over the abdomen. 6. Condition of collapse ; surface cold, profuse perspiration ; pulse feeble but very rapid.	1. Chemical antidotes : **Lemon juice** or **weak vinegar** and water. 2. No emetics or stomach tube. 3. Promptly neutralize the alkali with some weakly acid solution. 4. Demulcent drinks, especially milk or white of eggs. 5. Opium or morphine to relieve pain. 6. Alcoholic stimulants per rectum, and warmth to counteract collapse.

Ammonia

Preparations	Dose	Strength
Liquor Ammoniæ Fortis	No dose.	32·5 per cent.
Liquor Ammoniæ Dilutus	10–20 m.	10 per cent.

The above solutions are the only official preparations of ammonia likely to cause corrosive poisoning, although the fact that the strong liquor enters into the composition of such preparations as Linimentum Camphoræ Ammoniatum (25 per cent.) should not be lost sight of.

A teaspoonful of the strong liquor has caused death in ten minutes.

Poisoning may result from swallowing the fluid or from inhaling the vapours ; both are equally dangerous.

Liquefied ammonia gas is used as the cooling agent in many large refrigerating plants and leakages have been attended with serious results ; a concentration of 1 in 200 is likely to be fatal within a few minutes.

Owing to the choking fumes given off from the liquid there is more danger than usual of rapid death from asphyxiation.

Poisoning by Swallowing Ammonia

Symptoms	Treatment
The usual corrosive symptoms of severe burning pain, intense inflammation and swelling of the parts are noted. There is a strong ammoniacal odour in the breath, gasping respiration and a marked sense of suffocation.	1. Chemical antidotes : **Lemon juice** or **weak vinegar** and water. 2. No emetic or stomach tube. 3. Neutralize poison by giving weak acid solutions. 4. Pay special attention to respiration ; artificial respiration, inhalations of oxygen. 5. Tracheotomy may be necessary. 6. Routine treatment of demulcents, stimulants, warmth, rectal feeding.

Poisoning by Inhaling Ammonia Gas

Symptoms	Treatment
1. The symptoms are those of suffocation and collapse. 2. Throat and lungs inflamed and even if patient is rescued from the atmosphere of ammonia, he may die later on from bronchial and pulmonary inflammation.	1. Remove patient at once to a cool, damp atmosphere. 2. Inhalations of oxygen and continuous artificial respiration. 3. Respiratory stimulants such as atropine or strychnine. 4. Routine after treatment.

THE IRRITANT POISONS

Arsenic

Preparations	Dose	Strength
Arseni Trioxidum	$\frac{1}{60}$–$\frac{1}{12}$ gr.	—
Liquor Arsenicalis	2–8 m.	1 per cent.
Arseni Triiodidum	$\frac{1}{15}$–$\frac{1}{4}$ gr.	—
Liquor Arseni et Hydrargyri Iodidi ..	5–15 m.	1 per cent.
Also four organic arsenic compounds—Neoarsphenamina, Sulpharsphenamina, Acetarsol, and Tryparsamidum.		

Arsenic is taken as being the most typical member of the group of irritant poisons.

The chief source of arsenical poisoning is Arseni Trioxidum, which is known as arsenious acid, arsenious anhydride, white arsenic, or simply arsenic. It is a white, minutely crystalline powder, without odour or taste.

Arsenical compounds are largely used in the arts, manufactures, and agriculture, and can readily be obtained in large amounts for these purposes. It has been said that it is easier to obtain possession of a hundredweight of arsenic than a few grains, and this is probably true; a retail chemist would certainly refuse to sell a few grains of the pure substance whereas he would readily supply a large quantity of arsenical weed killer or sheep dip, which is just as poisonous as the pure substance.

Even from ancient times arsenic has been the favourite weapon of poisoners owing, no doubt, to the ease with which it can be mixed with food or drink and administered to the unsuspecting victim. Poisoners are usually sufficiently skilful not to make the mistake of giving a single large dose of the poison, but give small doses over a period, thus producing a chronic state of ill-health which the medical attendant may easily confuse with the symptoms of disease. The notorious Greenwood, Maybrick, and Seddon cases illustrate this point. The great deterrent to the use of arsenic for homicidal purposes is that even small amounts are readily detected by chemical tests, and that it can be traced in the body long after death.

Arsenic occurs as an impurity in a great number of metallic compounds, and limits of contamination have had to be fixed for drugs and foodstuffs. Mass poisoning of a chronic type has occasionally resulted from the accidental contamination of flour and sugar with arsenical compounds. A few years ago, an outbreak of chronic poisoning caused by drinking beer, was traced to arsenical impurities in the sulphuric acid

used in one of the brewing processes. On another occasion numerous serious cases occurred amongst children through arsenic having been dusted over sweets in mistake for rice-flour.

In country districts, arsenic is largely employed in the form of vermin killers, weed killers, and sheep dips. Arsenic for agricultural purposes is required to be coloured by the addition of a water soluble dye as an aid to recognition.

The arsenites of sodium and potassium are also used as weed killers, and for making arsenical fly-papers from which a strong solution can be obtained by soaking in water. Lead arsenite is used in the form of a spray for the protection of orchards and vineyards against the attacks of pests. Copper arsenite (Scheele's green) was, at one time, largely employed as a pigment in the manufacture of cheap wall-papers, fabrics and tapestries.

The sulphides of arsenic known as realgar and orpiment are used in the tanning and dyeing industries, and have been the cause of industrial arsenical poisoning.

Many organic arsenical compounds are now used in the treatment of syphilis and other spirochætic infections. These compounds include Cacodylic acid, Atoxyl, Stovarsol, Salvarsan, Sulpharsenol, and many others. Should poisoning result either from the handling or administration of these compounds, it will be of the chronic type.

A considerable degree of immunity from poisoning has been attained amongst workers in industries in which arsenical compounds are employed. The arsenic eaters of Styria and the Austrian Tyrol have been known to take up to 15 grains daily, not only without injury, but with seeming benefit. So accustomed do they become to the use of the drug, that if they are deprived of it altogether they become seriously ill.

The minimum fatal dose of arsenic is about 2 grains.

Acute Poisoning

Symptoms	Treatment
1. The interval between taking the poison and the onset of symptoms ranges from 10 minutes (if taken in solution on an empty stomach) to 10 hours or more (if taken in the solid form on a full stomach). The usual time is from half to one hour. 2. Preliminary symptoms of fainting and nausea. A dry or burning sensation in the mouth.	1. Chemical antidotes: **Freshly precipitated hydroxide of iron, lime water** or **magnesia.** 2. Do not wait for symptoms to develop but give an emetic or, better still, wash out the stomach with the tube. 3. Give the special iron antidote, or failing this, give lime water, magnesia or charcoal.

Acute Poisoning—*continued*

Symptoms	Treatment
3. Sensation of heat in the stomach rapidly developing into burning pains and spreading over the entire abdomen. 4. Then follows violent vomiting, and a little later, severe purging. Vomit and stools may be blood-stained. Stools, fæcal at first, afterwards consisting of an almost clear fluid containing shreds of membrane, and resembling the " rice-water " stools of cholera. 5. Sense of constriction in the throat. 6. Intense thirst caused by the withdrawal of body fluids. Drinks given to relieve thirst only cause further retching and vomiting. 7. Features pinched and sunken and expressive of great anxiety. 8. There may be severe muscular cramps in the calves of the legs. 9. Profound collapse and exhaustion; pulse feeble and irregular and may be imperceptible at the wrist. Surface of body cold and covered with a clammy sweat. 10. Collapse terminates in death in from 8 hours to 2 days.	4. The antidote is followed in about half an hour with a dose of castor oil to remove insoluble compounds from the intestinal tract and guard against reabsorption. 5. Demulcent drinks to allay the inflammation. 6. Morphine hypodermically, opium by mouth, or a starch and opium enema to relieve pain. 7. Intravenous or rectal injection of saline with 5 per cent. glucose to counteract shock and to replace lost fluids. 8. Cover the patient with blankets, apply hot water bottles. 9. Ether or strychnine hypodermically, or brandy by mouth, to counteract prostration. **The Special Iron Antidote.**—This may conveniently be prepared as follows: Twelve ounces of Liquor Ferri Perchlor are made up to a pint with water. To another pint of water add one ounce of calcined magnesia. Mix the two together and shake well. Give a tablespoonful every 5 to 10 minutes.

Note.—If a commercial form of arsenic has been swallowed, the vomit may be coloured according to the dye used in its manufacture.

Chronic Arsenical Poisoning

Chronic poisoning may result from the prolonged medicinal administration of arsenic, but more frequently occurs amongst workers in industries in which some arsenical compound is employed. Either the poison is inhaled in the form of a fine dust, or is carried to the mouth in contaminated food, or is absorbed through the skin by reason of continual handling of the compound.

The green pigments formerly so largely used in the manufacture of cheap wall-papers, fabrics, artificial flowers, etc., were arsenical compounds. With regard to the wall-papers, it has been suggested that damp walls encouraged the growth of certain moulds which in turn decomposed the solid arsenical compound with the liberation of arseniuretted hydrogen gas (arsine), and that it was the continual inhalation of this

poisonous gas which gave rise to the symptoms. This is a feasible explanation as a concentration of only 1 in 20,000 is dangerous.

The symptoms of chronic poisoning are :

(1) Slight gastric disorders with loss of appetite and a general feeling of ill-health.
(2) Redness and swelling of the lower eyelids.
(3) Irritation of the mucous membrane of the nose and throat causing catarrhal symptoms.
(4) A dry cough with scanty secretion of mucous.
(5) Intermittent attacks of vomiting and diarrhœa.
(6) Skin eruptions ; scaling of the hands and feet.
(7) Patchy " bronzing " of the skin, particularly under the axillæ and round the nipples ; occasionally more generally distributed.
(8) Headache ; pains in the muscles.
(9) Peripheral neuritis—tingling of limbs followed by numbness ; areas of hyper-sensitiveness and of anæsthesia.

Some of the above symptoms are caused by the drug being excreted from the body ; minute amounts are present in the secretions of the eyes, nose, throat, and skin, and give rise to a train of irritant symptoms. Other symptoms are the result of the action of the drug on the nervous system.

Antimony

Preparations	Dosage
Antimonii et Potassii Tartras (Tartar emetic). Antimonii et Sodii Tartras.	$\frac{1}{12}$ to $\frac{1}{8}$ grain, and $\frac{1}{2}$ to 1 grain (emetic), also $\frac{1}{2}$ to 2 grs. by intravenous injection.

Antimony compounds are irritant both externally and internally. When swallowed, they act directly on the stomach wall and cause vomiting. After absorption they act on the central nervous system, and profoundly depress the heart, spinal cord, and respiratory centres.

The Antimony compound most frequently used is tartar emetic ; other names for this substance are potassium antimonyltartrate, antimonium tartaratum and tartarated antimony.

Antimony preparations have been used in medicine from very early times, but they have a very limited use in modern medicine, and in consequence poisoning is not nearly so common

as formerly. As with arsenic, poisoners have administered small and frequent doses of antimony preparations to produce a general state of ill-health and exhaustion, from which the patient dies. Antimony has a preservative action on the tissues and persons who have died from the effects of this substance have been found in a remarkable state of preservation long after burial, and the poison has been demonstrated in the organs.

Antimony oxide is largely used in the manufacture of cheap grade enamel-ware, and poisoning may be caused by the oxide being dissolved out of the enamel by acid fluids. Several instances of mass poisoning have occurred in recent years from the making of lemonade in enamelled-iron vessels. In these cases the citric acid dissolved out sufficient of the oxide to cause serious symptoms of poisoning although happily there were no deaths.

The minimum fatal dose of tartar emetic is about 2 grains.

Acute Poisoning

Symptoms	Treatment
1. Strong metallic taste in the mouth even during the act of swallowing the poison. 2. Usually a short interval elapses before violent vomiting occurs. 3. Sense of constriction in the throat ; difficulty in swallowing. 4. Sensation of heat in the stomach followed by violent burning pains. 5. Incessant vomiting and severe diarrhœa ; vomit may be green from the presence of bile. 6. Sense of languor ; aching of muscles ; inability to stand. 7. Depression of circulatory system ; pulse small, and often imperceptible at the wrist. 8. Surface cold and covered with a clammy sweat. Subnormal temperature. 9. Dangerous condition of collapse and death in from 10 to 48 hours.	1. Chemical antidotes : **Tannic and gallic acids.** 2. Emetics not usually needed, but if vomiting has not occurred give a simple emetic or use the stomach tube. 3. Administer the Tannin antidote, either 60 grs. of tannic acid in warm water, or hot strong tea or coffee. The action of the antidote is to form an insoluble tannate. 4. Dose of castor oil to eliminate the insoluble product formed by the antidote. 5. Demulcents may be given, and opium if necessary to relieve pain. 6. Keep patient recumbent, and apply warmth to counteract fall of body temperature. 7. Digitalis or strychnine to stimulate the heart. 8. Alcoholic stimulants are indicated.

Antimony Chloride. Acts as a corrosive in concentrated form and must be treated as such. A strong solution of this compound is known as butter of antimony and bronzing fluid. Symptoms are similar to those described under the mineral

acids, but not so severe in character. Treatment consists of giving magnesia or some form of tannin as antidotes, and then carrying out the routine treatment of demulcents and remedies for collapse.

Chronic Antimony Poisoning

Symptoms of chronic poisoning have followed the intravenous injection of tartar emetic in the treatment of bilharziasis. The symptoms are mainly those of gastro-intestinal irritation with nausea, vomiting and diarrhœa. Great depression, headache, muscular pains, and weakness. Death results from exhaustion.

Mercury

Preparations	Dose	Strength
Mercury and its Compounds		
Hydrargyri Perchloridum (Corrosive sublimate)	$\frac{1}{32}$ to $\frac{1}{16}$ gr.	—
Hydrargyri Iodidum Rubrum	$\frac{1}{32}$ to $\frac{1}{16}$ gr.	—
Hydrargyri Oxycyanidum	$\frac{1}{12}$ to $\frac{1}{6}$ gr. (intramuscularly) also $\frac{1}{6}$ gr. (intravenously).	—
Hydrargyri Subchloridum (Calomel) ..	$\frac{1}{2}$ to 3 gr. and $\frac{1}{2}$ to 1 gr. (intramuscularly).	—
Hydrargyrum	$\frac{1}{2}$ to 3 gr. and $\frac{1}{2}$ to 1 gr. (intramuscularly).	—
Hydrargyri Oxidum Flavum	No dose.	—
Hydrargyrum Ammoniatum	No dose.	—
Hydrargyrum Oleatum	No dose.	—
Preparations Containing Free Metallic Mercury		
Hydrargyrum cum Creta (Grey Powder)	1 to 5 gr.	33 per cent.
Pilula Hydrargyri	4 to 8 gr.	33 ,,
Injectio Hydrargyri	5 to 10 m. by intramuscular injection.	10 ,,
Unguentum Hydrargyri	No dose.	30 ,,
Unguentum Hydrargyri Compositum ..	No dose.	12 ,,
Miscellaneous Mercury Preparations		
Liquor Hydrargyri Perchloridi ..	30 to 60 m.	0·1 ,,
Liquor Arseni et Hydrargyri Iodidi ..	5 to 15 m.	1 ,,
Injectio Hydrargyri Subchloridi ..	10 to 20 m. by intramuscular injection.	5 ,,
Lotio Hydrargyri Nigra	No dose.	0·7 ,,
Oculentum Hydrargyri Oxidi	No dose.	1 ,,

In so far as acute poisoning is concerned, metallic mercury is less poisonous than its compounds. The liquid metal is

volatile even at ordinary temperatures, and inhalation of the vapour has been known to cause serious symptoms of poisoning.

All mercury compounds are more or less poisonous, the soluble salts being more so than the insoluble ones. The most dangerous of all is **corrosive sublimate** (**Hydrargyri Perchloridum**) others only slightly less poisonous are the **oxycyanide, nitrate, oxides,** and **calomel** (**Hydrargyri Subchloridum**).

Many cases of poisoning have occurred in which solid corrosive sublimate, in crystals or tablet form, has been swallowed. In some cases violent vomiting has led to recovery of the solid substance within a short time and the patient has recovered ; in others, even although the solid poison has been recovered, death has resulted in from 8 to 12 days. Unless treatment can be begun within a few minutes of the ingestion of the poison, the prognosis is grave. The more acute symptoms may subside, but there may follow an almost complete suppression of urine and the patient eventually dies in a condition of uræmic coma.

The minimum fatal dose of corrosive sublimate is probably about 5 grains, although recovery has been made after far larger doses.

Acute Poisoning

Symptoms	Treatment
1. Symptoms frequently appear in about 10 minutes.	1. Chemical antidotes : **White of eggs, charcoal.**
2. Strong metallic taste in the mouth ; sense of constriction in the throat.	2. The soft rubber stomach tube to be used with extreme caution, or give emetic if necessary.
3. Violent burning pains in stomach and abdomen.	3. Albumin—in the form of white of eggs—should be given. This fixes the poison as insoluble albuminate of mercury. It does not remain insoluble for long and must be removed by further stomach washings. An alternative treatment is to give charcoal suspended in water, which, by reason of its adsorptive properties, hinders absorption of the poison.
4. Nausea, followed by vomiting of stringy mucous which may be bloodstained.	4. Demulcent drinks, especially milk (skimmed for preference).
5. Incessant purging accompanied by painful straining (tenesmus).	5. Intravenous injection of normal saline with 5 per cent. glucose added.
6. If corrosive sublimate has been taken the mucous membranes are white and shrivelled.	6. Routine treatment of warmth and stimulation.
7. Pulse very feeble and rapid ; extreme depression and exhaustion.	7. For the suppression of urine caffeine and other diuretics are given, and intravenous injection of sodium thiosulphate has been practised with some success.
8. If the patient survives the first few hours the greatest danger will be in the suppression of urine. In medicinal doses mercury is a diuretic, but in poisonous doses there is irritation and degeneration of the kidney tissue and almost total suppression of urine. The blood-urea content rises daily and the patient dies from uræmia.	

Chronic Poisoning

This may result from the prolonged medicinal use of mercury or its compounds. Before the use of organic arsenic compounds became general for the treatment of syphilis, mercury was regarded as a specific remedy and chronic poisoning was a common complication of this disease. Mercury is still administered in syphilis but there is no longer the same necessity to push its use to the extent of causing poisoning.

The metal mercury is volatile and industrial poisoning has been caused by inhaling the vapour or breathing in dust laden with particles of mercury compounds. In poisoning by inhalation of the vapour the mucous membrane of the air passages becomes inflamed; there is an irritating cough, bronchitis, and sometimes broncho-pneumonia.

The chief features of "mercurialism" as the chronic poisoning is called, are:

(1) Stomach pains; sickness; intermittent attacks of vomiting and diarrhœa.
(2) Pronounced salivation.
(3) Peculiar fœtid odour of the breath.
(4) Swollen and ulcerated gums; teeth become loose in the gums.
(5) A deep blue line is sometimes evident round the margin of the gums (evidence of absorption).
(6) Muscular tremors of face and limbs developing into paralysis (mercurial palsy).
(7) Progressive emaciation.

Lead.

Preparation	Dose	Strength
Plumbi Acetas (Sugar of lead) ..	½ to 2 gr.	—
Plumbi Monoxidum (Litharge) ..	No dose.	—
Liquor Plumbi Subacetatis Fortis ..	No dose.	Corresponds to 19–21½ per cent. of lead.
Liquor Plumbi Subacetatis Dilutus ..	No dose.	1¼ per cent. strong liquor.
Suppositorium Plumbi cum Opio ..	No dose.	3 gr. lead acetate in each.
Emplastrum Plumbi	No dose.	—

All lead compounds are poisonous, the most toxic being lead acetate (sugar of lead), lead carbonate, and the oxides. Sugar of lead is responsible for the majority of cases of acute poisoning; this substance resembles loaf sugar in appearance and has frequently been mistaken for it.

The glaze of earthenware vessels contains a high proportion of lead oxide and this may be a source of danger if acid liquids are kept in such vessels for any considerable time.

Lead poisoning is much more dangerous in the chronic form than in the acute, and although as little as 5 grains of the acetate have caused symptoms of poisoning, persons have recovered after swallowing an ounce or more.

Acute Poisoning

Symptoms	Treatment
The general symptoms of acute irritant poisoning are noted, but are much less severe than with arsenic and antimony.	1. Chemical antidotes : **Magnesium and sodium sulphates.** 2. The stomach tube may be used, or an emetic of zinc sulphate given. 3. Administer the special antidote, which forms insoluble lead sulphate in the stomach. Excess of the antidote acts as a purge and removes the insoluble compound from the intestines. Also, by attracting fluid from the intestinal wall, the antidote draws out lead which has been absorbed. 4. Routine after-treatment.

Chronic Poisoning

Lead alloys and compounds are used to a very considerable extent in a great variety of industries. Chronic poisoning or " plumbism " as it is sometimes called, has long been known industrially as " Painter's colic " owing to its prevalence amongst workers in this trade ; but plumbers, compositors, electricians, accumulator makers, and many others are also liable to contract this poisoning.

Poisoning is caused by the continual handling of lead or its compounds, and by inhaling air impregnated with lead dust. The finer the particles of lead the more severe the poisoning owing to the greater surface offered for absorption.

Lead poisoning has resulted from the drinking of water which has been conducted through lead pipes ; water which has been allowed to remain stagnant in the pipes for some time gradually absorbs small quantities of lead. In this respect soft water is more dangerous than hard water. New lead pipes are specially dangerous as the water is in direct contact with the metal ; older pipes become incrusted internally with an insoluble deposit which prevents the water coming into actual contact with the metal. Water containing more than $\frac{1}{60}$th grain per gallon must be regarded as unfit for drinking purposes.

The symptoms of chronic lead poisoning are :

(1) Loss of appetite ; muscular weakness ; emaciation.
(2) Colic pains in the stomach.
(3) Obstinate constipation ; suppression of urine.
(4) Tremors of the eye and mouth muscles.
(5) A blue line round the margin of the gums known as Burton's line.
(6) Wrist drop—due to paralysis of the muscles of the forearm.

The blue line round the gums is believed to be caused by a a deposit of insoluble lead sulphide in the gum tissues, formed by the interaction of lead with the sulphurous products of food decomposition in the crevices of the teeth.

Persons exposed to the danger of chronic lead poisoning should pay special attention to personal hygiene, and may be afforded some measure of protection by drinking fluids acidulated with sulphuric acid : milk, and white of eggs should be included in the diet.

It is usual to treat such cases by the administration of potassium iodide with the object of removing the insoluble lead compounds deposited in the tissues in the form of a soluble double iodide. At the same time saline purgatives should be given to remove lead compounds excreted by the intestines. Muscular deterioration may be avoided by massage or by electrical treatment.

Zinc

Preparation	Dose	Strength
Zinci Sulphas	1 to 3 gr. and 10 to 30 grs. (emetic).	—
Zinci Oxidum	5 to 10 grs.	—
Zinci Chloridum	No dose.	—
Zinci Stearas	No dose.	—
Gelatinum Zinci	No dose.	15 per cent.
Pasta Zinci Oxidi Composita	No dose.	25 ,,
Unguentum Zinci Oxidi	No dose.	15 ,,
Unguentum Zinci Oleatis	No dose.	50 ,,

Zinc salts are not strongly irritant poisons, and cases of poisoning are somewhat rare. The sulphate has been swallowed in mistake for Epsom salts, to which it bears a strong resemblance.

Zinc Chloride is much more toxic, 10 grains having been a fatal dose.

Liquid forms of this substance are soldering fluid and Burnett's fluid (Liquor Zinci Chloridi, B.P. 1914), which contains over 200 grains of the chloride in each fluid ounce. Such solutions are intensely corrosive and destroy the lining membranes of the mouth, throat and stomach. Treatment consists of emetics, a special antidote of sodium or potassium carbonate (forming insoluble zinc carbonate), and demulcents. Tannin containing solutions, such as strong tea or coffee, also act as antidotes in this poisoning.

Symptoms	Treatment
The general symptoms of irritant poisoning.	1. Chemical antidotes: Sodium and potassium **carbonates** and **bicarbonates.** 2. The stomach may be washed out if considered desirable; emetics will not usually be required as zinc salts have a strong emetic action. 3. Administer the special antidote which forms an insoluble carbonate of zinc. An alternative treatment is to administer tannin solutions—strong tea or coffee. 4. White of eggs or milk as demulcents. 5. Routine treatment for shock and collapse.

Copper

Preparation	Dose
Cupri Sulphas	¼ to 2 grs. and 5 to 10 grs. as an emetic.

A few instances have been recorded of poisoning by the official salt—copper sulphate (blue vitriol)—but most cases of poisoning by this metal have resulted from eating food which has been prepared in dirty copper pans. There is little or no danger if the vessels are kept scrupulously clean, but if acid or fatty material is permitted to remain in contact with the metal, then contamination is likely to occur. Fruit acids have a solvent action on the metal; vinegar (acetic acid) forms soluble copper acetate or verdigris, and fats and oils assist the metal to oxidize and form an oxycarbonate.

The symptoms of acute copper poisoning are similar to those described in the general table of irritant poisons, but the vomit may be blue or green in colour.

Treatment is on general lines; emetics will not usually

be required but the stomach tube may be used with advantage. The carbonate or bicarbonate of sodium or potassium may be administered in solution as an antidote, but the insoluble compound formed as a result of the interaction must be removed as soon as possible to guard against reabsorption.

Chronic poisoning is known amongst workers in copper and brass. The symptoms are : (1) a strong coppery taste in the mouth, (2) abdominal pain, (3) intermittent vomiting and diarrhœa, (4) emaciation, and (5) in a few cases a blue or green line has been seen round the margin of the gums.

Iodine

Preparations	Dose	Strength
Iodum	No dose.	—
Liquor Iodi Fortis	No dose.	10 per cent.
Liquor Iodi Simplex	3–15 m.	9 ,,
Liquor Iodi Aquosus	5–15 m.	5 ,,
Liquor Iodi Mitis	5–30 m.	2½ ,,
Oleum Iodisatum	No dose.	39–41 per cent. combined iodine.

Strong solutions of iodine, such as the Liquor Iodi Fortis, may cause blistering of skin and mucous surfaces, and this should be noted before attempting to use the stomach tube.

A teaspoonful of the strong solution has been fatal.

Acute Poisoning

Symptoms	Treatment
1. Lips and mouth stained yellowish or dark brown. 2. Burning sensation in throat and and stomach followed by severe pain. 3. Severe vomiting and purging. Vomit has characteristic odour of iodine, and is yellowish-brown or, if starchy substances are present in the stomach, blue. 4. Profuse salivation. 5. Intense thirst. 6. Headache, giddiness, and fainting. 7. Patient may become delirious, followed by extreme collapse.	1. Chemical antidote : **Sodium thiosulphate (hypo)** and **starchy substances.** 2. The stomach tube may be used with great care, or emetics may be given. 3. Give starchy substances—Flour, oatmeal, arrowroot, or plain starch. Alternatively " Hypo " in solution at once decolorizes the iodine and converts it into a non-irritant compound. 4. Demulcent drinks. 5. Routine after-treatment of warmth, rest and stimulation.

Chronic Poisoning

Iodoform has caused chronic iodine poisoning by being absorbed when used as a dressing, or when injected into abscess cavities, although in the latter case it is usually combined with liquid paraffin to localize the action and inhibit absorption.

Potassium iodide and other soluble iodides have also given rise to poisonous symptoms of an irritant nature through the liberation of free iodine in the tissues after absorption. Some persons are very susceptible to the action of iodides, and ordinary medicinal doses have caused symptoms of " iodism " as the chronic poisoning is called.

The symptoms of the chronic poisoning are :

(1) A brassy taste in the mouth.

(2) Inflammation and swelling of the nasal and respiratory mucous membranes giving rise to catarrhal and bronchial symptoms.

(3) Headache.

(4) Running discharge from the eyes and nose.

(5) Skin eruptions caused by the excretion of iodine by means of the sweat glands.

Phosphorus

The dose of phosphorus is about $\frac{1}{100}$ to $\frac{1}{25}$ grain, although it is no longer to be found in the Pharmacopœia. Poisoning is usually the result of the accidental swallowing of the drug in the form of rat pastes, or of sucking the heads of matches—the latter particularly in the case of children.

There are two varieties of phosphorus (*a*) yellow phosphorus, which is very toxic, and (*b*) red phosphorus, which is itself inert but which may be contaminated with the yellow variety. The heads of " safety " matches do not contain any yellow phosphorus.

Workers amongst yellow phosphorus exhibit symptoms of a chronic poisoning which is characterized by necrosis of the jaw bones, the poison attacking the bone through the medium of a decayed tooth. This condition is known as " phossy jaw."

One grain of phosphorus has been fatal to an adult, and death may take place in a few hours or be prolonged for fourteen days or more.

Symptoms	Treatment
1. The symptoms may be delayed for several days owing to non-absorption, but usually develop in from 15 minutes to an hour, with severe pain in the stomach and abdomen. 2. A peculiar garlic-like odour of the breath is noticeable. 3. Nausea, retching and vomiting. 4. The vomit is green or black in colour and is phosphorescent in the dark. 5. The abdomen is distended. 6. Intense thirst. 7. There may be convulsions and delirium, followed by collapse. 8. Death may take place during this acute stage in from 4 to 6 hours, or the patient may recover from these symptoms and appear to be making good progress when, after 3 or 4 days, the symptoms reappear with renewed violence. 9. The poison attacks the liver, which becomes enlarged ; jaundice sets in ; hæmorrhages occur from the mouth, stomach and mucous surfaces. There may be vomiting of blood. The skin is cold ; pulse very feeble and rapid ; condition of great prostration. The late symptoms of poisoning closely resemble acute yellow atrophy of the liver.	1. Chemical antidotes : **Potassium permanganate, copper sulphate, hydrogen peroxide, old oil of turpentine.** 2. The best emetic is copper sulphate, 3 grains in water at intervals of 15 minutes. This acts as an antidote as well as an emetic by coating the poison with an insoluble film of copper phosphide. 3. Undoubtedly the best treatment is to wash out the stomach with a 1 in 400 solution of pot. permang., followed by doses of medicinal charcoal as an adsorbent. 4. Other antidotes, as hydrogen peroxide (30 minims diluted with water) which oxidizes the poison to phosphoric acid ; also **old** oil turpentine which converts phosphorus into a solid non-toxic compound (terebintho-phosphoric acid). 5. Demulcents, such as white of eggs, but **do not give oils,** in which phosphorus is soluble. 6. Intravenous injections of saline to counteract shock. 7. After-treatment of warmth, rest, rectal feeding, etc. 8. The symptoms of liver in-inflammation should be treated by glucose (by mouth or subcutaneously), repeated doses of alkalies (Sod. bicarb., sod. citras.), and repeated doses of liver extract by mouth.

Cantharidin

Preparation	Dose	Strength
Cantharidinum	No dose.	—
Emplastrum Cantharidini	No dose.	0·2 per cent.
Liquor Epispasticus	No dose.	0·4 „

Cantharidin is the colourless, crystalline, active principle of the Spanish fly (cantharis), a shiny emerald-green beetle. The powdered beetles were at one time favoured for criminal

poisoning and for procuring abortion, but the few cases which occur nowadays chiefly result from the powdered cantharides being used in mistake for pepper or spice.

Cantharidin plasters may be a source of danger ; if left in contact with the skin for too long a period severe blistering is caused, the drug is absorbed, and poisonous symptoms develop.

The minimum fatal dose of pure cantharidin is about $\frac{1}{4}$ grain.

Symptoms	Treatment
1. Burning pains in the throat and stomach. 2. Constriction of the throat ; difficulty in swallowing. 3. Nausea and vomiting ; the vomit contains blood and mucous. 4. There may be diarrhœa accompanied by tenesmus ; the stools frequently contain blood and mucous. 5. Vesication of the throat and stomach. 6. Incessant desire to urinate, but only small amounts of bloody urine are passed. 7. Headache ; rapid pulse ; feverish temperature. 8. Convulsions and delirium, finally passing into a stupor.	1. No specific antidote. 2. If seen before blistering occurs, absorption may be prevented by the administration of charcoal and magnesium sulphate, followed by repeated stomach washings with charcoal suspensions. 3. If the throat is blistered give an emetic of apomorphine. 4. White of eggs or skimmed milk as demulcents but **do not give oils.** 5. Morphine may be required to relieve pain. 6. Inhalations of chloroform if convulsions appear. 7. In the later stages alcoholic stimulants or strychnine may be required. 8. Administration of alkaline solutions has been advocated as tending to lessen urinary irritation.

Croton Oil

This oil, which is no longer official, has a dose of $\frac{1}{2}$ to 1 minim. The few cases of poisoning recorded have been mainly due to the swallowing of liniments containing the oil as a rubefacient ingredient.

The symptoms are those of a powerful irritant purgative. There is an early sensation of burning in the throat and stomach, and there may be vesication of the mouth and throat. Vomiting and drastic purging occur, accompanied by painful retching and straining (tenesmus). Symptoms of profound collapse follow, and death may ensue in from 4 to 6 hours.

Treatment is on general lines. In the early stages the soft

rubber stomach tube may be employed, or an emetic may be administered. There is no special antidote and the main treatment consists of allaying irritation by giving draughts of demulcents, and administering soothing enemata. Starch and opium enema is particularly useful as it also helps to relieve pain. After-treatment of warmth, generous stimulation, and rectal feeding.

Miscellaneous Irritants

Silver Nitrate. Poisoning has been caused by a piece of stick silver nitrate (Argenti Nitras Induratus) slipping down a patient's throat whilst being applied to the tonsils. Symptoms of abdominal pain, with vomiting and diarrhœa are seen. The vomit becomes black on exposure to light. Sodium chloride (common salt) is both emetic and antidote, and converts the soluble nitrate into the insoluble chloride which should be eliminated by stomach washings or by purging.

Potassium Chlorate. The usual symptoms of moderately severe irritant poisoning are present. The poison, after absorption, acts upon the hæmoglobin of the red cells and interferes with the oxygenation of the tissues. Symptoms of oxygen-deficiency are to be noted—increasing cyanosis (the face is bluish-grey), followed by respiratory and cardiac failure. There is pain in the loins due to injury to the kidneys ; urine is dark coloured and scanty.

The treatment consists of frequent stomach washings ; digitalis by mouth or strychnine by injection ; artificial respiration, and inhalations of oxygen.

Potassium Permanganate. An antiseptic and deodorant in common use, occurring as slender purple crystals, which dissolve in water to form a deep purple solution. A solution of the sodium salt of permanganic acid is sold under the trade name of Condy's fluid, and potassium permanganate is frequently referred to, quite erroneously, as Condy's crystals. Symptoms of poisoning observed include, pain in the stomach, thirst, constriction of the throat, vomiting, rapid pulse, raised temperature, and suppression of urine.

Treatment consists of administering charcoal as an absorbent, followed by stomach washings. Further treatment is on general lines.

Potassium Bichromate. This salt, mixed with sulphuric acid, is used as a battery fluid. Poisoning as a result of drinking this fluid is due more to the free acid than to the

bichromate, and should be treated as corrosive poisoning. The pure potassium salt occurs in large, orange-red crystals, and poisonous symptoms to be noted are—vomiting of a greenish-yellow fluid, diarrhœa, cramps in the limbs, dilated pupils and suppression of urine.

There is no specific antidote, and the routine treatment of stomach washings, demulcents, etc., should be followed.

Barium. Barium sulphate which is insoluble is much used in X-ray work but it must be in a high state of purity. The soluble salts, of which the chloride and nitrate are examples, are irritant poisons and also affect the heart and central nervous system. Poisonous barium salts are present in some rat poisons and in fireworks. There is abdominal pain, great thirst, violent vomiting and purging, dilated pupils and possibly convulsions.

Magnesium or sodium sulphate should be given as a chemical antidote ; a tablespoonful dissolved in a tumbler of warm water converts the poison into the insoluble sulphate which may afterwards be removed by stomach lavage. Warmth and generous stimulation are required.

THE SYSTEMIC POISONS

Aconite

Preparations	Dose	Strength
Aconitum (Aconite root)	No dose.	—
Linimentum Aconiti	No dose.	50 per cent. powdered root.

The official Aconitum is the root of the plant Aconitum Napellus, commonly known as Monkshood, Wolfsbane, or Blue Rocket from the colour and formation of the flowers. All parts of the plant contain the highly poisonous alkaloid aconitine, $\frac{1}{50}$ grain of which has been a fatal dose. There have been a few isolated cases of poisoning by the pure alkaloid, but the majority of cases have occurred through drinking the liniment or neuralgia mixtures containing the tincture (no longer official).

Poisoning has also occurred through pieces of the root being eaten in mistake for horseradish, although it is difficult to imagine such an error as the distinguishing features are quite prominent.

Aconite Root.	Horseradish Root.
1. A short, tapering root.	1. A long, almost cylindrical root.
2. White when freshly cut, slowly turning reddish.	2. Remains white when cut.
3. Solid and starchy within.	3. Soft, and rather spongy internally.
4. Slight taste, followed by tingling and numbness of the lips and tongue.	4. Taste hot and pungent, but no numbness.

Symptoms	Treatment
1. In a few minutes there is dryness of the mouth and throat with a sensation of warmth. 2. Tingling and numbness of the lips and tongue, later spreading over the whole of the body. 3. Pain in the stomach followed by violent vomiting and purging. 4. Symptoms of profound collapse ; the surface of the body is cold, the temperature is lowered, and there is profuse sweating. 5. The pulse rate gradually slows and becomes weak and irregular. 6. Respiration slow and laboured. 7. Pupils dilated and vision impaired. 8. Patient remains conscious and death ensues from heart failure associated with respiratory paralysis.	1. Therapeutic antidotes : **Digitalis, strychnine, atropine.** 2. If seen at once give potassium permanganate or tannin solution to decompose the poison, afterwards washing out the stomach. Alternatively charcoal suspension may be given as an adsorbent. 3. Emetics may be given if necessary. 4. Administer remedies to stimulate the heart and respiration—Digitalis by mouth, strychnine or atropine by injection. Inhalations of Amyl nitrite are of value. 5. Artificial respiration, and inhalation of oxygen with 5 per cent. carbon dioxide. 6. Mustard leaves to head and extremities to promote circulation. 7. Alcoholic stimulants. 8. Warmth by every possible means ; hot water bottles, massage of limbs, etc.

Belladonna and Atropine

Preparations	Dose	Strength
Belladonna Leaf and Preparations		Per cent.
Belladonna Folium	No dose.	0·3 alkaloids.
Belladonna Pulverata	½–3 gr.	0·3 ,,
Extractum Belladonnæ Siccum	¼–1 gr.	1·0 ,,
Tinctura Belladonnæ	5–30 m.	0·03 ,,

Belladonna and Atropine—*continued*

Preparations	Dose	Strength
Belladonna Root and Preparation		Per cent.
Belladonnæ Radix	½–2 gr.	0·4 alkaloids
Emplastrum Belladonnæ ..	No dose.	0·25 ,,
Extractum Belladonnæ Liquidum	¼–1 m.	0·75 ,,
Suppositorium Belladonnæ ..	No dose.	$\frac{1}{60}$ gr. alkaloids each.
Linimentum Belladonnæ ..	No dose.	0·375 per cent. alkaloids.
Alkaloidal Preparations		
Atropina	$\frac{1}{240}$–$\frac{1}{60}$ gr.	—
Atropinæ Sulphas	$\frac{1}{240}$–$\frac{1}{60}$ gr.	—
Lamellæ Atropinæ	No dose.	$\frac{1}{3000}$ gr. each.
Oculentum Atropinæ	No dose.	0·25 per cent.
Oculentum Atropinæ cum Hydrargyri Oxidi	No dose.	0·125 ,,

The symptoms of poisoning are similar whether caused by the root, leaves, or the alkaloids of belladonna. The fruit of the official Atropa Belladonna, or Deadly Nightshade as it is commonly called, is like a black cherry, whilst that of the Woody Nightshade is a bright red berry. Children have frequently been poisoned by eating the attractive looking fruits, particularly those of the Woody Nightshade, which is a common hedgerow plant in this country. Symptoms of vomiting and general gastric irritation, in addition to the usual symptoms, are seen when the fruits have been eaten, but there are no such symptoms when a preparation of the alkaloid has been taken.

Similar poisonous symptoms are caused by the drugs **Hyoscyamus** (Henbane), **Datura,** and **Stramonium** (Thorn-apple), and by the alkaloids **Hyoscyamine** and **Hyoscine,** although with the latter the stage of cerebral excitement is much shorter.

The fatal dose of atropine is about half a grain.

Symptoms	Treatment
1. Paralysis of the secretions—mouth and throat dry, urine suppressed. 2. Hoarseness of voice ; difficulty in swallowing.	1. Therapeutic antidotes : **morphine** and **pilocarpine.** 2. Potassium permanganate or tannin treatment if seen soon after the poison has been taken and before onset of symptoms.

Symptoms	Treatment
3. Skin dry and flushed; sometimes a scarlet rash appears; temperature raised. 4. Giddiness; reeling gait. 5. Pupils dilated to utmost extent; vision indistinct. 6. Pulse small and rapid (up to 160). 7. Respirations at first rapid, later becoming slow and deep. 8. Muscular tremors of face and limbs, passing into active delirium. 9. Delirium passes into a gradually deepening state of coma.	3. Emetics may be used, or better still repeated stomach lavage with pot. permang. solutions or charcoal suspensions. 4. $\frac{1}{3}$ gr. pilocarpine nitrate as therapeutic antidote may be administered, and repeated after 2 hours, until the skin becomes moist. Morphine is effective during delirium. 5. Artificial respiration if necessary. 6. Alcoholic stimulants after the stage of delirium has passed. 7. Much of the poison is excreted by the kidneys, and the bladder should be emptied by a catheter to guard against reabsorption.

Opium and Morphine

Preparations	Dose	Strength
Preparations of the Drug		
Opium	No dose.	Not less than 9½ per cent. morphine.
Opium Pulveratum	½–3 gr.	10 per cent. morphine.
Extractum Opii Siccum ..	¼–1 gr.	20 ,, ,,
Pulvis Cretæ Aromaticus cum Opio	10–60 gr.	2½ ,, Opium.
Pulvis Ipecacuanhæ et Opii ..	5–10 gr.	10 ,, ,,
Suppositorium Plumbi cum Opio	No dose.	1 gr. opium in each.
Tinctura Opii	5–30 m.	1 per cent. morphine.
Tinctura Opii Camphorata ..	30–60 m.	0·05 per cent. morphine.
Alkaloidal Preparations		
Morphinæ Tartras	$\frac{1}{8}$–$\frac{1}{3}$ gr.	—
Morphinæ Hydrochloridum ..	$\frac{1}{8}$–$\frac{1}{3}$ gr.	—
Liquor Morphinæ Hydrochloridi	5–30 m.	1 per cent.
Suppositorium Morphinæ ..	No dose.	¼ gr. in each.
Trochiscus Morphinæ et Ipecacuanhæ	No dose.	$\frac{1}{32}$ gr. in each.

The minimum adult fatal dose of opium is about 5 grains, and of morphine 1 grain. Children are peculiarly susceptible to the action of opium, and a single drop of the tincture has been sufficient to cause the death of an infant.

Habit is readily established by gradually increasing doses

of the drug, and an active craving for this and other narcotics may be built up. The addict will go to any lengths of deceit and crime to obtain supplies, and up to a few years ago there was a large underground traffic in narcotics in most large seaports and cities of this country. It was to deal with such a situation and to obtain control over the importation and distribution of such drugs, that the Dangerous Drugs Acts were framed. The morphine addict falls into a condition of physical, mental and moral decay. He has no appetite, cannot concentrate on his work, and passes sleepless nights which lead him to take soporifics of other types which are more easily procured.

Symptoms and treatment of poisoning by **Codeine** and **Diamorphine** (Heroin) are similar to those described for opium and morphine.

Symptoms	Treatment
1. An interval of half to one hour before symptoms develop. 2. A short period of cerebral excitement, followed by : 3. Headache, weariness, mental depression, and sleepiness. 4. Loss of sensation in the limbs. 5. Face pallid or cyanosed. 6. Skin cold and covered with a clammy sweat. 7. Muscular relaxation. 8. Pupils contracted to "pin points." 9. Pulse feeble and irregular. 10. Respirations slow, irregular and stertorous. Sometimes only two or three respirations a minute. 11. A gradually deepening state of coma from which there is no awakening.	1. Therapeutic antidotes: **Atropine** and **Strychnine.** 2. Stomach tube or emetics. 3. Wash out stomach with solution of pot. permang. 1 in 1000 and leave some of the solution in the stomach. Repeat this treatment at intervals as the poison, after absorption, is re-excreted into the stomach. 4. Attempt to rouse patient by supporting him and walking him about ; dash cold water in the face, but do not overdo the treatment so as to cause exhaustion. 5. If the patient is once roused do not let him again lapse into unconsciousness. 6. Atropine or strychnine by injection to stimulate respiratory centres. 7. Continuous artificial respiration. 8. Inhalations of oxygen with 5 per cent. carbon dioxide. 9. Promote circulation by warmth and stimulation. Note.—The stomach ought always to be washed out even if the poison has been administered hypodermically. This is because the drug is excreted into the stomach, from which it may again be absorbed and give rise to further symptoms.

Nux Vomica and Strychnine

Preparations	Dose	Strength
Preparations of the Drug		
Nux Vomica	No dose.	1·2 per cent. strychnine.
Nux Vomica Pulverata	1–4 gr.	1·2 ,, ,,
Extractum Nucis Vomicæ Siccum	$\frac{1}{4}$–1 gr.	5 ,, ,,
Extractum Nucis Vomicæ Liquidum	1–3 m.	1·5 ,, ,,
Tinctura Nucis Vomicæ	10–30 m.	0·125 ,, ,,
Alkaloidal Preparations		
Strychninæ Hydrochloridum ..	$\frac{1}{32}$–$\frac{1}{8}$ gr.	—
Liquor Strychninæ Hydrochloridi	3–12 m.	1 per cent. strych. hyd.
Syrupus Ferri Phosphatis cum Quinina et Strychnina ..	30–60 m.	0·0246 per cent. strych. hyd.

Occasionally poisoning by strychnine has been caused by the swallowing of Battle's or other vermin killers, which are mixtures of the alkaloid with soot or flour. Strychnine is not allowed to be sold for these purposes now. More frequently poisoning has resulted from an overdose of a tonic syrup containing the alkaloid; children have eaten Easton's syrup tablets in mistake for sweets with fatal results.

Strychnine is so intensely bitter that it can easily be detected in food or drink, but it has been administered in pill form with homicidal intent.

The minimum fatal dose of the alkaloid is about half a grain.

Symptoms	Treatment
1. Symptoms develop in from 5 to 10 minutes. 2. There is a sensation of suffocation and great difficulty in breathing. 3. Feeling of stiffness in the limbs, and restlessness. This soon gives way to more acute symptoms. 4. Twitchings of the muscles, rapidly passing into convulsions which cause— (a) Profuse sweating. (b) Sardonic grin on the face (risus sardonicus). (c) Staring and protruding eyeballs. (d) Fixed chest and abdominal muscles.	1. Therapeutic antidotes: **Physostigmine, morphine, chloral hydrate.** 2. Potassium permanganate or tannin treatment may be of use in the early stages. 3. An emetic ($\frac{1}{10}$ gr. apomorphine) may be given, or the stomach washed out with warm water containing charcoal in suspension. The stomach tube may only be used in the period before symptoms develop. 4. Special antidotes are given: (a) Chloral hydrate, 20-grain doses by mouth or 40 grains rectally.

Symptoms	Treatment
(e) Opisthotonos—head bent back and spine arched; body rests on back of head and heels only. During the convulsive spasm the breathing is almost suspended and a cyanosed condition sets in. 5. Pulse feeble but rapid. 6. Hearing and sight abnormally acute. 7. Patient remains conscious but completely collapsed for an interval, then the convulsions return. The jaws are not fixed as in tetanus. 8. Convulsive fits become more frequent and death occurs in 2 hours or less during a convulsion from asphyxia, or in the interval between convulsions from exhaustion. A peculiarity of strychnine convulsions is that, during the quiescent interval, the stimulus of a bright light, current of cold air, or a loud noise, will cause the convulsive spasms to reappear.	(b) Pot. bromide, 120 grains in water. (c) Physostigmine sulphate by injection as a spinal depressant. (d) Morphine by injection. 5. Inhalations of chloroform will be necessary to control convulsions. 6. Artificial respiration will be necessary if asphyxiation appears imminent. 7. Large doses of alcohol, by mouth or rectum, have been advocated (alcohol in **large** doses is a narcotic). **Judah Jona's Treatment.**—This treatment consists of giving half an ounce of 1 in 1000 adrenalin solution by mouth as soon as possible after the poison has been swallowed. The adrenalin constricts the absorptive vessels to such an extent that absorption of the poison is retarded for sufficient time for other remedial measures to be adopted. The treatment has been successful in other alkaloidal poisoning and also in the case of prussic acid.

Cocaine

Preparations	Dose	Strength
Cocaina	$\frac{1}{8}$–$\frac{1}{4}$ gr.	—
Cocainæ Hydrochloridum ..	$\frac{1}{8}$–$\frac{1}{4}$ gr.	—
Lamellæ Cocainæ	No dose.	$\frac{1}{60}$ gr. in each.
Oculentum Cocainæ	No dose.	0·25 per cent.
Trochiscus Krameriæ et Cocainæ	No dose.	$\frac{1}{20}$ gr. in each.

Cocaine is an alkaloid from the leaves of the coca shrub, and its principal use in medicine is as a local anæsthetic. Its use is attended by a certain danger owing to its rapid absorption and toxicity, and it has largely been superseded by synthetic preparations which retain the local anæsthetic action but are less poisonous. Examples of such synthetic drugs to be found in the B.P., are **Amylocainæ Hydrochloridum (stovaine), Benzocaina, Orthocaina,** and **Procainæ Hydrochloridum (novocaine)**. Poisoning by these substances is to be treated as cocaine poisoning.

Chronic Poisoning or "Cocainism." Cocaine solutions used for local anæsthetic purposes have sometimes been the cause of acute poisoning, but there is an even greater danger in that the patient may be lead to a craving for the drug. Many addicts have obtained their desire for the drug through the use of cocainated solutions for the relief of toothache or other nerve pain.

The drug is often taken by sniffing the powder up the nose whence it is absorbed by the nasal mucous membrane. In time the nostrils become inflamed, with ulceration or perforation of the septum. When an addict takes a dose of the drug he becomes revived rapidly, the mental activity increases and there is a marked sense of well-being. The pulse rate increases and the pupils dilate. This condition is only temporary and is soon followed by acute depression of mind and physical weariness. With continued use the moral fibre is undermined, and there is mental and physical degeneration. The body becomes emaciated through lack of appetite ; there are gastric disturbances, muscular tremors and hallucinations.

Following the Great War, the habitual use of cocaine and similar drugs became very widespread, and stringent measures were necessary to deal with the situation and put down the illicit traffic. Both the alkaloid, its salts, and all synthetic cocaines are now within the special provisions of the Dangerous Drugs Acts.

The minimum fatal dose of cocaine is about 1 grain, but recovery has followed much larger doses.

Acute Poisoning

Symptoms	Treatment
1. Symptoms begin with restlessness and a general state of unnatural excitement, followed by : 2. Giddiness ; palpitation of the heart. 3. Pupils widely dilated. 4. Face pallid, lips cyanosed. 5. Pulse rate increased at first, but later becomes slow and feeble. 6. Respirations rapid and shallow. **Later** 7. Loss of sensation in the limbs. 8. Muscular spasms which may pass into convulsions. 9. Collapsed condition deepening to coma. 10. Death from respiratory paralysis.	1. Therapeutic antidotes : **Strychnine, digitalis.** 2. Pot. permang. or tannin treatment in the early stages. 3. An emetic may be given, or the stomach washed out with warm water containing charcoal in suspension. 4. Strychnine, $\frac{1}{60}$ gr. by injection, or digitalis by mouth. 5. Inhalations of amyl nitrite or ammonia. 6. Continuous artificial respiration. 7. Stimulation and warmth in the later stages of collapse.

Digitalis

Preparations	Dose	Strength
Digitalis Folium ..	No dose.	—
Digitalis Pulverata ..	½–1½ gr. repeated 3–10 gr. single	10 grs. contain 6 units of activity.
Infusum Digitalis Recens	90–300 m. repeated 1–4 fl. oz. single	4 fl. oz. contain 6 units of activity.
Tinctura Digitalis ..	5–15 m. repeated 30–90 m. single	90 minims contain 6 units of activity.

The Purple Foxglove, from which the official leaves are obtained, is a common plant in many parts of the British Isles. Cases of poisoning are somewhat rare and occur chiefly through medicinal overdosage.

Chronic Poisoning. The active principles of digitalis are only slowly excreted from the system owing to the action of the drug in constricting the renal vessels, and chronic poisoning may suddenly occur in a patient under medicinal treatment by the drug. The pulse which was healthy and strong becomes weak, slow, and irregular; the patient complains of feeling weak and faint; vomiting and diarrhœa may occur.

Acute Poisoning

Symptoms	Treatment
1. Preliminary symptoms of headache and giddiness, followed by vomiting. 2. Stomach and abdominal pain, and diarrhœa. 3. Dilated pupils. 4. Pulse weak, slow, and irregular. Pulse rate may fall to 20 a minute. 5. Breathing slow, face pallid, lips cyanosed. 6. Surface of body cold, and covered with perspiration. 7. There may be convulsions. 8. **Symptoms are aggravated by movement on the part of the patient; death may take place suddenly if the patient should attempt to sit up.** 9. Unconsciousness.	Special antidote: **Tannic acid.** 1. An emetic may be given. 2. Stomach washings with tannin solution are valuable, some of the solution being left in the stomach. 3. The patient must be kept lying down and perfectly quiet. 4. Atropine has been advocated, and strychnine has been given with success. Both of these stimulate respiration. 5. Generous stimulation, and warmth by every possible means; blankets, hot-water bottles, massage of limbs, etc.

Hydrocyanic Acid (Prussic Acid)

The official Acidum Hydrocyanicum Dilutum of the B.P., is an aqueous solution containing 2 per cent. of hydrogen cyanide gas ; the dose of this solution is 2 to 5 minims. There is also a stronger, but unofficial, solution containing 5 to 6 per cent. known as Scheele's acid.

Do not be mislead by the name " acid," it is not corrosive in action, but a very powerful systemic poison which paralyses the central nervous system and prevents oxygenation of the tissues.

Cherry laurel (Laurocerasi) leaves, bitter almonds (Amygdala Amara), and certain other plants contain active principles which produce hydrocyanic acid when chewed or when digested with water ; these plants may usually be distinguished by their " bitter almond " odour and taste.

Metallic cyanides are also extremely poisonous. The cyanides are used commercially in photography, steel hardening, electro-plating, and the hydrocyanic vapour itself is extensively used in large scale fumigation (ships, warehouses).

The fatal dose of the B.P. dilute acid is about 40 minims although a less quantity may cause very serious symptoms, and when a large dose has been swallowed, the patient will be unconscious in a few seconds and death occur in from 2 to 10 minutes.

Symptoms	Treatment
1. An odour of bitter almonds in the breath. Prompt recognition of this fact is of great importance. 2. Symptoms vary according to the amount taken ; if the dose has been large symptoms develop during the act of swallowing the poison. 3. The patient falls insensible to the ground as in a fit, sometimes uttering a cry as he does so. 4. Eyes fixed and glassy ; pupils dilated and insensitive to light. 5. White or bloody froth round the mouth. 6. Fixation of the jaws. 7. Skin cold ; face pallid. 8. Gasping respirations drawn at long intervals. 9. Pulse often imperceptible at the wrist. 10. A little later—relaxation of all muscles with involuntary passing of urine and/or stools.	1. Chemical antidotes : **Cobalt nitrate, sodium thiosulphate, potassium permanganate, hydrogen peroxide.** 2. Only the speediest measures are of use ; the stomach may be washed out with 1 in 400 pot. permang. solution, or dilute hydrogen peroxide (1 in 8 of the B.P. liquor). 3. An emetic of apomorphine by injection, or zinc sulphate by mouth, may be given. 4. Judah Jona's or Kobert's method of treatment. 5. Artificial respiration. 6. Cobalt nitrate and sodium thiosulphate have been suggested as chemical antidotes. 7. Inhalations of ammonia or amyl nitrite. 8. Alternate hot and cold affusions to head and spine. 9. Ether by injection, or brandy by mouth, as stimulants.

Symptoms	Treatment
11. Death in a few minutes.	10. Atropine by injection to stimulate respiratory centres. 11. Intravenous injection of glucose has been suggested as helping to neutralize the effects of the poison on the respiratory organs.

Kobert's Treatment.—Consists of injecting 3 per cent. hydrogen peroxide solution (Liquor Hydrogenii Peroxidi B.P.) at various points of the body, every three to five minutes. The stomach should be washed out with a 1 in 8 solution of the B.P. liquor. The HCN is converted into oxamide, both in the stomach and in the blood stream.

Pilocarpine

The only official preparation of this alkaloid is Pilocarpine Nitrate, the dose of which is $\frac{1}{20}$ to $\frac{1}{5}$ grain.

Symptoms	Treatment
1. Increased secretions—profuse salivation, and very acute sweating. 2. Nausea, vomiting, and diarrhœa. 3. Pupils contracted to the utmost. 4. Pulse slow and very irregular. 5. Acts on the spinal cord, paralysing the respiratory muscles and causing asphyxiation. 6. Patient remains conscious for a long period until the final stages when a collapsed condition is noted.	1. Therapeutic antidotes: **Atropine, strychnine.** 2. Potassium permanganate or tannin treatment in the early stages. 3. Emetics may be given. 4. Atropine $\frac{1}{60}$ grain by injection repeated until the pupils dilate. This stimulates respiration as also does strychnine. 5. Artificial respiration. 6. Warmth and stimulation.

Chloral Hydrate

This drug occurs in colourless, diamond-shaped crystals, having a characteristic sour odour, and a bitter, pungent taste. Its official dose is 5 to 20 grains, and its medicinal action is hypnotic.

It is difficult to estimate the fatal dose with any certainty. As little as 30 grains has caused death in some cases, while in others recovery has been made after a dose of half an ounce. It is likely that the average fatal dose is between 120 and 180 grains.

Symptoms	Treatment
1. Within 15 minutes the patient falls into a deep sleep which gradually deepens into coma. 2. Face pallid ; lips cyanosed. 3. Pulse may be rapid at first, but later becomes slow, very weak, and irregular. 4. Respirations slow and laboured. 5. Complete loss of sensation. 6. Surface of body cold and covered with perspiration. 7. Dangerous fall of body temperature. 8. In fatal cases the patient never wakes and dies from heart and respiratory failure in a condition of deep coma.	1. Therapeutic antidote : **Strychnine.** Chemical antidote : **Liquor potassii hydroxidi.** 2. The stomach tube may be used, or a rapid emetic given. 3. Make vigorous attempts to rouse the patient. 4. Keep patient warm by every possible means. 5. Liquor Potassii Hydroxidi, 1 drachm well diluted to be given every hour to decompose the chloral. 6. Strychnine or atropine by injection act as antidotes by stimulating respiration. 7. Continuous artificial respiration. 8. Generous stimulation—ether by injection, brandy by mouth, or one pint of warm coffee to which brandy has been added per rectum.

Paraldehydum

This is a colourless fluid, possessing a strong nauseous taste, and having a dose of 30 to 120 minims. It is employed as a hypnotic. It is much less toxic than chloral hydrate, but if poisoning does occur the symptoms will be similar to those described under chloral but much less severe. There are also preliminary symptoms of giddiness, nausea, and vomiting.

Chlorbutol (Chloretone)

Dose : 5 to 20 grains. Resembles chloral hydrate in action but is much less toxic ; symptoms of poisoning are not nearly so severe and can be treated on the same general lines.

The Synthetic Hypnotics

The substances of this class in the B.P. are :

Phenobarbitonum (Luminal)	..	½—2 grs.
Phenobarbitonum Solubile	..	½—2 ,,
Barbitonum (Veronal) ..	..	5—10 ,,
Barbitonum Solubile (Medinal)	..	5—10 ,,
Carbromalum (Uradal) ..	..	5—15 ,,
Sulphonal	..	5—20 ,,
Methylsulphonal (Trional) ..	..	5—20 ,,

The above are the official members of a large group of synthetic hypnotics ; other drugs belonging to this group but

which are not described in the B.P. are known under various trade names as Dial, Adalin, Somnifen, Pernokton, etc.

Poisoning, both accidental and suicidal, by this class of drug is steadily increasing. Persons suffering from insomnia take these drugs to enable them to sleep and as they soon become accustomed to the drug, larger doses are required to produce the desired effect. In many instances persons who have formed the habit of taking such drugs swallow a fatal dose whilst in a state of mental confusion occasioned by previous non-effective doses.

These substances are only slowly absorbed and symptoms of poisoning are slow to develop. On the other hand there is a corresponding slowness in excretion, thus causing a prolonged state of poisoning which, however, affords ample time for remedial measures to be adopted.

The hypnotics vary considerably as to their toxicity and the minimum fatal dose is difficult to estimate. It is probable that 60 grains of Luminal and 150 grains of Veronal are average fatal doses, but much larger doses of Sulphonal and Carbromalum have been taken without fatal results.

In non-fatal cases, after the period of unconsciousness has passed, the patient has the appearance of waking from the influence of a general anæsthetic and there are symptoms of headache, giddiness, nausea, and vomiting. In fatal cases the picture is one of a deepening coma with paralysis of respiration, in which condition the patient dies.

Symptoms	Treatment
Early stages. 1. Preliminary restlessness and mental confusion. 2. Headache, giddiness, and frequently nausea and vomiting. 3. There may be delirium or even convulsions. 4. Face red and congested. 5. Respiration rapid and irregular.	1. Therapeutic antidote: **Strychnine.** 2. Stomach tube or emetic. 3. Wash out the stomach with warm water in which charcoal is suspended, or leave warm strong coffee in the stomach after lavage. 4. Strychnine or caffeine may be administered hypodermically. 5. Artificial respiration. 6. Inhalations of oxygen. 7. Intravenous injection of saline and glucose. 8. Warmth and stimulation. 9. Catheterization if necessary. 10. The pressure of the cerebro-spinal fluid may be greatly increased and it may be necessary to relieve pressure on the brain by withdrawing some of the spinal fluid by lumbar puncture. This also removes that part of the poison which has already passed into the fluid.
Later stages. 6. Deep sleep which passes into coma. 7. Face cyanosed. 8. Pulse very feeble and irregular. 9. Respiration slow and shallow. 10. Total loss of sensation. 11. Suppression of urine. The urine is pinkish in sulphonal poisoning. 12. Complete muscular relaxation. 13. Death in about 48 hours.	

Poisoning by Antineuralgics

The members of this class of drug in the Pharmacopœia include :

Amidopyrina (Pyramidon) .. .. 5—10 grains.
Phenacetinum .. .. 5—10 grains.
Phenazonum (Antipyrine) .. .. 5—10 grains.
Acidum Acetylsalicylicum (Aspirin) 5—15 grains.

Other drugs commonly employed for the relief of nerve pains (analgesics) but which are not official include Acetanilidum (Antifebrin) and Methylacetanilidum (Exalgin).

Proprietary headache and neuralgia powders frequently consist solely of one of these drugs, or may be an admixture of several, and poisoning has been caused by their too frequent use.

The symptoms of poisoning vary slightly in each case, but the main features of the poisoning are as shown in the table below.

Symptoms	Treatment
1. Headache and giddiness. 2. Nausea and vomiting. 3. Pulse feeble but rapid. 4. Breathing rapid and gasping. 5. Temperature sometimes raised. 6. Later there is drowsiness and unconsciousness, together with cyanosis and a collapsed condition. 7. There may be muscular spasms. 8. Urine frequently scanty and dark in colour. 9. The red cells of the blood undergo a change and the hæmoglobin is decomposed. Thus respiration is interfered with and the patient dies from an insufficient oxygen supply to the tissues.	1. Therapeutic antidote : **Strychnine.** 2. Give an emetic or wash out the stomach. 3. Administer strychnine $\frac{1}{30}$ grain by subcutaneous injection, and repeat if necessary. 4. Artificial respiration. 5. Inhalations of oxygen. 6. In the collapsed condition, apply warmth and give stimulants.

Chloroform

Preparations	Dose	Strength
Chloroformum	1–5 m.	—
Aqua Chloroformi	$\frac{1}{2}$–1 fl. oz.	1 in 400.
Spiritus Chloroformi	5–30 m.	5 per cent.

Chloroform is a clear, colourless liquid with a characteristic odour ; it is volatile but is not inflammable. It is largely employed as a solvent of organic substances ; the vapour is administered as a general anæsthetic. Poisoning may result from swallowing the liquid or inhaling the vapour. In strong

concentrations the vapour is rapidly fatal ; diluted, it produces unconsciousness and total loss of muscular power in from 2 to 10 minutes.

Symptoms	Treatment
Poisoning by Inhalation	
1. An initial state of excitement. 2. Face pallid or cyanosed. 3. Surface of body cold and moist. 4. Pupils insensitive to light and frequently dilated. 5. Pulse weak and slow. 6. Relaxation of muscles and complete loss of sensation. 7. Respiration stertorous and drawn at irregular intervals (Cheyne-Stoke's breathing). 8. Death from heart failure or paralysis of respiratory organs.	1. Therapeutic antidotes : **Atropine, strychnine, digitalis.** 2. Discontinue inhalation, turn the patient on his stomach ; keep the tongue drawn forward. 3. Artificial respiration. Oxygen inhalations. 4. Atropine ($\frac{1}{60}$ gr.) or strychnine by injection or digitalis by mouth, to stimulate action of the heart. 5. Adrenalin by injection into heart muscle. 6. Alcoholic stimulants by mouth and rectum. 7. In chronic poisoning glucose should be given intravenously, and large doses of alkalis by mouth.
Poisoning by Swallowing	
1. Vomiting frequently occurs in the early stages. Vomit has the characteristic odour of chloroform. 2. Patient rapidly becomes drowsy and later unconscious. 3. Other symptoms as for poisoning by inhalation.	1. The stomach tube should be employed and the stomach well washed out. Emetics may have little action. 2. Heart and respiratory stimulants and general treatment as for poisoning by inhalation.

Alcohol (Ethyl Hydroxide)

The preparations of ethyl hydroxide in the Pharmacopœia are **Alcohol Dehydratum** (Absolute Alcohol) 99·4 per cent., and **Alcohol** (formerly known as Rectified Spirit) 95 per cent. Alcohol is diluted to various strengths for making B.P. galenicals, the official dilutions containing 90, 80, 70, 60, 50, 45, 25, and 20 per cent. of ethyl hydroxide respectively.

For the first time the B.P. includes **industrial methylated spirit** (Spiritus Methylatus Industrialis) which is a colourless mixture of 19 volumes of alcohol (95 per cent.) and 1 volume of wood naphtha. Ordinary coloured (mineralized) methylated spirit, not official, contains 90 per cent. ethyl alcohol, $9\frac{1}{2}$ per cent. wood naphtha, $\frac{1}{2}$ per cent. crude pyridin and is coloured with methyl violet.

Alcohol poisoning must be distinguished from ordinary drunkenness, although the preliminary symptoms of the former may be the same as those of drunkenness. Acute alcohol poisoning is only caused by the sudden ingestion of a fairly large quantity of a strong alcoholic solution, and in such cases the symptoms are those of a true narcotic. Alcohol is very rapidly absorbed from the stomach and intestines, and its presence in the blood stream can be detected after a few minutes.

The vapour of alcohol is also dangerous, especially to young children.

Methyl Alcohol (Wood Spirit). In the U.S.A., during the period of prohibition, crude wood spirit was commonly sold as whisky and other spirits. It is much cheaper to produce than ethyl alcohol, but its effects are much more dangerous. Symptoms observed were, vomiting, convulsions, collapse, and death from respiratory failure. In many cases serious and even permanent injury to the eyes was noticed, with total blindness in some instances.

Chronic Alcohol Poisoning. This condition is known amongst persons who habitually drink large quantities of spirits. The symptoms include gastritis, fatty degeneration and dilatation of the heart, nervous and visual disorders, changes in moral character, and delirium tremens.

Acute Poisoning

Symptoms	Treatment
1. Initial stage of excitability, with giddiness, staggering gait, confusion of ideas, thick speech, lack of co-ordination. 2. Surface of body flushed and covered with perspiration. 3. Eyes congested, pupils usually dilated and fixed. 4. Pulse rapid and of low tension. 5. Stertorous breathing. 6. Convulsions, followed by comatose condition and collapse. 7. Death from heart failure and paralysis of respiratory centres.	1. Therapeutic antidote: **Strychnine.** 2. Give an emetic of apomorphine or wash out the stomach, afterwards filling up with hot, strong coffee. 3. The following antidotes may be given: Strychnine $\frac{1}{60}$ grain by injection. Ammonium carbonate 30 grs. in half a tumbler of warm water. Liquor Ammon. Acetatis, 1 fluid ounce. 4. Artificial respiration. 5. Attempt to rouse the patient, cold affusions to head and spine. 6. Warmth is essential as there is great loss of body heat. 7. In a desperate effort to restore circulation vesication of the soles of the feet with boiling water has been successful.

Miscellaneous Organic Poisons

Turpentine (Oleum Terebinthinæ B.P.). Dosage: 3 to 10 minims, and 120 to 240 minims as an anthelmintic.

Oil of turpentine is in general use for a variety of purposes. It is a component of many liniments and embrocations, and is extensively used in the preparation of furniture creams and floor polishes.

When swallowed, turpentine has a local irritant action on the stomach, which is evidenced by the symptoms of nausea, vomiting, and purging. The characteristic odour of the breath and vomit is noticed. After absorption, symptoms reminiscent of opium poisoning are exhibited—unconsciousness, stertorous breathing, contracted pupils, coldness of the body, muscular relaxation with occasional convulsive movements, and coma. The kidneys are inflamed as the drug is excreted, and blood and albumin are found in the urine, which has an odour of violets.

Treatment consists of emetics or stomach lavage, administration of 1 ounce of Epsom salts dissolved in warm water as a purge, followed by demulcent drinks. Further treatment as required according to the symptoms.

Eucalyptus and other Essential Oils. A strong odour of the oil is apparent in the breath. There is a burning sensation in the mouth and throat, nausea, abdominal pain, and vomiting. The patient may become cyanosed and convulsions may occur, to be followed by unconsciousness. As the oil is excreted the kidneys are inflamed and the urine may contain blood.

Treatment is on general lines with emetics, stomach lavage, demulcents, etc.

Ergot. Poisoning of a chronic nature is chiefly caused by eating bread made from rye flour which is contaminated with the ergot fungus (Claviceps purpurea). Cases of acute poisoning have resulted from the misguided use of ergot preparations as abortifacients.

Acute symptoms are nausea, vomiting, great thirst, abdominal pain, dilation of the pupils, muscular weakness, cramping pains in the limbs, and coma.

Chronic poisoning is characterized either by convulsions or gangrene. After preliminary symptoms of headache, retching and vomiting, there is an itching sensation of the skin and numbness of the limbs. Later, either convulsions of a tetanic character are seen, or in the gangrenous type the hands and feet swell and become numb. A dry or scaly gangrene then begins with more or less general septicæmia; the living flesh putrifies and the patient suffers agonizing pain.

Camphor. Poisoning by this drug is usually the result of accidental swallowing of some camphor-containing liniment; children have been poisoned by being given camphorated oil in mistake for castor oil or cough syrup. It is not powerfully toxic, but 30 grains have been fatal to a child. Symptoms frequently manifest themselves in a short time, and there is nausea, vomiting, and diarrhœa. The odour of the drug is very noticeable. The face is pallid, the body cold and clammy. Delirium and convulsions appear, followed by a comatose condition with intermittent convulsive spasms. The pulse rate is increased, breathing rapid and laboured, and the pupils are frequently dilated.

Emetics, or stomach washings, should be employed; warmth is very essential; cardiac and respiratory stimulants should be given.

Paraffin, Petrol, Benzene. Symptoms noted are, burning pains in mouth, throat, and stomach; headache; vomiting; muscular weakness. The body is cold and clammy, cyanosis is pronounced, and the patient becomes insensible. The odour of the poison is easily detected in the breath and vomited matter.

Treatment should consist of emetics or stomach lavage, warmth, artificial respiration, strychnine or alcoholic stimulants.

Nicotine. This is a colourless liquid alkaloid obtained from the leaves of the tobacco plant. Crude nicotine solutions are used as insecticide sprays in horticultural work, and numerous fatal cases of poisoning have occurred from the swallowing of such solutions. The poison is extremely rapid in action and death may take place within a few minutes.

There is a burning sensation in the mouth and throat, followed by depression, vertigo, nausea, vomiting, and convulsions. Breathing is rapid and laboured. The body becomes cold and clammy, the patient lapses into unconsciousness in which state the breathing becomes weaker and of a sighing character, and death results from asphyxia.

Routine treatment of emetics or stomach lavage is to be carried out. Artificial respiration is necessary, warmth should be applied, and stimulants administered, strychnine about $\frac{1}{40}$ grain may be given.

Poisonous Fungi. Poisoning may be caused by eating edible mushrooms that have been allowed to become stale, or by eating poisonous fungi (toadstools) in mistake for the edible variety. Some, but not all, types of poisonous fungi contain a poisonous active principle—muscarin.

There is usually an interval of several hours before symptoms are seen, and then they develop rapidly. There is acute abdominal pain, with vomiting and diarrhœa. This is followed by painful muscular cramps in the limbs and great prostration. Surface of the body is cold and the temperature subnormal. The pupils may be dilated. The pulse, rapid at first, becomes weak, and the patient sinks into a coma. Death results from cardiac and respiratory failure.

When muscarin is present in the fungus there is a preliminary stage of mental excitement with delirium and convulsions. The pupils are contracted.

General treatment consists of emetics or stomach lavage. If lavage is impossible give draughts of water containing charcoal in suspension. Intravenous injections of glucose in saline are advocated, and heart stimulants will be needed. Severe pain may be relieved by morphia, and if the pupils are contracted (*i.e.* if muscarin is the active principle involved) atropine $\frac{1}{80}$ grain may be given, and repeated until the pupils dilate.

Food Poisoning

In general, food poisoning is caused either by micro-organisms or by chemical poisons present in food.

Some of the conditions in which foodstuffs may be poisonous are :

(1) Presence of active bacteria or their toxins, such as, the *Bacillus botulinus* and organisms of the *Salmonella* group.
(2) Putrefactive changes with formation of chemical poisons known as " ptomaines."
(3) Contamination with organic or metallic poisons (lead, arsenic, opium, etc.), or with germs of disease (dysentery, etc.).
(4) Consumption of unsuitable foods, as certain types of shell-fish and poisonous fungi.
(5) Sensitiveness of individuals to certain foods, a condition known as " food-allergy."

Ptomaine Poisoning. In the past it has been common to classify cases of severe gastro-irritation as " ptomaine " poisoning, but in reality such cases are extremely rare.

Ptomaines are chemical poisons which are produced during the putrefaction of animal proteins. Such substances do certainly exist, but they are by no means responsible for the large number of cases of food poisoning attributed to them. Ptomaines are only formed during advanced decomposition, and no sane person would eat food in such a condition.

Food Allergy. It seems likely that many cases of food poisoning which cannot be traced to any specific organism or poison are due to an idiosyncrasy on the part of the individual to certain kinds of food. The person may not be aware of any such predisposition, but it is well known that such articles of food as mussels, oysters, strawberries, eggs, cheese, etc., are peculiarly intolerable to some individuals and not to others. This condition cannot be ascribed to any suspicion of unwholesomeness on the part of the food, and is believed to be due to some inherent peculiarity in the patient. The condition is termed "**food allergy**" and gives point to the "one man's meat" and "another man's poison" story. The symptoms to be noted usually include—abdominal pain, nausea, vomiting, diarrhœa, and urticarial rashes.

Botulism. The term is derived from the Latin (botulus—sausage), but is apt to be misleading as the majority of cases of botulism have been traced to foods other than sausages. The poisoning is caused by the toxin of the *Bacillus botulinus*, which is taken into the system with the food eaten. Nearly all cases are caused by meats or fish that have been subjected to smoking, pickling, or canning, and which are eaten without previous cooking. Meat which has been insufficiently cooked, allowed to stand for several days, and then made into meat pastes, pies, etc., is a source of danger; thorough cooking is an efficient protection.

The onset of symptoms takes place in from 12 to 36 hours. Gastro-intestinal irritation is slight and may be lacking altogether. Symptoms noted are vertigo, difficulty in swallowing and in speaking, progressive muscular weakness, laboured breathing, and constipation. The eyes are especially affected; vision is dim, the pupils do not react to light, and either double vision or squint may be observed.

Purgatives are given as a routine treatment, and a specific antitoxin may be administered.

Salmonella group. Food poisoning of this type is caused by (*a*) the invasion of bacilli into the living animal (cattle, sheep, pigs) which is afterwards killed and eaten as food or (*b*) the presence of the toxin of the bacillus in the food. Thorough cooking is the best preventative; raw and under-cooked meats are dangerous.

An important point to note is that there will be no apparent change in the appearance, odour, or taste of the infected meat.

Of the many organisms in this group, the chief are *Salmonella ærtrycke* and *S. enteritidis*.

Symptoms usually occur in from 4 to 12 hours, but

occasionally may not appear until after 24 to 48 hours. Gastro-intestinal irritation is always present, with symptoms of vomiting, diarrhœa, and abdominal pain. There is usually a slight rise in temperature, with prostration and occasionally collapse.

GASEOUS POISONS

Carbon Dioxide (CO_2).

This gas is formed when carbonaceous material is burned or becomes oxidized in a free supply of air or oxygen. It is present as a normal constituent of the atmosphere, and is found in higher concentrations in coal mines, wells, and deep shafts. It is also produced in large quantities during fermentation, and is evolved when chalk is burned to form lime.

Carbon dioxide is a colourless, inodorous gas, and is heavier than air. It is not in itself a toxic gas but the replacement of atmospheric oxygen by the gas leads to death by asphyxia.

In high concentrations death rapidly results, but in low concentrations (up to 2 per cent.) symptoms of vertigo, loss of muscular power, laboured and quickened breathing, pain in the chest, and cramps in the limbs are noted.

Rapid recovery follows removal of the patient from the impure atmosphere and no further treatment may be needed. If, however, the breathing is distressed, artificial respiration and inhalations of oxygen may be given.

Carbon Monoxide (CO).

This gas is produced when carbon compounds are oxidized in a limited supply of air or oxygen. It is a very deadly gas and, being inodorous, gives no warning of its presence. It forms the main poisonous constituent of coal gas and water gas. It is given off in the exhaust gases of petrol engines, and in the vapours from coke and charcoal fires and slow combustion stoves. Blast furnace gases are rich in carbon monoxide, and the firing of explosive charges in mines also leads to a considerable evolution of the gas. During the firing of high explosives in gun turrets and emplacements the gas is liberated in large quantities and, if ventilation is not adequate, poisoning of the gun crews may result.

The poisonous effect of the gas is produced by its absorption into the blood in the lung cells, where it combines with the hæmoglobin of the blood to form carboxyhæmoglobin. This compound is more stable than the normal oxyhæmoglobin of the blood, and readily displaces the oxygen from the latter compound. In this way it prevents oxygen from being taken

up by the blood and distributed to the tissues. A concentration of only 1 in 1,000 is sufficient to interfere with effective oxygenation of the tissues. The action of the gas, therefore, is due to interference with the normal gaseous interchange rather than to any inherent quality of toxicity.

In low concentrations preliminary symptoms of headache and lassitude are noted, followed by giddiness, nausea, throbbing in the head, and great muscular weakness. The breathing is rapid and laboured, vomiting may occur, and in a few cases a violent delirium has been noted. Finally paralysis and a state of coma.

If exposed to a high concentration of the gas, unconsciousness may so rapidly develop that preliminary symptoms are absent and the patient falls insensible to the ground. In such cases, unless the patient is speedily removed from the contaminated atmosphere, death will rapidly ensue.

A post-mortem feature of carbon monoxide poisoning is a patchy cherry-red coloration of the surface of the body.

Treatment consists of immediate removal of the patient to a pure atmosphere, artificial respiration should be practised and persevered with, and inhalations of oxygen with 5 per cent. CO_2 should be administered to stimulate respiration and improve lung ventilation. Venesection, and the withdrawal of 12 to 20 ounces of blood is advocated by some authorities as is also blood transfusion.

Coal Gas. Suicide by means of coal gas has greatly increased during the past twenty years. During recent years no less than 65 per cent. of all cases of suicidal poisoning have been due to coal gas, and in addition there have been numerous accidental deaths from the same cause.

The main poisonous constituent is carbon monoxide, the proportion of which varies from 6 per cent. to as much as 20 per cent. according to the purpose for which the gas is supplied, *e.g.* for household lighting or for commercial heating. Pure carbon monoxide is odourless, but coal gas may readily be detected by its penetrating and characteristic smell.

Symptoms and treatment as for poisoning by carbon monoxide.

Sulphuretted Hydrogen (H_2S).

This gas is produced by the action of acids on metallic sulphides, and also during putrefactive changes in many organic compounds. It is present in small quantity in coal gas, and is the main poisonous constituent of **sewer gas.**

It is a highly poisonous gas, concentrations of 1 in 200,000

are sufficient to cause definite symptoms, while a concentration of 1 in 500 is rapidly fatal.

In low concentration there is a feeling of nausea, with pains in the head, vertigo, loss of muscular power, and subsequent unconsciousness. In high concentrations the patient quickly becomes unconscious.

Treatment consists of rapid removal of the patient into pure atmosphere, artificial respiration, inhalations of oxygen, and administration of stimulants.

MATERIA MEDICA

The term " Materia Medica " means " medicinal materials," and the subject deals with the study of the various classes of drugs, their nature, appearance, and properties.

Groups of Active Constituents. The majority of medicinal plants contain one or more active principles upon which the therapeutic activity of the plant depends. These active principles are grouped according to their chemical constitution and the more important groups are described as follows :

Alkaloids.

These form the chief group of plant active principles and it is to the presence of these substances that some of the most important drugs owe their medicinal properties.

The word alkaloid means " like an alkali " and, like alkalis, these compounds have the property of turning red litmus blue and of combining with acids to form alkaloidal salts.

Alkaloids are complex, nitrogenous, organic compounds, and they have marked physiological properties. Liquid alkaloids contain the elements carbon, hydrogen, and nitrogen only ; solid alkaloids nearly always contain oxygen in addition. In plant cells the alkaloids are usually found in combination with such plant acids as tannic, citric, oxalic, and malic acids.

Pure alkaloids are sparingly soluble or insoluble in water, more readily in alcohol, and are usually freely soluble in ether and chloroform. Most alkaloids are colourless and crystalline in appearance, but there are a few exceptions—berberine is yellow ; xanthaline, itself colourless, yields yellow salts, and sanguinarine, also colourless, yields bright red salts. Examples of liquid alkaloids are lobeline, nicotine, and sparteine.

The pure alkaloids described in the Pharmacopœia are **Atropina, Caffeina, Cocaina, Codeina, Ergometrina, and Theophyllina.**

Glucosides.

This group of principles ranks next in importance to that of the alkaloids. Glucosides are organic compounds of carbon, hydrogen, and oxygen, and only rarely contain the element nitrogen. Glycosides are compounds of similar composition. In appearance they closely resemble alkaloids, being colourless and crystalline in structure, but they possess neither alkaline nor acid properties and, therefore, cannot form salts.

A characteristic property of glucosides is that of producing sugars, chiefly glucose, on decomposition. This decomposition may be brought about by boiling the glucoside with a dilute mineral acid or through the agency of enzymes or ferments (yeast-like bodies capable of producing decomposition or fermentation).

Decomposition by ferment or enzyme action may take place within the tissues of the growing plant, or in the blood stream of the body after the drug has been absorbed, and a number of drugs owe their medicinal value to the formation of new compounds in this way. For example, bearberry leaves contain a glucoside arbutin, which is broken down in the blood by enzyme action, liberating an internal antiseptic called hydroquinone.

Examples of glucosides in the B.P. are **Salicinum** and **Strophanthinum.**

Neutral Bodies.

This is a small group of substances of varying chemical composition and properties. They are neither acid nor alkaline, do not form salts, and differ from both alkaloids and glucosides in other respects.

Santoninum and **Aloin** are examples of this group.

Gums.

These are non-crystalline carbohydrates. They either exude (flow out) naturally from the stems and branches of gum-producing plants, or are collected after making incisions in the outer bark. Gums possess a basis of either arabin or bassorin ; those containing the former are readily soluble in water, while those containing the latter only slowly dissolve. Gums dissolve in water to form thick, adhesive fluids called **mucilages,** which are employed in the making of emulsions and in the suspension of insoluble powders in mixtures.

Resins.

Resins are solid, non-crystalline substances of varied composition, generally regarded as being oxidation products

of volatile oils. Some resins exude naturally from the stems and branches of plants and harden into tear-drops on exposure to the air, others are obtained after incision.

Resins are freely soluble in alcohol, ether, and essential oils, but are completely insoluble in water. If water is added to an alcoholic solution of resin, or vice versa, the resin is precipitated from solution. When treated with alkaline solutions the insoluble resin-acids are saponified to resin-soaps and rendered soluble in, or at least miscible with, water.

Examples of resins described in the B.P. are **Colophonium** and **Podophylli Resina.**

Gum-Resins.

These are plant exudates consisting of a variable mixture of gum and resin. The gum portion is soluble in water but not alcohol, and the resin portion is soluble in alcohol but not water, so no single solvent will entirely dissolve such a substance. If, however, a powdered gum-resin is triturated (stirred) with water, the gum element dissolves to form a mucilage in which the resin particles are suspended. The product has the appearance of a milky-white emulsion. Ammoniacum, official in the 1914 B.P. but not in the 1932 edition, is an example of this class of drug.

Oleo-Resins.

Oleo-resins are natural plant exudates containing resins dissolved in a volatile oil. The only official example is **Copaiba**—a thick, yellowish fluid, insoluble in water and entirely soluble in alcohol. Copaiba is commonly called " Balsam of Copaiba " but it cannot be classified as a balsam as it does not contain either of the aromatic acids, benzoic or cinnamic acid.

Oleo-Gum-Resins.

Mixtures of volatile oils, gum, and resin in varying proportions. **Myrrh** (a hard, brittle solid) and **Asafetida** (a soft, plastic mass) are the B.P. examples of the group. The proportion of natural gum in the substance is insufficient to suspend the insoluble oil and resin, and when water is added both these constituents are thrown out of solution. An emulsion can be formed by the addition of more gum.

Balsams.

Solid or thick liquid substances of an oily or resinous nature containing the aromatic benzoic or cinnamic acids. They are distinguished from resins by having a pleasing

aromatic odour. They are almost completely soluble in alcohol, and only partially soluble in water. B.P. examples are **Benzoinum** (solid), **Balsam of tolu** (semi-solid), **Balsam of peru** and **Storax** (liquids). The physical state of the balsam depends upon its resin content, the higher the proportion the more solid the balsam.

Oils.

Oils fall naturally into two classes :

(*a*) Volatile or essential oils.
(*b*) Fixed or expressed oils.

Volatile or Essential Oils.

These are vegetable products obtained from various parts of plants by distilling the crushed plant tissues in a current of steam. They vary considerably in chemical constitution, but may consist of a solid stearoptene dissolved in an aromatic liquid hydrocarbon, or may contain a large proportion of " terpenes " ; in any case they have no chemical relationship with fats and fixed oils.

Volatile oils are of various colours, and have a pleasant aromatic or fragrant odour. They completely volatilize even at ordinary temperatures leaving no residue. They are very sparingly soluble in water, but readily dissolve in alcohol and chloroform. They do not form soaps when treated with caustic alkalis. Many volatile oils are now prepared by synthetic processes, and have become much cheaper in consequence.

Essential oils do not differ materially from a chemical point of view from another class of fragrant and aromatic liquids called **essences,** but the latter term is particularly used to describe the fragrant oily fluids employed in the manufacture of perfumes and as flavouring agents. Essences are nearly all synthetic products.

Fixed or Expressed Oils.

These oils are extracted from plant or animal tissues by simple expression (pressure) ; they cannot be obtained by distillation as they are non-volatile and decompose with heat.

Chemically such oils may be regarded as esters (salts) formed by the union of three molecules of fatty acid (oleic, stearic, palmitic acids), with one molecule of glycerol.

Expressed oils are usually thick, yellowish fluids, and have a rather unpleasant oily or rancid odour. On keeping, they become rancid, developing free acid and an unpleasant odour. They are insoluble in water, but soluble in ether and chloro-

form. They are non-volatile, leave a greasy mark when dropped on paper, and form soaps when treated with caustic alkalis.

Fats are fixed oils which remain solid at ordinary temperatures, but waxes are composed of only one molecule of fatty acid in combination with a monohydric alcohol. Apart from their chemical composition, waxes have many physical properties in common with fats.

Mineral oils are not oils at all in a chemical sense, but are mixtures of liquid hydrocarbons which possess some of the physical characteristics of oils (see the section on Paraffins).

The Vegetable Materia Medica has been divided into sections according to the part of the plant used. Thus, all barks and all seeds are grouped together, and it will be found that little similarities and minor points of difference will be more easily remembered than if the specimens were arranged alphabetically.

At the head of each group will be found a table giving the name, botanical source, natural order, and habitat of each member of the group. These tables need not be memorized, but they are interesting and are of value for reference.

Plants have been divided into natural groups or families ; this is the natural order, and members of the same order possess certain family characteristics in common. Thus many of the members of the order Solanaceæ (sleep-producing order) contain narcotic or hypnotic active principles like hyoscyamine, hyoscine, atropine and daturine. The Leguminoseæ order all bear fruits in the form of a pod (legume) or bean.

Each of the different members of a natural order possesses some difference in appearance or qualities, and so that there can be no mistake as to which particular plant of the order is intended to be used, each one has a special name—the botanical source. For example, there are several plants in Great Britain to which the general name of Nightshade or Belladonna has been given and which all belong to the same plant family, but the name Atropa Belladonna belongs only to one plant. Atropa Belladonna is the plant from which the B.P. drug is obtained ; other varieties of belladonna may contain similar active principles but they cannot be used for official preparations.

Many of the names of active principles are derived from the botanical name of the plant, thus the Atropa Belladonna contains the alkaloid atropine, the Cephaëlis Ipecacuanha contains the alkaloid cephaëline, and Hydrastis Canadensis contains both hydrastine and canadine.

The habitat simply indicates the country or region of origin of the drug.

The percentage figure quoted for each preparation indicates the percentage strength of the drug or active principles contained therein.

The Barks (Cortex = Bark)

Specimen	Botanical Source	Natural Order	Habitat
Aurantii Cortex Recens .. .. / **Aurantii Cortex Siccatus.**	Citrus Aurantium.	Rutaceæ.	Southern Europe.
Cascara Sagrada ..	Rhamnus Purshiana.	Rhamnaceæ.	N. America.
Cinchona	Cinchona Calisaya, Cinchona succirubra, and other species.	Rubiaceæ.	Java, India, Ceylon.
Cinnamomum ..	Cinnamomum Zeylanicum.	Lauraceæ.	Ceylon.
Limonis Cortex ..	Citrus Limonis.	Rutaceæ.	S. Europe.
Prunus Serotina ..	Prunus serotina.	Rosaceæ.	N. America.
Quillaia	Quillaja Saponaria.	Rosaceæ.	Chile, Peru.

No. 1. Aurantii Cortex Recens. Fresh Bitter-Orange Peel.

The fresh outer part of the rind or peel of the fruit. In thin strips, with but a small amount of the adherent white "pith" attached. Outer surface deep orange-red and pitted with oil glands. Fragrant odour; taste aromatic and bitter.

Constituents. Hesperidin, aurantiamarin, volatile oil.
Therapeutics. Mild bitter tonic and flavouring agent.
Preparations.

Tincture	30– 60 m.	25 per cent.
Syrup	30–120 m.	1 in 8 of tincture.

No. 2. Aurantii Cortex Siccatus. Dried Bitter-Orange Peel.

Thin, narrow, curved strips of the dried peel. Outer surface deep orange-red in colour and freely pitted with oil glands. A thin layer of white pith adheres to the inner surface. Aromatic odour; taste, bitter and aromatic.

Constituents. Hesperidin, aurantiamarin, volatile oil.
Therapeutics. Mild bitter tonic and flavouring agent.
Preparations.

Fresh infusion ..	½–1 fl. oz.	5 per cent.
Concentrated infusion	30–60 m.	40 ,,

No. 3. Cascara Sagrada. Sacred Bark.

The dried bark in quilled or channelled pieces, stored for at least one year before use so that certain natural ferments may break down emetic and irritant active principles and modify their action. The bark is covered with a smooth layer of purplish-brown cork, with occasional patches of silvery-grey lichens. Inner surface smooth, reddish-brown to nearly black, and marked with faint longitudinal striations. Breaks with a short fracture. Faint, but characteristic odour ; bitter, nauseous taste.

Dose of the powdered drug. 20 to 60 grains.

Constituents. Emodin and other anthracene bodies.

Therapeutics. Stomach tonic in small doses, purgative in large doses. Useful in chronic constipation.

Preparations.

Elixir	30–60 m.	1 in 1
Liquid extract ..	30–60 m.	1 in 1
Dried extract ..	2–8 gr.	—

No. 4. Cinchona. Cinchonæ Rubræ Cortex, Red Cinchona Bark.

The dried bark of the stems and roots from cultivated trees of Cinchona Calisaya, C. Ledgeriana, C. officinalis, C. succirubra and hybrids.

Stem Bark. In quills or curved pieces from a few inches to a foot long, and from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick. Outer surface rough, grey or brownish-grey, often bearing mossy growths, wrinkled longitudinally, and with numerous transverse cracks and furrows. Inner surface pale yellowish-brown to deep reddish-brown, and striated. Little odour ; taste very bitter and rather astringent.

Root Bark. Irregular curved or twisted pieces from 1 to 3 in. long. often scaly and marked externally with shell-like depressions, and of the same colour internally as externally.

Either bark must contain a total of not less than 6 per cent. alkaloids of which not less than half consists of quinine and cinchonidine.

Dose of the powdered drug. 5 to 15 grains.

Constituents. About twenty alkaloids, the chief of which are quinine, quinidine, cinchonine, and cinchonidine. Also resins and tannin.

Therapeutics. Antiperiodic, antipyretic, tonic.

Preparations.

		Per cent.
Extract	2– 8 grs.	10 alkaloids.
Liquid extract ..	5–15 m.	5 ,,
Tincture	30–60 m.	1 ,,
Compound tincture	30–60 m.	0·5

Totaquina is a mixture of total alkaloids from various species of cinchona, and containing about one-fifth of its weight of quinine.

No. 5. Cinnamomum. Cinnamon Bark.

The dried inner bark of shoots from truncated or coppiced stocks. The trunks are cut down to within a foot or so of the ground, and from these stocks long slender shoots arise. These are cut when from 3 to 6 ft. in length and the bark stripped off. In closely rolled quills up to 3 ft. or more in length, larger quills having smaller ones packed within them. Outer surface dull yellowish-brown, smooth, free from cork, and marked with faint shining wavy lines and occasional scars. Inner surface longitudinally striated. Brittle, splintery fracture. Fragrant, spicy odour ; taste sweet and aromatic.

Dose of the powdered drug. 5 to 20 grains.

Constituents. Volatile oil, tannin, mucilage.

Therapeutics. Carminative, aromatic stomach tonic.

Preparations.

Distilled cinnamon water	½–1 fl. oz.	10 per cent.
Oil	1–3 m.	—

No. 6. Limonis Cortex. Lemon Peel.

The fresh outer peel or rind of the fruit. In strips or curved irregular pieces ; outer surface pale yellow and rough from the presence of oil glands. Inner surface white, but with only a small amount of white pith adhering. Strong aromatic odour ; taste aromatic and rather bitter.

Constituents. Volatile oil, hesperidin.

Therapeutics. Flavouring agent.

Preparations.

Syrup	30–120 m.	6 per cent.
Tincture	30–60 m.	25 ,,
Oil	1–3 m.	—

No. 7. Prunus Serotina. Wild Cherry Bark, Pruni Virginianæ Cortex.

The dried bark, collected in autumn, in curved or channelled pieces, or irregular broken fragments. The bark is covered

with a smooth, thin, reddish-brown, papery cork, marked with transverse parallel lenticels (lens-shaped scars). The cork is easily removed disclosing a greenish-brown bark. Inner surface reddish-brown and finely striated. Fracture short and granular. Little odour when dry, but when chewed or distilled with water, a prussic acid odour develops. Taste aromatic, astringent, and rather bitter.

Dose of the powdered drug. 15 to 30 grains.

Constituents. Prunasin (glucoside) and Emulsin (enzyme), which interact in the presence of water and produce hydrocyanic (prussic) acid, benzaldehyde, and glucose. Also contains much tannin.

Therapeutics. Mild sedative and expectorant.

Preparation.

Syrup	30–120 m.	15 per cent.

No. 8. Quillaia. Soap Bark, Panama Bark.

The dried inner portion of the bark, in flat, tough pieces of various lengths, and from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick. Outer surface yellowish or brownish-white, with patches of a darker colour where the bark has not been completely removed. Inner surface pale yellowish-white, smooth and hard. Fracture very fibrous and splintery, minute crystals of calcium oxalate are exhibited over the entire freshly fractured surface. No odour; taste acrid and astringent. Aqueous preparations of the bark yield a copious, persistent froth when shaken.

Dose of the powdered drug. 1 to 3 grains.

Constituents. Saponins.

Therapeutics. Expectorant. Saponifying agent for fixed oils.

Preparation.

Tincture	30–60 m.	5 per cent.

The Roots (Radix = Root)

Specimen	Botanical Source	Natural Order	Habitat
Aconitum	Aconitum Napellus.	Ranunculaceæ.	British Isles.
Belladonnæ Radix ..	Atropa Belladonna.	Solanaceæ.	Britain and Central Europe.
Calumba	Jateorhiza palmata.	Menispermaceæ.	Banks of the River Zambesi.

The Roots (Radix = Root)—*continued*

Specimen	Botanical Source	Natural Order	Habitat
Gentiana	Gentiana lutea.	Gentianaceæ.	Central Europe.
Glycyrrhiza	Glycyrrhiza glabra.	Leguminoseæ.	S. Europe.
Ipecacuanha ..	Cephaëlis Ipecacuanha.	Rubiaceæ.	Brazil, Burma, New Granada.
Ipomœa	Ipomœa orizabensis.	Convolvulaceæ.	Mexico.
Jalapa	Ipomœa purga.	Convolvulaceæ.	Mexico, Jamaica.
Krameria	Krameria triandra.	Polygalaceæ.	Peru, Brazil.
Senega	Polygala Senega.	Polygalaceæ.	U.S.A.

No. 9. Aconitum. Aconite Root, Monkshood.

The dried root, from 1 to 4 in. long, somewhat conical in shape and tapering from the crown downwards. Externally very dark brown and shrivelled. The larger end is crowned with decayed bases of stems and marked with the remains of rootlets. Internally solid, whitish and starchy. Old roots are brownish internally, and have a central core. No odour; taste at first slight, followed by persistent tingling and numbness of the lips and tongue.

Constituents. Several alkaloids chief of which is aconitine.

Therapeutics. Cardiac sedative, diaphoretic, but there are no preparations for internal use. Local anodyne externally.

Preparation.

Liniment .. .. No dose. 1 in 2.

No. 10. Belladonnæ Radix. Belladonna Root, Deadly Nightshade Root.

The root collected in autumn when the plant is about three to four years old, and dried. In nearly cylindrical pieces, either entire or divided longitudinally, from 6 to 12 in. long and up to about 1 in. in diameter. Externally pale greyish-brown, wrinkled lengthwise, and marked at intervals with circular depressions left by decayed bases of aerial stems. Internally greyish-white to brownish. No odour; rather bitter taste.

Dose of the powdered drug. ½ to 2 grains.

Constituents. Not less than 0·4 per cent. of the belladonna alkaloids atropine, hyoscyamine, and hyoscine.

Therapeutics. Internal action the same as that of the leaves, but the preparations of the root are mostly intended for external use as local anodynes.

Preparations.		Per cent.
Liquid extract ..	¼–1 m.	0·75 alkaloid.
Plaster	No dose.	0·25 ,,
Liniment	No dose.	0·375 ,,
Suppository ..	No dose.	$\frac{1}{60}$ gr. alkaloid in each.

No. 11. Calumba. Calumba Root.

The dried root cut into flattish transverse slices, irregularly oval or circular in shape, from 1 to 2 in. in diameter, and up to ½ in. thick. Externally a thin layer of wrinkled greyish-brown cork adheres closely to a thick yellowish bark. The slices appear to be built up of concentric rings and are depressed towards the centre of each side, largely due to the shrinking of the softer central tissues on drying. Little odour; very bitter taste.

Dose of the powdered drug. 10 to 30 grains.

Constituents. Alkaloids and starch.

Therapeutics. Bitter tonic.

Preparations.

Fresh infusion ..	½–1 fl. oz.	5 per cent.
Concentrated infusion	30–60 m.	40 ,,
Tincture	30–60 m.	10 ,,

No. 12. Gentiana. Gentian Root.

The dried rhizome and roots in nearly cylindrical pieces of various lengths and up to about 1 in. in diameter; also seen in transverse slices. Externally yellowish-brown, wrinkled longitudinally, and marked with numerous fine encircling rings. Tough and flexible when moist; brittle when dry. Internally of a uniform reddish-yellow colour. Characteristic earthy odour; taste, at first sweetish, afterwards bitter.

Distinguished from belladonna by its colour and the fine ring-like markings.

Dose of the powdered root. 10 to 30 grains.

Constituents. Bitter principles.

Therapeutics. Bitter tonic without astringency.

Preparations.

Extract	2–8 grs.	—
Concentrated compound infusion ..	30–60 m.	10 per cent.
Fresh compound infusion	½–1 fl. oz.	1·25 ,,
Compound tincture	30–60 m.	10 ,,

No. 13. Glycyrrhiza. Liquorice Root.

The dried root and rhizome (underground stem), either unpeeled or with the outer bark removed.

Peeled. Cylindrical pieces from 4 to 8 in. long, of a uniform pale yellow colour. Porous and very fibrous.

Unpeeled. Differs in having a yellowish-brown to dark brown outer layer of bark, and is wrinkled lengthwise.

Faint earthy odour ; sweet taste.

Liquorice powder is directed to be made from the peeled root unless the unpeeled variety is specifically named.

Dose of the powdered root. 15 to 60 grains.

Constituents. Glycyrrhizin. Sugar. Starch.

Therapeutics. Demulcent. Laxative. Chiefly used to cover the taste of nauseous drugs.

Preparations.

Extract	10–30 grs.	—
Liquid extract ..	30–60 m.	—
Compound powder ..	60–120 grs.	16 per cent.

No. 14. Ipecacuanha. Ipecacuanha Root.

The dried root in somewhat twisted pieces from 1 to 4 in. long, and not more than $\frac{1}{4}$ in. thick. Dark brown externally and closely ringed—the ridges are rounded and completely encircle the root. Fracture short ; the broken surface shows a thick bark surrounding a narrow white woody centre. The active principles are all contained in the bark ; the centre wood is inert. Little odour ; bitter taste.

The root should contain not less than 2 per cent. alkaloids.

When powdered ipecacuanha root is prescribed the official Ipecacuanha Pulverata must be dispensed.

Constituents. Alkaloids chiefly emetine.

Therapeutics. Expectorant. Emetic. In combination with opium (Dover's powder) it has diaphoretic properties.

Preparations.

		Per cent.	
Liquid extract ..	$\frac{1}{2}$–2 m. and 10–30 m. emetic.	2	alkaloid.
Tincture	10–30 m. and $\frac{1}{2}$–1 fl. oz. emetic.	0·1	,,
Powder (standardised)	$\frac{1}{2}$– 2 grs and 15–30 grs. emetic.	2	,,
Powder with opium	5–10 grs.	10	opium.
Lozenge with morphine	No dose.	$\frac{1}{10}$ gr. each.	

Ipecacuanha Pulverata. Powdered Ipecacuanha.

A standardized powder for medicinal purposes. The root is finely powdered and adjusted to contain exactly 2 per cent. total alkaloids by the admixture of suitable proportions of lactose or of powdered ipecacuanha of known alkaloidal content.

Doses. ½ to 2 grains and 15 to 30 grains as an emetic.

No. 15. Ipomœa. Ipomœa Root, Mexican Scammony Root.

In irregular pieces of varying size, frequently cut into transverse slices up to 3 in. diameter and 1 in. thick. Externally greyish-black, furrowed, and deeply wrinkled ; internally greyish or brown. Very hard, tough, and fibrous. Transverse sections show an irregular concentric arrangement of woody fibres which project above the surface. Little odour ; acrid taste.

Dose of the powdered root. 5 to 20 grains.

Constituent. Scammony resin.

Therapeutics. Drastic cathartic.

Preparation. Only used as a source of Scammony resin.

No. 16. Jalapa. Jalap.

The dried tuberous root in oval or ovoid pieces up to 3 or 4 in. long ; the larger roots are frequently cut into pieces. Externally very dark brown, deeply furrowed, and marked with paler transverse scars. Internally pale yellowish or greyish-brown ; very hard, compact, and resinous. Characteristic odour, especially when powdered ; taste at first sweetish, afterwards acrid and disagreeable.

The root should contain not less than 9 per cent. of resin.

Constituent. Resin.

Therapeutics. Drastic cathartic ; acts only in the presence of bile.

Preparations.

		Per cent.
Powder (standardized)	5–20 grs.	10 resin.
Compound powder . .	10–60 grs.	30 jalap.

Jalapa Pulverata. Powdered Jalap.

Jalap in fine powder adjusted to contain 10 per cent. resin by admixture with lactose or another sample of jalap. This

powder is to be used for dispensing purposes whenever jalap powder is prescribed.

Dose. 5 to 20 grains.

No. 17. Krameria. Krameria Root, Rhatany Root.

The dried root of Peruvian rhatany, in nearly cylindrical pieces. Reddish-brown externally and covered with a scaly cork layer. The bark is about one-third the radius of the root in thickness and is somewhat easily separated from the pale reddish-brown central wood. No odour; astringent taste.

Dose of the powdered root. 10 to 30 grains.

Constituents. Krameria-tannic acid about 8 per cent. Krameria red.

Therapeutics. Astringent.

Preparations.

Dry extract	5–15 grs.	—
Lozenge	No dose.	1 gr. extract.
Lozenge with cocaine	No dose.	1 gr. extract and $\frac{1}{20}$ gr. cocain hyd. in each.
Tincture	30–60 m.	20 per cent.

No. 18. Senega. Senega Root.

The dried root in slender tapering pieces from 2 to 6 in. long, somewhat curved and twisted, and may have a distinct ridge or keel along the inner edge. Each piece of root is crowned with a knotty growth of decayed stem bases which are often of a purplish-pink colour. The root is yellowish-brown externally, and whitish within. Faint, characteristic odour; taste at first sweetish, afterwards bitter. Causes salivation when chewed.

Dose of the powdered root. 6 to 12 grains.

Constituents. Saponins, similar to Quillaia.

Therapeutics. Stimulating expectorant. Diaphoretic.

Preparations.

Liquid extract ..	5–15 m.	1 in 1.
Tincture	30–60 m.	20 per cent.
Fresh infusion ..	$\frac{1}{2}$–1 fl. oz.	5 ,,
Concentrated infusion	30–60 m.	40 ,,

The Rhizomes (Rhizome = underground stem)

Specimens	Botanical Source	Natural Order	Habitat
Filix Mas ..	Dryopteris Filix-mas.	Polypodiaceæ.	Gt. Britain.
Podophyllum Indicum.	Podophyllum emodi.	Berberidaceæ.	India.
Podophyllum ..	Podophyllum peltatum.	Berberidaceæ.	U.S.A., Canada.
Rheum	Rheum palmatum.	Polygonaceæ.	China, Thibet.
Serpentaria ..	Aristolochia reticulata.	Aristolochiaceæ.	U.S.A.
Valeriana ..	Valeriana officinalis.	Valerianaceæ.	Gt. Britain.
Zingiber	Zingiber officinalis.	Zingiberaceæ.	West Indies.

No. 19. Filix Mas. Male Fern. Aspidium.

The rhizome and leaf stalks, collected in late autumn, stripped of its roots, leaves, and dead portions, and carefully dried. Not to be used if more than 1 year old from date of collection. The rhizome is from 2 to 6 in. long, and entirely covered with the hard, dark brown bases of leaf stalks, which bear numerous light-coloured chaffy scales. Internally the rhizome is of a greenish colour. Faint, rather disagreeable odour ; taste at first sweetish, afterwards bitter and nauseous.

Dose of the powdered drug. 60 to 180 grains.

Constituent. Filicin.

Therapeutics. Anthelmintic for tapeworm, usually given in the form of the emulsified liquid extract, and followed by a dose of a purgative.

Preparation.

Extract .. .. 45–90 m. 25 per cent. Filicin.

No. 20. Podophyllum Indicum. Indian Podophyllum Rhizome.

The rhizome is irregularly cylindrical or flattened, yellowish-brown in colour, and very twisted and knotted. On the upper surface are three or four cup-shaped depressions, and on the under-surface are numerous stout roots or the scars of broken roots. The roots are mostly detached from the major part of the drug. Internally pale brown, hard and resinous. Little odour ; taste acrid and bitter.

Dose of the powdered rhizome. 2 to 10 grains.

Constituent. The official podophyllin resin.

Therapeutics. Cathartic. Liver stimulant.

No. 21. Podophyllum. Podophyllum Rhizoma. Mandrake.

The dried rhizome and roots ; rhizome straight, smooth, cylindrical, and reddish-brown in colour. At intervals of about 2 in. the rhizome is flattened and enlarged and often branched at these points ; each swollen portion bears a single circular depression above, and the white scars of broken roots below. The roots, usually detached from the rhizome, are cylindrical, brown, and brittle. Slight odour ; taste, bitter and acrid.

Dose of the powdered rhizome. 2 to 10 grains.

Constituent. The official podophyllin resin—a mixture of resins chief of which is podophyllotoxin.

Therapeutics. Cathartic. Liver stimulant.

Preparation. Resin. $\frac{1}{4}$–1 grain.

No. 22. Rheum. Rhei Rhizoma. Rhubarb.

The rhizome, deprived of most of its outer bark, and dried. Met with in commerce in rounded, conical, or barrel-shaped pieces known as Shensi or Canton rounds, or Turkey rhubarb. Also in flat transverse slices called English flats. Large pieces are often pierced with a hole made for stringing up the pieces whilst drying. The pieces are firm and compact, covered externally with a bright yellowish-brown powdery deposit. Fracture granular and uneven ; the freshly broken surface is greyish or pinkish-brown, and mottled with darker reddish-brown lines and star-like spots.

Characteristic, somewhat aromatic odour ; taste, bitter and rather astringent. Gritty when chewed due to the presence of cluster-crystals of calcium oxalate.

Dose of the powdered rhizome. 3 to 15 grains.

Constituents. Rhein. Emodin. Cathartic acid. Rheotannic acid.

Therapeutics. Valuable stomach tonic (small doses). Cathartic (larger doses).

Preparations.

Compound pill ..	4– 8 grs.	25 per cent.
Compound powder ..	10–60 grs.	25 ,,
Compound tincture ..	30–60 m.	10 ,,

No. 23. Serpentaria. Texan Snake Root.

Consists of the dried rhizome and roots, of a dull yellowish-brown colour. The rhizome is slender and twisted, with

remains of stems on the upper surface and numerous wiry, interlacing rootlets, 2 to 3 in. long, growing from the under-surface. Bunches of the roots are frequently detached from the rhizome. Strong, camphor-like odour ; bitter, aromatic taste.

Dose of the powdered rhizome. ¾ to 1½ grains.

Constituents. A bitter principle and tannin.

Therapeutics. Bitter tonic. Diaphoretic.

Preparation. Enters into the composition of compound tincture of cinchona.

No. 24. Valeriana. Valerian Rhizome.

The rhizome and roots, collected in autumn, and dried at a low temperature. Rhizome short and upright and of a yellowish-brown colour. Numerous slender roots from 3 to 4 in. long grow from the under surface. Whitish internally. Strong, unpleasant odour ; taste, camphoraceous and disagreeable.

Dose of the powdered rhizome. 5 to 15 grains.

Constituents. Volatile oil. Valerianic acid.

Therapeutics. Carminative. Antispasmodic in hysteria.

Preparation.

Ammoniated tincture	30–60 m.	20 per cent.

No. 25. Zingiber. Ginger.

The rhizome, scraped to remove the outer skin, and dried in the sun. Known commercially as unbleached Jamaica ginger. In flattened or rounded pieces from 2 to 4 in. long, buff coloured and striated externally. Irregularly lobed or branched ; the summit of each branch bears a single depressed scar. Fracture fibrous and uneven, with projecting thread-like fibres. Odour, agreeable and aromatic ; pungent taste.

Dose of the powdered drug. 5 to 15 grains.

Constituents. Gingerol. Volatile oil. Resin. Starch.

Therapeutics. Carminative. Antispasmodic. Aromatic stimulant.

Preparations.

		Per cent.	
Strong tincture ..	5–10 m.	50	
Weak tincture ..	30–60 m.	20	strong tinct.
Syrup	30–120 m.	5	,, ,,

The Leaves

Specimen	Botanical Source	Natural Order	Habitat
Belladonnæ Folium	Atropa Belladonna.	Solanaceæ.	Europe.
Buchu	Barosma betulina.	Rutaceæ.	Cape of Good Hope.
Digitalis Folium ..	Digitalis purpurea.	Scrophulariaceæ.	Gt. Britain.
Hamamelis ..	Hamamelis Virginiana.	Hamamelaceæ.	N. America.
Hyoscyamus ..	Hyoscyamus niger.	Solanaceæ.	Gt. Britain.
Sennæ Folium ..	Cassia acutifolia. Cassia angustfolia.	Leguminoseæ.	Egypt. India.
Stramonium ..	Datura Stramonium.	Solanaceæ.	Gt. Britain.

No. 26. Belladonnæ Folium. Belladonna Leaf. Deadly Nightshade Leaf.

The leaves of the deadly nightshade, collected when the plant is in flower, and dried. Leaves usually in pairs, each pair consisting of a larger and a smaller leaf. Occasional purple flowers present. Blade of the leaf from 3 to 6 in. long, ovate, margin entire, apex acute. Brownish on the upper surface, pale yellowish-green beneath. The leaves become brittle and fragile when dried.

Constituents. Not less than 0·3 per cent. of belladonna alkaloids, chiefly hyoscyamine and atropine.

Therapeutics. Narcotic. Mydriatic. Antispasmodic. Anhidrotic. Acts as a sedative, and relieves the spasm of asthma. Well tolerated by children, and successfully used in the treatment of infantile whooping cough and incontinence of urine.

Preparations.		Per cent.
Powder (standardized)	½–3 grs.	0·3 alkaloids.
Dry extract	¼–1 gr.	1 ,,
Tincture	5–30 m.	0·03 ,,

Belladonna Pulverata. Powdered Belladonna Leaf.

A standardized powder of the leaf adjusted to contain 0·3 per cent. of belladonna alkaloids by the admixture of powdered exhausted leaf. Must be stored in an air-tight container.

Dose. ½ to 3 grains.

No. 27. Buchu. Buchu Leaves.

The small dried leaves from ½ to ¾ in. long, bright yellowish-green upper surface, freely pitted with oil glands. Margin sharply serrated, especially towards the apex. Apex blunt and recurved. Strong, minty odour ; bitter taste.

Dose of the powdered leaf. 15 to 30 grains.

Constituents. Volatile oil and mucilage.

Therapeutics. Diuretic and antiseptic to the urinary organs.

Preparations.

Fresh infusion ..	1–2 fl. oz.	5 per cent.
Concentrated infusion	60–120 m.	40 ,,

No. 28. Digitalis Folium. Digitalis Leaf. Purple Foxglove.

The leaves, collected from plants beginning to flower, and carefully dried at a temperature between 55° and 60° C. as soon as possible after collection. Should be stored in containers which prevent access of moisture.

The leaves are from 4 to 12 in. long and 2 to 4 in. wide ; upper surface hairy, dull green and wrinkled. Lower surface greyish-green, covered with soft fine hairs, and marked with a close network of small veins. Margin of leaf wavy. The leaf stalk is winged on both sides and the lower veins are decurrent (run parallel with the midrib for some way). Faint odour ; very bitter taste.

Constituents. Several glycosides.

Therapeutics. Diuretic. Cardiac tonic. It acts upon the cardiac muscle, strengthens the muscular contractions and slows the pulse.

Preparations.

Powder (standardized)	½–1½ grs. repeated, 3–10 grs. single.
Tincture	5–15 m. repeated, and 30–90 m. single dose.
Fresh infusion ..	90–300 m. repeated, and 1–4 fl. oz. single dose.

Digitalis Pulverata. Powdered Digitalis.

A biologically standardized powder which must be used whenever powdered digitalis is prescribed. Its therapeutic activity is required to be 10 units per gramme. The powder must be stored in an air-tight container.

Doses. ½ to 1½ grains repeated, and 3 to 10 grains single dose.

No. 29. Hamamelis. Hamamelidis Leaves. Witch Hazel Leaves.

The dried leaves are from 4 to 6 in. long, broadly oval in shape and heart-shaped at the base. Dark brownish-green upper surface, pale green beneath, thin and papery in texture. Margin of the leaf wavy, apex acute. The main veins are prominent, and appear brown on the under surface, with a network of smaller veins between. Taste, astringent and rather bitter.

Constituents. Tannin. Volatile oil.

Therapeutics. Astringent. Hæmostatic.

Preparation.

Liquid extract ..	30–60 m.	1 in 1.

No. 30. Hyoscyamus. Hyoscyamus Leaf. Henbane.

The dried leaves and flowering tops of the plant which should be stored in a dry place. The leaves are up to 10 in. long, ovate in shape, and pale greyish-green in colour, and hairy. Margin irregularly toothed or wavy. Frequently mixed with compressed masses of yellow flowers having purple veins. Strong, peculiar odour ; bitter taste.

Dose of the powdered leaves. 3 to 6 grains.

Constituents. Not less than 0·05 per cent. of the alkaloids hyoscyamine, hyoscine, and atropine.

Therapeutics. Narcotic. Cardiac and cerebral sedative.

Preparations.

		Per cent.
Liquid extract ..	3–6 m.	0·05 alkaloids.
Dry extract	¼–1 gr.	0·3 ,,
Tincture	30–60 m.	0·005 ,,

also enters into the composition of Pil. colocynth. et hyoscyami.

No. 31. Sennæ Folium. Senna Leaf.

Two varieties of Senna leaves are official :

(1) Tinnevelly (Indian) Senna, and
(2) Alexandrian Senna.

The Indian variety are from 1 to 2 in. long and usually entire, the Alexandrian variety are from ½ to 1 in. long and usually much broken. The dried leaves of both varieties are pale greyish or yellowish-green, thin, and papery. Lanceolate (lance-shaped) in shape, margin entire, apex acute, unequal at the base. Veins prominent on the under surface. Faint tea-like odour ; bitter taste.

Dose of the powdered leaves. 10 to 30 grains.

Constituents. Certain anthraquinone derivatives.

Therapeutics. Cathartic.

Preparations.

Confection	60–120 grs.	10 per cent.
Compound powder of liquorice	60–120 grs.	

(Senna is the active ingredient of this.)

No. 32. Stramonium. Stramonium Leaf. Thornapple.

The dried leaves and flowering tops of the plant, which must be stored in a dry place. Leaves from 3 to 10 in. long, ovate and frequently uneven at the base, the leaf stalk being winged on one side only. Margin toothed or wavy; apex acute. Upper surface dark greyish-green, paler and minutely wrinkled beneath. Leaves become thin and brittle on drying, with pale yellowish veins and long twisted leaf stalks. Occasional white or purple flowers may be present. Strong, characteristic odour; bitter, unpleasant taste.

Dose of the powdered leaves. ½ to 3 grains.

Constituents. Not less than 0·25 per cent. alkaloids, hyoscyamine and atropine.

Therapeutics. Narcotic. Antispasmodic. A specific for asthma—the powdered leaves are smoked in the form of cigarettes.

Preparations.

		Per cent.
Liquid extract ..	½–3 m.	0·25 alkaloids.
Dry extract	¼–1 gr.	1 ,,
(Also special dose of 1–8 grs.)		
Tincture	5–30 m.	0·025 ,,

The Seeds

Specimen	Botanical Source	Natural Order	Habitat
Cardamomum ..	Elettaria Cardamomum.	Zingiberaceæ.	Ceylon, Malabar.
Colchici Semen ..	Colchicum autumnale.	Liliaceæ.	Gt. Britain.
Linum	Linum usitatissimum.	Linaceæ.	Gt. Britain.
Myristica	Myristica fragrans.	Myristicaceæ.	W. Indies. India.
Nux Vomica ..	Strychnos Nux-vomica.	Loganiaceæ.	India, Malay.
Strophanthus ..	Strophanthus Kombé.	Apocyanaceæ.	Africa.

No. 33. Cardamomum. Cardamoms. Cardamom Seeds.

Cardamoms are small, angular, reddish-brown seeds, about $\frac{1}{8}$ to $\frac{1}{6}$ in. long, and more or less covered with a thin membranous seed-coat. The seeds are contained in a tough yellowish-white capsule about $\frac{1}{2}$ in. long. The capsule is internally divided into three cells, each of which contains two closely packed rows of seeds. The seeds only are used in the official preparations, but are retained in the capsules until required for use in order to preserve their aromatic qualities. Odour and taste aromatic.

Dose of the powdered seeds. 10 to 30 grains.

Constituent. Volatile oil.

Therapeutics. Carminative. Antispasmodic.

Preparation.

Compound tincture	30–60 m.	1·4 per cent.

Also enters into several other B.P. preparations as a flavouring agent.

No. 34. Colchici Semen. Colchicum Seeds.

Tiny globular seeds, about $\frac{1}{10}$ in. diameter, minutely pitted, and of a dull reddish-brown colour. Very hard and tough, difficult to reduce to powder. Oily internally. No odour; taste acrid and bitter.

Dose of the powdered seeds. 2 to 5 grains.

Constituents. Not less than 0·3 per cent. of the alkaloid colchicine. Fixed oil.

Therapeutics. Diuretic. Purgative. Used to relieve the pain and swelling of gout.

Preparations.

		Per cent.
Tincture	5–15 m.	0·03 colchicine
Liquid extract ..	2–5 m.	0·3 ,,

No. 35. Linum. Linseed. Flax Seed.

Small, flattish, brown seeds, about $\frac{1}{4}$ in. long, pointed at one end and rounded the other. Smooth, glossy, and minutely pitted externally; yellowish-white and oily within. The seed coat contains mucilage and swells in water. No odour; oily taste.

Constituents. 20 to 50 per cent. fixed oil. Mucilage.

Therapeutics. Demulcent. Emollient. The oil, emulsified with an equal volume of lime water, constitutes Carron oil—a favourite application for burns.

Preparations.

Oil	$\frac{1}{2}$–1 fl. oz.	—
Crushed linseed.		

Linum Contusum. Crushed Linseed. Linseed Meal.

The seeds reduced to a coarse powder. Brownish-yellow, with readily visible particles of the brown seed-coat. Contains not less than 30 per cent. fixed oil. Used as a poultice for local inflammation.

No. 36. Myristica. Nutmeg.

The dried kernel of the seed, from which the shell has been removed. Oval or ovoid in shape, about 1 in. long, hard and compact. Externally greyish-brown, marked with minute black lines or points, and furrowed. Internally having a network of reddish-brown veins giving a mottled appearance. Odour, strong and aromatic ; taste, warm, spicy, and somewhat bitter.

Dose of the powdered seeds. 5 to 10 grains.

Constituent. Volatile oil.

Therapeutics. Carminative. Stomach tonic.

Preparation.

Oil	1 to 3 m.	—

No. 37. Nux Vomica. Strychni Semen. Poison Nut.

The dried ripe seeds ; nearly flat or concavo-convex, and about 1 in. in diameter. Almost circular and usually described as button-shaped. Ash-grey or greenish-grey in colour, and entirely covered with short, fine, silky hairs. Tough and horny within. No odour ; taste, bitter and persistent.

Constituents. Not less than 1·2 per cent. of the alkaloid strychnine also contains the alkaloid brucine.

Therapeutics. General tonic. Cardiac and spinal stimulant.

Preparations.

		Per cent.
Liquid extract ..	1–3 m.	1·5 strychnine
Dry extract	¼–1 gr.	5 ,,
Tincture	10–30 m.	0·125 ,,
Powder (standardized)	1–4 grs.	1·2 ,,

Nux Vomica Pulverata. Powdered Nux Vomica.

A standardized powder adjusted to contain 1·2 per cent. of strychnine either by the addition of lactose or another sample of the drug of known alkaloidal content. This powder must be dispensed whenever nux vomica is prescribed.

Dose. 1 to 4 grains.

No. 38. Strophanthus. Kombé Seeds.

The dried, ripe seeds, about ½ in. long and ⅙ in. broad, flattened and rounded at the base and pointed towards the apex. Light brown, greenish, or fawn coloured, the best quality being greenish-fawn and covered with short, fine, silky hairs. On one side is a ridge running from the centre to the apex. Internally, white and oily. Slight odour; bitter and persistent taste.

Constituent. Strophanthin—a bitter, poisonous, glycoside.
Therapeutics. Cardiac tonic.
Preparation. Tincture. 2–5 m.

The Fruits

Specimen	Botanical Source	Natural Order	Habitat
Anethum	Anethum graveolens.	Umbelliferæ.	S. Europe.
Capsicum ..	Capsicum minimum.	Solanaceæ.	Africa, S. India.
Carum	Carum Carvi.	Umbelliferæ.	Europe, Asia, U.S.A.
Cassia	Cassia Fistula.	Leguminosæ.	E. and W. Indies.
Colocynthis ..	Citrullus Colocynthis.	Cucurbitaceæ.	Spain, Smyrna.
Coriandrum ..	Coriandrum sativum.	Umbelliferæ.	S. Europe.
Fœniculum ..	Fœniculum vulgare.	Umbelliferæ.	S. Europe.
Sennæ Fructus ..	Cassia acutifolia.		Egypt.
	Cassia angustifolia.	Leguminosæ.	India.
Tamarindus ..	Tamarindus indica.	Leguminosæ.	India, Tropical Africa.

No. 39. Anethum. Dill Fruit.

The dried ripe fruits, about ⅙ in. long, usually separated into two halves (mericarps) and not attached to a stalk. Oval in shape; brown, with three paler ridges in the centre and surrounded with a pale yellow border. Odour and taste agreeably aromatic.

Constituent. Volatile oil.

Therapeutics. Carminative. Antispasmodic. Dill water is a favourite remedy for infantile colic.

Preparations.

Distilled dill water ..	½–1 fl. oz.	10 per cent.
Concentrated dill water	5–15 m.	2 per cent. oil.
Oil	1–3 m.	—

No. 40. Capsicum. Cayenne Pepper. Chillies.

The dried ripe fruits, from ½ to ¾ in. long, with a dull, orange-red, semi-transparent outer skin. Externally smooth, leathery, and somewhat shrivelled. Internally, divided into two cells, each containing from 10 to 20 small flat seeds. Taste extremely fiery and pungent.

Dose of the powdered fruits. ½ to 2 grains.

Constituent. Capsaicine.

Therapeutics. Powerful stimulant. Carminative. Rubefacient.

Preparations.

Tincture	.. ..	5–15 m.	5 per cent.
Ointment	.. ..	No dose.	25 ,,

No. 41. Carum. Caraway Seeds.

The dried ripe seed-like fruits, from ⅙ to ¼ in. long; either entire or separated into mericarps. Brown in colour, and marked with five yellow ridges. Slightly curved and tapering towards each end. Odour and taste aromatic.

Dose of the powdered fruits. 10 to 30 grains.

Constituent. Volatile oil.

Therapeutics. Carminative. Antispasmodic.

Preparation. Oil. 1–3 m.

No. 42. Cassia. Cassia Pulp.

The long cylindrical cassia pods are crushed, and the pulp is dissolved out by percolation with distilled water. The percolate is evaporated to the consistence of a soft paste.

Dose of the pulp. 60 to 120 grains.

Therapeutics. Mild laxative, and as such, enters into the composition of Confectio Sennæ.

No. 43. Colocynthis. Colocynth Pulp. Bitter Apple.

The dried pulp of the fruit, containing not more than 5 per cent. of the seeds. In white or pale yellowish-white spongy balls about 2 in. in diameter, or broken fragments of the same. Internally pale yellowish and divided into numerous cells containing flat, oval seeds. No odour; intensely bitter taste.

Dose of the powdered drug. 2 to 5 grains.

Therapeutics. Drastic cathartic—causes painful griping and watery motions and is best prescribed along with other less drastic cathartics and carminatives.

Preparations.

Compound extract ..	2–8 grs.	About 25 per cent.
Pill with hyoscyamus	4–8 grs.	12½ per cent.

No. 44. Coriandrum. Coriander Fruit.

Small globular fruits about $\frac{1}{6}$ in. in diameter. Yellowish-brown in colour, smooth, and marked with ribs or ridges. Little odour in the entire state, but strongly aromatic when crushed ; taste aromatic and spicy.

Dose of the powdered fruits. 5 to 15 grains.

Constituent. Volatile oil.

Therapeutics. Carminative. Antispasmodic. Its chief official use is as a flavouring agent for preparations of senna and rhubarb.

Preparation. Oil. 1–3 minims.

No. 45. Fœniculum. Fennel Fruit.

The dried ripe fruits from cultivated plants ; about $\frac{1}{3}$ in. long. Slightly curved, and beaked at one end where the stalk was attached. Yellowish or greenish-brown, with five prominent ridges on each mericarp. Aromatic odour ; sweet spicy taste resembling that of aniseed.

Dose of the powdered fruits. 5 to 10 grains.

Constituents. Volatile oil. Sugar.

Therapeutics. Carminative. Antispasmodic. Galactagogue. Enters into the composition of Compound liquorice powder.

No. 46. Sennæ Fructus. Senna Fruit. Senna Pods.

The flat ripe fruits of both species of senna.

Alexandrian Senna. About 2 in. long, nearly 1 in. broad, and roughly kidney-shaped. Rounded at both ends, pale green near the margin, dark brown in the centre. The containing pod is thin, brittle and papery in texture, and is marked with a number of parallel lines from margin to margin. Little odour ; bitter taste.

Tinnevelly Senna. The pods are smaller and have a more extensive dark brown area in the centre.

Dose of the powdered fruits. 10 to 30 grains.

Therapeutics. Cathartic—stimulates peristalsis in the large intestine.

Preparations.

Liquid extract ..	10–30 m.	1 in 1.
Syrup	30–120 m.	25 per cent. Liq. Ext.
Concentrated infusion	30–60 m.	—
Fresh infusion ..	½–2 fl. oz.	10 per cent.
Compound mixture	1–2 fl. oz.	—

No. 47. Tamarindus. Tamarinds.

The pulp of the fruits separated from the brittle outer shell and preserved with sugar. A reddish-brown, moist, sugary mass, containing coarse fibres and glossy seeds. Taste sweet and acid.

Constituents. Tartaric acid. Cream of tartar.

Therapeutics. Mild laxative. Only used as a constituent of Confectio Sennæ.

Evaporated Juices and Exudations

Specimen	Botanical Source	Natural Order	Habitat
Aloe	Various species of Aloe.	Liliaceæ.	West Indies, East Africa, Zanzibar.
Catechu	Uncaria gambier.	Rubiaceæ.	Singapore, Java, Sumatra.
Opium	Papaver Somniferum.	Papaveraceæ.	Asia Minor, India, Persia.

No. 48. Aloe. Aloes. Bitter Aloes.

Is the evaporated juice which flows from the transversely cut leaves of various varieties of aloe, and known commercially as (*a*) Cape, (*b*) Curaçao, (*c*) Socotrine, or (*d*) Zanzibar aloes.

Cape Aloes. Dark brown or greenish-brown, glassy masses.

Curaçao Aloes. Dark chocolate-brown opaque masses, with a dull, waxy fracture.

Socotrine Aloes. Hard, dark brown, opaque masses, with an uneven, porous fracture.

Zanzibar Aloes. Dark reddish-brown opaque masses, with a nearly smooth and slightly porous fracture.

Characteristic odour, especially noticeable on warming; bitter, nauseous taste.

Dose of the powdered drug. 2 to 5 grains.

Constituents. A yellow, bitter principle—aloin, and resins.

Therapeutics. Cathartic, producing its action in the lower portion of the large intestine. It only acts in the presence of bile, the flow of which it stimulates.

Preparations.

Pill	4–8 grs.	58 per cent.
Pill with asafetida ..	4–8 grs.	30 ,,
Pill with iron ..	4–8 grs.	20 ,,
Aloinum	¼–1 gr.	—

No. 49. Catechu. Pale Catechu. Gambir.

Catechu is an extract of the leaves and young shoots prepared by boiling with water and evaporating to dryness. In cubes about 1 in. square, dark reddish-brown externally, pale cinnamon-brown within. Brittle, porous and crumbly. No odour; taste at first bitter and astringent, afterwards sweetish.

Dose of the powdered drug. 5 to 15 grains.

Constituents. Tannins.

Therapeutics. Valuable astringent in diarrhœa and dysentery.

Preparation.

Tincture	30–60 m.	20 per cent.

No. 50. Opium.

Opium is the juice (latex) from the unripe capsules of the white poppy (Papaver Somniferum). Superficial incisions are made in the poppy heads and the exuded juice collected by scraping the capsule with a knife, and transferring the sticky mass to a large poppy leaf. When sufficient has been gathered for one package it is wrapped in several layers of the leaves and set aside for a few days to dry and harden. The capsules are only capable of yielding the drug for a matter of 5 to 10 days, and the whole of the collecting must be done in this period.

The juice is milky-white at first, but as it dries it becomes brown and plastic, and with long storing, hard and dark brown.

The drug is met with in rounded balls weighing from ½ to 2 lb., entirely covered with poppy leaves and usually with the fruits of various species of Rumex adhering to the mass. Strong, characteristic odour; bitter taste.

Constituents. Not less than 9·5 per cent. of morphine. Also codeine, narcotine, papaverine, thebaine, and about thirteen other alkaloids.

Therapeutics. Narcotic. Anodyne.

Preparations.		Per cent.
Powder (standardized)	½–3 grs.	10 morphine.
Dry extract	¼–1 gr.	20 ,,
Aromatic powder of chalk with opium.	10–60 grs.	2·5 opium.
Powder of ipecacuanha with opium ..	5–10 grs.	10 ,,
Lead suppository with opium	No dose.	1 gr. ,,
Tincture	5–30 m.	1 per cent. morphine.
Camphorated tincture	30–60 m.	0·05 per cent. morphine.

Opium Pulveratum. Powdered Opium.

Is opium, dried at a moderate temperature, powdered and adjusted to contain 10 per cent. morphine by addition of lactose. A light brown powder with the characteristic odour and taste of the drug.

Dose. ½ to 3 grains.

The Resins

Specimen	Botanical Source	Natural Order	Habitat.
Colophonium ..	Various species of Pinus.	Coniferæ.	America, France.
Podophylli Resina	Podophyllum emodi.	Berberidaceæ.	N. India.
	Podophyllum peltatum.		N. America.
Scammoniæ Resina	Ipomœa orizabensis.	Convolvulaceæ.	Mexico.

No. 51. Colophonium. Colophony. Resin.

Colophony is the residue remaining after the distillation of oil of turpentine from the crude oleo-resin. In solid, brittle masses, of a light amber colour. Translucent, and easily reduced to powder. Breaks with a glassy fracture. Insoluble in water ; soluble in alcohol, ether, and oils. Odour and taste faintly resembling turpentine.

Constituent. About 90 per cent. abietic acid.

Therapeutics. Chiefly used as a plaster basis. It has a local stimulating effect and mild antiseptic properties.

Preparation.

Plaster	No dose.	10 per cent.

No. 52. Podophylli Resina. Podophyllum Resin. Podophyllin.

A mixture of resins obtained from Podophyllum or Indian Podophyllum. A tincture is made from the powdered rhizome with alcohol, and after this has been evaporated to a low volume, the concentrated solution is poured into eight times its volume of distilled water. The insoluble resin separates out and is collected, washed, and dried.

An amorphous powder, varying in colour from pale yellow to yellowish-brown. It should be stored in well-closed containers, protected from light. Bitter, acrid taste.

Dose. $\frac{1}{4}$ to 1 grain.

Constituent. Podophyllotoxin.

Therapeutics. Hydragogue cathartic. Liver stimulant.

No. 53. Scammoniæ Resina. Scammony Resin. Ipomœa Resin.

A mixture of resins from Ipomœa prepared by a similar process to that described for Podophyllum resin. Brownish, translucent, brittle fragments, or pale brown powder. Agreeable odour ; acrid taste.

Dose. $\frac{1}{2}$ to 3 grains.

Therapeutics. Hydragogue cathartic.

The Balsams

Specimen	Botanical Source	Natural Order	Habitat.
Benzoinum ..	Styrax Benzoin.	Styraceæ.	Sumatra. Java.
Balsamum Peruvianum.	Myroxylon Pereiræ.	Leguminosæ.	San Salvador.
Balsamum Tolutanum	Myroxylon Toluifera.	Leguminosæ.	New Granada and Venezuela.
Styrax	Liquidambar orientalis.	Styraceæ.	Asia Minor.

No. 54. Benzoinum. Benzoin. Gum Benzoin.

A solid, resinous balsam, obtained after incision of the stem, and known in commerce as Sumatra benzoin.

Hard, brittle masses, consisting of irregular whitish tears, embedded in a brownish, translucent resin. Agreeable odour ; slightly acrid taste.

Dose. 10 to 30 grains.

Constituents. 30 to 60 per cent. balsamic acids—benzoic and cinnamic acids. Resin. Volatile oil.

Therapeutics. Antiseptic externally. Diuretic and expectorant internally. In the form of Friar's Balsam it is used in boiling water inhalers for laryngitis and catarrh.

Preparation.

Compound tincture	30–60 m.	10 per cent.

No. 55. Balsamum Peruvianum. Balsam of Peru.

A liquid balsam exuded from the trunk of the tree after the bark has been beaten, scorched, and removed at intervals. The gaps in the bark are filled with rags or other absorbent material which soaks up the balsam as it exudes. On boiling the rags with water, the insoluble balsam rises to the surface as a scum and is collected.

A dark brown or almost black viscid liquid, transparent in thin films. Insoluble in water, soluble in alcohol and chloroform. Aromatic odour ; acrid taste.

Dose. 5 to 15 minims.

Constituents. Benzoic and cinnamic acids. Volatile oil. Resin.

Therapeutics. Expectorant. Antiseptic and stimulant externally. An excellent healing application to broken chilblains and frost cracks.

No. 56. Balsamum Tolutanum. Balsam of Tolu.

An exudation from the trunk of the tree obtained after incision. A soft, plastic solid when first imported, becoming harder and darker with keeping. Dark brown and opaque in mass, transparent, and yellowish-brown in thin films. Almost insoluble in water ; soluble in alcohol. Fragrant odour ; agreeable taste.

Dose. 5 to 15 grains.

Constituents. Benzoic and cinnamic acids. Volatile oil. Resin.

Therapeutics. Expectorant.

Preparations.

Syrup	30–120 m.	2½ per cent.
Tincture	30–60 m.	10 ,,

No. 57. Styrax. Storax.

A thick, liquid balsam, obtained from the trunk of the tree, purified by dissolving in alcohol, filtering and evaporating off

the solvent. Dark brown in mass, transparent and yellowish-brown in thin films. Insoluble in water ; soluble in alcohol. Odour and taste pleasant and aromatic.

Dose. 10 to 30 grains.

Constituents. Not less than 30 per cent. of balsamic acids, chiefly cinnamic acid, also Styrol (volatile oil) and resin.

Therapeutics. Expectorant. Antiseptic.

Preparation. Enters into Compound tincture of benzoin.

The Oleo-Gum-Resins

Specimen	Botanical Source	Natural Order	Habitat
Asafœtida ..	Ferula fœtida and other species of Ferula.	Umbelliferæ.	Persia and Afghanistan.
Myrrha	Commiphora molmol.	Burseraceæ.	Arabia and Abyssinia.

No. 58. Asafœtida. Asafetida.

An oleo-gum-resin obtained by incision of the living root. The stems are cut down close to the root, and a milky juice exudes which rapidly sets to a plastic mass. Fresh slices are cut from the root as long as the juice continues to flow.

In rounded or flattened tears or in masses of a yellowish or reddish-brown colour. The freshly exposed surface is milky white or yellowish, but gradually darkens on exposure to air. Strong, characteristic, onion-like odour ; taste acrid, bitter, and nauseous.

Dose. 5 to 15 grains.

Constituents. Resin. Volatile oil. Gum.

Therapeutics. Antispasmodic. Stimulant. Used in hysteria.

Preparations.

Pill of aloes and asafetida	4–8 grs.	30 per cent.
Tincture	30–60 m.	20 ,,

No. 59. Myrrha. Myrrh.

A solid oleo-gum-resin obtained as a natural exudation. Occasionally in tears, more commonly in irregular masses of tears ; reddish-brown in colour, and more or less covered with a powdery deposit. Breaks with an uneven, resinous fracture,

showing a somewhat translucent interior of a rich brown colour. Almost insoluble in water; partially soluble in alcohol. Aromatic odour; taste bitter and aromatic.

Dose. 5 to 15 grains.

Constituents. Resin, volatile oil, and gum.

Therapeutics. Aromatic carminative and stimulant. Has slight antiseptic properties.

Preparation.

Tincture	30–60 m.	20 per cent.

The Gums

Specimen	Botanical Source	Natural Order	Habitat
Acacia	Acacia senegal and other species.	Leguminosæ.	Kordofan. N. Africa.
Tragacantha ..	Astragalus gummifer and other species.	Leguminosæ.	Asia Minor.

No. 60. Acacia. Gum Acacia. Gum Arabic.

A liquid exudation from the stems and branches which rapidly hardens into a brittle solid. It occurs in rounded tears of varying size, and ranges from colourless to yellowish or brownish according to age and quality. The pieces are opaque due to numerous minute cracks in the outer surface. Hard and brittle; the fractured surface is smooth and glassy. Insoluble in alcohol, but dissolves in water to form a thick mucilage. No odour; taste bland and mucilaginous.

Largely employed for emulsifying oils and resins, and as a suspending agent for insoluble powders in mixtures. It is also added to saline solutions to increase their viscosity.

Therapeutics. Demulcent.

Preparations.

Mucilage	60–240 m.	40 per cent.
Injection of sodium chloride and acacia	No dose.	6 ,,

No. 61. Tragacantha. Gum Tragacanth, known as Persian Tragacanth.

Tragacanth is a gummy exudation seen in thin, wavy, irregular, twisted flakes. White or yellowish-white in colour, and more or less folded. Hard and horny when dry, flexible

when moist. Marked with parallel wavy lines and ridges on the surface. Only sparingly and slowly soluble in water, but gradually absorbs water and swells into a homogeneous, adhesive mass. No odour ; almost tasteless.

Therapeutics. Demulcent. Suspending agent.

Preparations.

Mucilage	60–240 m.	1·25 per cent.
Compound powder ..	10–60 grs.	15 ,,

Bulbs and Corms

Specimen	Botanical Source	Natural Order	Habitat
Colchici Cormus	Colchicum autumnale.	Liliaceæ.	Gt. Britain.
Scilla	Urginea Scilla.	Liliaceæ.	Mediterranean countries.

No. 62. Colchici Cormus. Colchicum Corm. Meadow Saffron.

The fresh corms of meadow saffron collected in the early summer, or the same stripped of their outer and membranous coats, cut into transverse slices, and dried at a temperature not above 65° C.

The fresh corms are about 1½ in. long and 1 in. broad, somewhat conical, rounded on one side, flattened the other, with a small hollow near the base containing a bud. Covered with a thin, brown, outer coat. Internally whitish and solid. When cut a whitish opaque juice is yielded which has a disagreeable odour and bitter taste.

The dried slices are roughly kidney-shaped, and about ⅛ to ¼ in. thick. Yellowish at the edges, whitish and starchy within. No odour ; bitter taste.

Dose of the dried corm. 2 to 5 grains.

Constituents. Not less than 0·25 per cent. of the alkaloid colchicine.

Therapeutics. Diuretic. Purgative. Relieves the pain and swelling of gout.

Preparation.

Dry extract	¼–1 grain.	1 per cent. colchicine.

No. 63. Scilla. Squills.

The bulbs are divested of their several coats, cut into slices, and dried. In curved or flat strips of a yellowish-white

colour. Tough and flexible when moist, brittle and easily powdered when dry. The powder is hygroscopic (absorbs atmospheric moisture and becomes damp), and should be stored quite dry in a dessicated atmosphere (over lime). No odour ; taste bitter and disagreeable.

Dose of the powdered drug. 1 to 3 grains.

Constituents. A number of glycosides.

Therapeutics. Expectorant. Diuretic. Cardiac tonic resembling digitalis in action.

Preparations.

Vinegar	10–30 m.	10 per cent.
Oxymel	30–60 m.	5 ,,
Syrup	30–60 m.	4·5 ,,
Tincture	5–30 m.	10 ,,

The Stearoptenes

Specimen	Botanical Source	Natural Order	Habitat
Camphora ..	Cinnamomum Camphora.	Lauraceæ.	China, Formosa, Japan.
Eucalyptol ..	Eucalyptus and other volatile oils.	Myrtaceæ.	Australasia.
Menthol	Various species of Mentha.	Labiatæ.	China and Japan.
Thymol	Volatile oils of Thymus vulgaris, Monarda punctata, etc.	Labiatæ.	Europe, U.S.A.

No. 64. Camphora. Camphor.

Camphor is obtained from the wood of the cinnamon camphor tree. Chips of the wood are distilled in a current of steam and the vapours condensed. The camphor is separated by filtration or fractional distillation, and afterwards purified by sublimation.

Camphor occurs in colourless, transparent crystals or masses of such (Flowers of camphor), or in translucent blocks. It is volatile even at ordinary temperatures, and leaves no residue. Tough and difficult to powder unless a few drops of alcohol are added. Soluble in water (1 in 700) freely soluble in alcohol, ether, and chloroform. It forms an oily fluid when triturated in the dry state with other stearoptenes or with

phenol, chloral hydrate, and certain other substances. Strong, characteristic, persistent odour; taste pungent, rather bitter, and followed by a sensation of cold.

Solutions for injection are sterilized by heating in an autoclave, or by Tyndallization. Solutions for injection are usually made with olive oil.

Dosage. By mouth: 2 to 5 grains. By subcutaneous injection: 1 to 3 grains.

Therapeutics. Internally: Cardiac stimulant. Expectorant. Antispasmodic. Externally: Rubefacient. Mild antiseptic.

Preparations.

Water	½–1 fl. oz.	0·1 per cent.
Liniment	No dose.	20 ,,
Ammoniated liniment.	No dose.	12·5 ,,
Spirits	5–30 m.	10 ,,
Camphorated tincture of opium	30–60 m.	0·3 ,,

No. 65. Menthol.

A crystalline substance obtained by freezing Mint Oils and filtering out the crystals. In colourless, needle-shaped crystals, with the characteristic odour of peppermint. Entirely volatile, leaving no residue. Pungent odour with an after sensation of cold; taste warm followed by cold. Sparingly soluble in water, freely in alcohol, ether, and liquid paraffin.

Dose. ½ to 2 grains.

Therapeutics. Antiseptic. Local anæsthetic. A useful application for facial neuralgia in the form of menthol cones or plasters. Also used in inhalations for laryngitis and bronchitis.

No. 66. Thymol.

Occurs in large, colourless or yellowish, somewhat irregular crystals. Entirely volatile, leaving no residue. Soluble about 1 in 1,000 of water, freely soluble in alcohol. Odour resembling that of thyme. Taste pungent and aromatic.

Dosage. By mouth; ½ to 2 grains, and 15 to 30 grains in ankylostomiasis (hookworm).

Therapeutics. Antiseptic. Deodorant, Anthelmintic.

No. 67. Eucalyptol. Cineole.

The active principle of Eucalyptus, Cajuput, and certain other volatile oils. A colourless liquid with an aromatic camphoraceous odour, and pungent cooling taste. Insoluble in water ; freely soluble in alcohol and liquid paraffin.

Dosage. 1 to 3 minims.

Therapeutics. Antiseptic. Is less irritant than eucalyptus oil and therefore more suitable for nasal sprays.

Miscellaneous

Specimen	Botanical Source	Natural Order	Habitat
Amylum	Zea Mays.	Graminaceæ.	America. Africa.
Ergota	Claviceps purpurea.	Fungi and Graminaceæ.	Europe.
Quassia	Picræna excelsa.	Simarubaceæ.	Jamaica.
Lobelia	Lobelia inflata.	Campanulaceæ.	India. N. America.
Caryophyllum ..	Eugenia aromatica.	Myrtaceæ.	Molucca Isles.
Copaiba	Various species of Copaifera.	Leguminosæ.	Banks of the River Amazon.
Agar	Gelidum corneum.	Gelidiaceæ.	Japan and Far East.
Pix Liquida ..	Various species of Pinaceæ.	Coniferæ.	N. Europe. Asia.

No. 68. Amylum. Starch. Maize or Rice Starch.

A fine, white powder, or irregular angular masses, without odour or taste, prepared from the grains of maize or rice. It is insoluble in cold water, but when boiled with water a thick, opalescent jelly is formed. This starch jelly gives a deep blue coloration with iodine ; the colour disappears on heating and reappears again on cooling.

Constituents. The outer film consists of insoluble starch-cellulose, the inside of the grain being soluble starch-granulose.

Therapeutics. Demulcent. Used externally as an absorbent in weeping skin diseases.

Preparation.

Glycerin	No dose.	8·5 per cent.

No. 69. Ergota. Ergot of Rye.

Ergot is a fungus growth which attacks and finally replaces the grain of the rye. It should be thoroughly dried and kept in air-tight containers, and should not be used if more than one year old.

When first attacked a kind of fermentation takes place in the grain, and a sweetish yellow mucous exudes called "Honeydew of Rye." Afterwards the grain loses its starch, ceases to grow, and becomes violet-black in colour. The grains are ¾ to 1½ in. long, somewhat curved and tapering to each end. Furrowed longitudinally. Greyish-white or pinkish within. Odour and taste rancid and disagreeable.

Constituents. Should contain not less than 0·5 per cent. total alkaloids. The chief alkaloidal principles are ergometrine, ergotoxine, and ergotinine.

Therapeutics. Emmenagogue. Ecbolic.

Preparations.

		Per cent.
Prepared ergot ..	5–15 grs.	0·1 alkaloids
Liquid extract ..	10–20 m.	0·06 ,,

Ergota Præparata. Prepared Ergot.

Ergot which has been powdered and deprived of its fat. It contains 0·1 per cent. of Ergot alkaloids and must be stored in an air-tight container. This powder must be dispensed whenever Ergot or powdered ergot is prescribed.

Dose. 5 to 15 grains.

No. 70. Quassia. Quassia Wood. Quassia Chips.

The wood of the trunk and branches of a Jamaican tree. Pieces of the trunk and larger branches are exported in logs and, for medicinal purposes, are freed from the outer bark, cut into chips, and dried. In longitudinal sections the wood is hard and dense, but in transverse slices it is brittle, porous, and easily divided. The wood is of a pale yellowish-white colour throughout. No odour; taste extremely bitter and persistent.

Dose of the powdered drug. 2 to 8 grains.

Constituents. A crystalline, bitter principle, known as Quassin or Picrasmin.

Therapeutics. Bitter tonic. Infusion Quassia is used as an enema for threadworm.

Preparations.

Fresh infusion ..	½–1 fl. oz.	1 per cent.
Concentrated infusion	30–60 m.	8 ,,
Tincture	30–60 m.	10 ,,

No. 71. Lobelia. Indian Tobacco.

The dried flowering and fruiting tops of the plant. The stems are grooved or angular, often purplish in colour, and

hairy. The leaves are pale green, hairy, and irregularly toothed at the margin. The inflated fruits are two-celled capsules containing minute brown seeds. Slight, somewhat irritating odour ; taste acrid and pungent.

Dose of the powdered drug. 1 to 3 grains.

Constituent. Lobeline (liquid alkaloid).

Therapeutics. Expectorant. Emetic. Antispasmodic in asthma.

Preparation. . .

Ethereal tincture . .	5–15 m.	20 per cent.

No. 72. Caryophyllum. Cloves.

Cloves are the dried, unexpanded flower buds, a little more than ½ in. long. The buds are white when young, becoming green and then crimson during ripening, when they are collected. Each flower bud consists of a reddish-brown cylindrical calyx, surmounted by four angular calyx teeth ; these in turn support four lighter coloured unopened petals in the form of a rounded bud. When pressed with the finger nail a volatile oil exudes, of which cloves contain an usually large amount. Fragrant, spicy odour ; taste warm and aromatic.

Dose of the powdered drug. 2 to 5 grains.

Constituents. Volatile oil and tannins.

Therapeutics. Aromatic carminative and tonic. The oil is employed to relieve toothache.

Preparations.

Fresh infusion . .	½–1 fl. oz.	2½ per cent.
Concentrated infusion	30–60 m.	20 ,,
Oil	1–3 m.	—

No. 73. Copaiba. Balsam of Copaiba.

An oleo-resin obtained by incision of the trunks of various species of Copaifera. The oleo-resin collects in cavities in the trunk, and is collected by boring holes in the base of the tree. A viscous, yellowish or golden-brown, semi-transparent liquid. Insoluble in water, soluble in alcohol. Characteristic odour ; bitter, unpleasant taste.

Dose. 10 to 30 minims.

Constituents. Volatile oil. Resin.

Therapeutics. Stimulant to the bronchial and urinary mucous membranes. Administered in capsule form or as an emulsion.

No. 74. Agar. Agar-agar. Japanese Isinglass.

Agar is a dried gelatinous substance prepared from various seaweeds found on the coast of Japan and other far eastern countries. It occurs as slender, translucent strips, about 24 in. long, of a greyish-white colour, and with a somewhat crinkled surface. Also in flattened bands about a foot long and an inch wide, of a yellowish colour. When immersed in cold water, agar swells to a gelatinous mass but does not dissolve. Soluble when boiled with water (1 in 100), the solution cooling to a stiff jelly.

Dose. 60–240 grains.

Therapeutics. Passes unchanged through the stomach and intestines, but absorbs moisture and greatly increases in bulk. For this reason it is used in chronic constipation, promoting peristalsis and giving softened motions.

No. 75. Pix Liquida. Tar. Wood Tar. Stockholm Tar.

A thick, black, tarry liquid, obtained by the destructive distillation of pine woods. Partially soluble in water, entirely soluble in alcohol. Characteristic tarry odour and taste.

Dose. 2 to 10 grains.

Constituents. Tar is a variable mixture of phenols, cresols, creosote, acetic acid, etc.

Therapeutics. Expectorant. A stimulating application in chronic skin diseases, especially psoriasis and eczema.

Dose Table of the more important Crude Drugs

Drug	Dose	Repeated or Special Dose
Podophylli Resina	¼–1 gr.	
Digitalis Pulverata	½–1½ grs.	3–10 grs. single dose.
Belladonnæ Radix	½–2 grs.	
Capsicum	½–2 grs.	
Menthol	½–2 grs.	
Thymol	½–2 grs.	15–30 grs. anthelmintic.
Ipecacuanha Pulverata	½–2 grs.	15–30 grs. emetic.
Opium Pulverata	½–3 grs.	
Belladonna Pulverata	½–3 grs.	
Stramonium	½–3 grs.	
Scammoniæ Resina	½–3 grs.	
Serpentaria	¾–1½ grs.	
Quillaia	1–3 grs.	
Scilla	1–3 grs.	
Lobelia	1–3 grs.	
Nux Vomica Pulverata	1–4 grs.	

Dose Table of the more important Crude Drugs—*contd.*

Drug	Dose	Repeated or Special Dose
Aloe	2–5 grs.	
Colchici Semen		
Colocynthis		
Colchici Cormus		
Camphor	2–5 grs.	1–3 grs. subcutaneously.
Quassia	2–8 grs.	
Podophyllum	2–10 grs.	
Pix Liquida		
Hyoscyamus	3–6 grs.	
Rheum	3–15 grs.	
Myristica	5–10 grs.	
Cinchona	5–15 grs.	
Valeriana		
Zingiber		
Coriandrum		
Catechu		
Balsamum Tolutanum ..		
Asafœtida		
Myrrha		
Ergota Præparata		
Balsamum Peruvianum ..	5–15 m.	
Cinnamomum	5–20 grs.	
Jalapa Pulverata		
Senega	6–12 grs.	
Styrax	10–30 grs.	
Benzoinum		
Sennæ Fructus and Folium		
Calumba		
Gentiana		
Krameria		
Copaiba	10–30 m.	
Prunus Serotina	15–30 grs.	
Buchu		
Glycyrrhiza	15–60 grs.	
Cascara	20–60 grs.	
Cassia	60–120 grs.	
Filix Mas	60–180 grs.	
Agar	60–240 grs.	

List of Therapeutic Terms

Absorbents. These are substances like **starch,** which absorb irritant or inflammatory secretions on the surface of the skin, or like medicinal **charcoal** which is given internally to absorb gases which collect in the bowel.

Acids. Concentrated acids are only used externally on rare occasions as powerful caustics. The dilute acids, when administered internally, at once neutralize free alkalis in the stomach, and afterwards check the natural acid

secretions. Examples are dilute Nitric, Hydrochloric, and Sulphuric Acids.

Note. Dilute Hydrocyanic Acid (a powerful sedative) does not come under this heading.

Alkalis or **Antacids.** The **carbonates, bicarbonates,** and **hydroxides** are direct alkalis and immediately counteract acidity of the stomach when given internally. Other salts, such as **citrates** and **acetates,** may be changed in the tissues into carbonates, and alkalize the blood and urine.

Alteratives. These substances gradually change and correct abnormal conditions of the organs without demonstrating in what way the curative effect is obtained. They are the survivors of the old therapeutic class of "**specifics,**" and the group is rapidly diminishing in number as modern research reveals their true action. Examples are **mercury, arsenic,** and **iodine.**

Anaphrodisiacs. Drugs which weaken sexual function—**camphor** and **bromides**.

Aphrodisiacs. These stimulate the sexual functions—**cantharidis, strychnine, phosphorus.**

Anæsthetics. There are three types—**local, general,** and **spinal.**

Local Anæsthetics are drugs like **cocaine, phenol, ethyl chloride,** etc., which, when applied directly to the part, cause loss of sensation locally by their action on the sensory nerve endings.

General Anæsthetics are gases or highly volatile liquids such as **ethylene** and **nitrous oxide** (gases), **ether** and **chloroform** (liquids). When inhaled they cause unconsciousness and total loss of sensation by action on the brain and spinal centres. General anæsthesia may also be induced by the oral, hypodermic, or intravenous injection of certain drugs.

Spinal (**intrathecal**) **Anæsthetics** are substances like **stovaine** which, when injected into the spinal canal, act upon the spinal cord and cause loss of sensation below the line of injection.

Analgesics. Drugs which relieve nerve pain without causing unconsciousness, by action on the brain. Examples are **aspirin, phenacetin,** and **phenazone.**

Anodynes. These applied externally relieve pain by action on the sensory nerve endings, *e.g.* **Liniment of Belladonna.**

Anhidrotics. Drugs which check profuse perspiration—**quinine, belladonna.**

Anthelmintics. Remedies which destroy worms or expel them from the intestines.

There are three divisions of this class of drug :

Vermicides actually kill the worm. Examples are **filix mas** (tapeworm), **santonin** (roundworm), and **thymol** (hookworm).

Vermifuges, usually powerful purgatives, which expel the worm by reason of their irritant action on the walls of the intestines. **Jalap** and **scammony** are examples.

Indirect Anthelmintics as **quassia** and **perchloride of iron** which act by removing the mucous in which the worm lives.

Antiparasitics. Drugs which destroy minute parasites which exist on or just below the surface of the skin. **Chrysarobin** and **sulphur** are examples.

Antiperiodics. These are given in recurring fevers like ague ; they act by destroying the toxin of the disease. Examples—**quinine, arsenic.**

Antipyretics. Remedies which lower the body temperature in fevered conditions. **Quinine, aspirin,** and **sodium salicylate** are examples.

Antiseptics. These prevent decay and putrefaction by arresting the growth and multiplication of germs of disease. Such substances are **boric acid, mercuric oxycyanide,** etc.

They differ in degree with

Disinfectants. These are powerful chemicals capable of killing disease germs. Antiseptics only form a medium in which germ life cannot develop, but the latter group destroy germs already present. Disinfectants are more correctly known as **germicides** and are represented by **corrosive sublimate, phenol, chloramine, potassium permanganate,** etc.

Astringents. These remedies contract the smaller blood-vessels and are employed to check bleeding by local application—**alum.** Internally they are given to check secretions and discharges, as in some forms of diarrhœa and dysentery. Astringents also cause gelatin and albumin to be precipitated on mucous surfaces and form protective coverings, hence their use in sore throat. Examples of such drugs are **tannic acid, perchloride of iron.**

Antispasmodics. Stimulants for the muscular lining of the stomach and intestines and to relieve painful spasm,

e.g. **asafœtida, valerian**. Such drugs are also known as **carminatives** which also stimulate the stomach and bowel and assist the expulsion of gases—**ginger, various volatile oils.**

A more specific group of antispasmodics are those drugs which relieve spasm of the bronchial muscle, examples are **lobelia, belladonna,** and **ephedrine.**

Antisialics. These check the secretions of the salivary glands—**atropine.**

Cathartics. Medicines which speed up or increase evacuation of the bowels. They are subdivided into groups according to the intensity of their action.

Aperients or Laxatives slightly increase peristaltic action and produce softened motions, as **figs, prunes, olive oil,** etc.

Cathartics or Simple Purgatives cause a much stronger peristaltic action and also increase the intestinal secretions—**senna, aloes, rhubarb,** etc.

Drastic or Hydragogue Cathartics have a local irritant action upon the intestines, cause the free flow of intestinal fluids, producing painful griping and loose watery motions. Examples are **Colocynth** and **scammony.**

Saline Purgatives are a sub-group of the Drastic Purgative class but they act in a different manner. **Magnesium** and **sodium sulphates** and **phosphates** belong to this class ; they are not absorbed but attract fluid from the intestinal wall and thus cause watery motions.

Cholagogue Cathartics owe their purgative properties to stimulation of the liver and increasing the flow of bile. They frequently cause greenish motions. Examples are **calomel** and **podophyllum.**

Counter Irritants. External remedies which stimulate the part to which they are applied causing irritation or some degree of inflammation. The sub-groups differ only in intensity of action, thus **Rubefacients** dilate the superficial blood vessels, cause a flow of blood from deeper parts towards the surface and produce local warmth and redness. **Capsicum, camphor** and **turpentine** are examples of rubefacients.

Vesicants or **Epispastics** produce local inflammation ending in the formation of a blister—**cantharidin, croton oil,** etc.

Demulcents. Thick oily or mucilaginous liquids which are used to form a protective covering to inflamed mucous

surfaces. They have a special use in the treatment of corrosive and irritant poisoning. **Glycerin, olive oil** are examples.

Diaphoretics or **Sudorifics.** Medicines which induce sweating by action on the nerves controlling the sweat glands, or by causing dilation of the surface capillaries. Indirectly they lower the temperature of the body. Examples are **pilocarpine, antimony,** and **spirits of nitrous ether.**

Diuretics. These increase the volume of urine secreted—**squills, buchu,** and **potassium citrate.**

Ecbolics. These promote powerful contraction of the uterus and assist in expelling its contents. In small doses they act as Emmenagogues. *E.g.* **pituitary, ergot.**

Emmenagogues. These have a stimulating action on the uterus and relieve disordered or suppressed menstruation —**aloes, iron compounds, myrrh, quinine.**

Emetics. Drugs which cause vomiting. **Apomorphine,** by injection, acts upon the vomiting centre and is both rapid and certain. Other emetics like **ipecacuanha** and **zinc sulphate** excite the muscular lining of the stomach and, consequently, are much slower and less certain in action.

Emollients. Substances used externally to soften and relax the tissues and to soothe the parts to which they are applied. Examples—**glycerin, lanolin.**

Expectorants. These promote the secretion of bronchial mucous and aid its expulsion. *E.g.* **tolu, squills, senega, ipecacuanha.**

Galactagogues. These increase the secretion of the mammary glands—**fennel.**

Hæmatinics. These increase the number of and restore vitality to the red blood corpuscles, thus acting as blood tonics. Examples are **iron preparations, liver extract, calcium chloride.**

Hæmostatics. These are administered by mouth or injection to check internal hæmorrhage—**adrenaline, calcium salts.**

Hypnotics. These lessen the activity of the brain cells and induce sleep without causing previous excitement—**veronal, chloral hydrate, sulphonal, luminal, paraldehyde.** They are also known as **soporifics.**

Mydriatics. These dilate the pupils of the eyes—**atropine** and **cocaine.**

Myotics. These contract the pupils and reduce ocular tension—**pilocarpine** and **physostigmine.**

Narcotics. These produce sleep by action on the cerebrum. A stage of excitement precedes sleep, and this serves to distinguish this group from the hypnotics. **Morphine** and **alcohol** are narcotics.

Refrigerants. These allay thirst and tend to reduce body temperature in fevered conditions, *e.g.* **citric** and **tartaric acids.**

Resolvents. These cause the absorption of inflammatory swellings by stimulating the lymphatics, *e.g.* **iodine, potassium iodide.**

Sedatives or **Depressants.** Medicines which exert a soothing or depressant action on some particular organ.

Respiratory Sedatives, which include **chloroform, hydrocyanic acid** and **morphine.**

Nerve Sedatives as **bromides** and **phenylbarbitone.**

Gastric Sedatives as **bismuth salts, chloroform,** and **hydrocyanic acid.**

Cardiac Sedatives as **aconite** and **pilocarpine.**

Sialogogues. Stimulants for the salivary glands and to increase the flow of saliva, *e.g.* **pilocarpine.**

Sternutatories. Irritants for the nasal mucous membrane and to excite sneezing—**snuff, ipecacuanha powder.**

Stimulants. These are the opposite to sedatives or depressants ; drugs of this group usually have a specific action upon some particular organ.

Respiratory stimulants include **strychnine, caffeine** and **atropine.**

Nerve Stimulants as **strychnine** and **caffeine.**

Cardiac Stimulants as **strophanthin** and **digitalis.**

Stimulants are also known as tonics ; the class of drugs called **bitter tonics** act by toning up the stomach nerves, improve digestion, and create appetite. **Quassia, calumba,** and **gentian** are included in this group.

Styptics. These are really external astringents and arrest bleeding by coagulating the blood or by contracting the blood vessels, *e.g.* **tannic acid, alum, lead acetate.**

Vaso-dilators. Drugs causing dilatation of the blood vessels and thereby reducing blood pressure. Examples are **amyl nitrite** and **erythrol tetranitrate.**

Vaso-constrictors. These constrict the vessels and cause a rise in blood pressure—**adrenaline, ephedrine, pituitary.**

The Neutral Principles

These are either glucosides or similar bodies which possess neither acid nor alkaline properties and do not form salts.

Substance	Dose	Properties and Remarks
Strophanthinum ..	$\frac{1}{240}$–$\frac{1}{60}$ grain by intramuscular or intravenous injection.	A mixture of glycosides from strophanthus seeds. A white or yellowish-white powder containing minute crystalline particles. Moderately soluble in water and alcohol. The solution, prepared by aseptic methods, is to be used within 24 hours of making. Powerful cardiac stimulant and diuretic.
Aloinum	$\frac{1}{4}$–1 gr.	A mixture of crystalline principles from aloes, consisting mainly of barbaloin and isobarbaloin. A yellow, minutely crystalline powder, having the faint odour of aloes and a very bitter taste. Usually administered in pill or tablet form as a cathartic.
Santoninum	1–3 grs.	Colourless, flat, shining crystals gradually becoming lemon-yellow on exposure to light. No odour; faintly bitter taste. Almost insoluble in water, more readily soluble in organic solvents. Administered in powder or tablet form as an anthelmintic for round and thread worm. Should be given for three consecutive nights and followed by a purgative each morning. Overdoses, and sometimes medicinal doses, cause a disturbance of colour sense, all objects appearing yellow or green, and occasionally all sense of colour is temporarily lost.
Salicinum	5–15 grs.	A glucoside in colourless crystals or white crystalline powder. No odour; bitter taste. Soluble 1 in 28 of water. Antipyretic and antirheumatic, also used in the treatment of influenza. Administered in mixture form, powders or cachets.

Elements of the B.P.

Element	Dose	Properties and Remarks
Ferrum	No dose.	Metallic iron in the form of fine bright wire of 0·1 millimetre diameter. It is used for making the three B.P. syrups of iron, and is a tonic and hæmatinic.
Iodum	No dose.	Made from the ashes of sea-weeds or by distilling native iodides and iodates with manganese dioxide and concentrated sulphuric acid, and purified by resublimation. Occurs in heavy, violet-black lustrous scales of a metallic appearance. It is volatile at ordinary temperatures, and on being heated is converted into a violet vapour. Peculiar characteristic odour. Sparingly soluble in water, more readily in alcohol, and freely soluble in aqueous solutions of potassium iodide. When added to starch solution a deep blue colour is imparted which disappears on heating and reappears on cooling. *Externally*. Antiseptic Antiparasitic. Counter-irritant. A 2 to 5 per cent. solution in alcohol is used to sterilize the skin before operations. *Internally*. Simple solutions administered in milk for chronic rheumatism and rheumatoid arthritis. Also given to check vomiting.
Hydrargyrum ..	½–3 grs. by mouth, ½–1 gr. by intramuscular injection.	Quicksilver. A shining, silvery, liquid metal, obtained by the dry distillation of Cinnabar (mercuric sulphide). About 13½ times heavier than water. It may be reduced to a fine state of subdivision by triturating it with chalk or grease. Insoluble in water and alcohol. *Externally*. Antiparasitic. Stimulant in chronic inflammatory conditions and glandular enlargements. *Internally*. Purgative and intestinal antiseptic in the form of the official pill or grey powder. Also used orally and by intramuscular injection for syphilis.

Elements of the B.P.—*continued*

Element	Dose	Properties and Remarks
Bismuthum Præcipitatum	1½–3 grs. by intramuscular injection.	A dull grey powder containing not less than 98½ per cent. of metallic bismuth. Insoluble in, but readily diffuses in water. Administered in the form of the official injection for syphilis.
Ferrum Redactum ..	1–10 grs.	Reduced Iron. Obtained by heating ferric oxide in a stream of hydrogen gas. Contains not less than 80 per cent. metallic iron together with a variable amount of oxide. A fine, greyish-black powder, free from metallic lustre and from gritty particles. Given in pills, lozenge, or cachet form as a tonic and hæmatinic.
Sulphur Præcipitatum	15–60 grs.	Milk of Sulphur. A soft, pale greyish-yellow or greenish-yellow, amorphous powder. Insoluble in water and alcohol; almost completely soluble in carbon bisulphide. *Externally*. Antiparasitic (especially in scabies). *Internally*. Laxative. Alterative in chronic skin diseases and rheumatism.
Sulphur Sublimatum	15–60 grs.	Flowers of Sulphur. Prepared from native rock sulphur by a process of sublimation. A fine, yellow, slightly gritty powder. Slight, characteristic odour; little taste. Only soluble in carbon bisulphide. Action similar to that of milk of sulphur.

Animal Products

A list of miscellaneous drugs and fine products derived from animal sources.

Substance	Dose	Properties and Remarks
Thyroxinsodium ..	$\frac{1}{640}$–$\frac{1}{64}$ gr.	Thyroxine-sodium. The sodium salt of thyroxin, the active principle of the thyroid gland. It contains 61·65 per cent. of iodine. A white, sparingly soluble, crystalline powder. Administered by injection in thyroid-deficiency conditions such as cretinism and myxœdema. Solutions must be used within 24 hours.
Adrenalina	$\frac{1}{600}$–$\frac{1}{120}$ gr. by injection.	Epinephrine. An active principle from the suprarenal glands of animals, or prepared synthetically. Should be kept dry and stored in dark-coloured containers to protect from light. A white, or light buff, finely crystalline powder. Dissolves in dilute mineral acid solutions to form salts. Slightly bitter taste and causes temporary numbness to the tongue. Vaso-constrictor. Hæmostatic. Relieves the spasm of asthma. Added in small amount to solutions intended for injection as local anæsthetics it prevents diffusion of the drug and localizes the action.
Thyroideum	½–5 grs.	Thyroid. Thyroid Extract. A powder prepared from the fresh, healthy glands of the ox, sheep, or pig. It occurs as a cream-coloured, amorphous powder, with a faint meat-like odour and taste. It contains iodine in combination as thyroxine. Used with success in treatment of young children who are making little or no physical or mental progress, and in cretinism (dwarf growth associated with idiocy), caused by hereditary absence or malformation of the glands.

Animal Products—*continued*

Substance	Dose	Properties and Remarks
Pancreatinum ..	3–10 grs.	Pancreatin. An amorphous powder prepared from the fresh pancreas of certain animals. It contains the enzymes trypsin lipase, and amylase. A white or buff-coloured hygroscopic powder, having a meaty odour. Soluble in water. Administered 2 to 3 hours after meals as an aid to starch and protein digestion. For invalids with weak digestion, beef tea and milk foods are "pre-digested" by adding some form of pancreatin.
Pepsinum	5–10 grs.	Pepsin. An enzyme obtained from the stomach mucous membrane of certain animals, chiefly the pig, sheep, or calf. A colourless or light buff-coloured powder or scales; faint meat-like odour, taste slightly acid or salty. One grain will dissolve not less than 2,500 grains of coagulated white of egg. Administered in pills and tablets, or in solution, half an hour after meals as an aid to the digestion of proteins. It only acts in an acid medium and it is inactivated by alkalis.
Insulinum	5–100 units by subcutaneous injection.	Insulin is a biologically standardized preparation containing the specific anti-diabetic principle of the animal pancreas. It is officially prepared in two forms, solution and tablet. **Insulin Solution** is a solution of the dry powder in acidulated water, and contains added antiseptic equal to 0·5 per cent. phenol. It should be kept at as low a temperature as possible above its freezing-point and should not be exposed to temperatures exceeding 20° C. Under these conditions it will retain its potency for

Substance	Dose	Properties and Remarks
Insulinum—*continued*		at least 18 months from the date of manufacture. The label on each container must state the number of units per millilitre. **Insulin in Tablet Form** is made by mixing the dry powder with lactose and compressing into tablets. The tablets must be sterile and be packed into sterile containers. They readily and completely dissolve in water for injection purposes. The number of units per tablet must be stated on the label. Insulin has no action when taken by mouth, but when injected it keeps the blood sugar within normal limits in persons suffering from diabetes mellitus. Insulin solution containing 20 units per millilitre will always be dispensed unless a solution of some other strength, or the tablet form is specifically prescribed.
Cantharidinum ..	No dose.	The active principle of various species of Cantharis (Spanish Fly) and Mylabris. In colourless, glistening crystals. Almost insoluble in water, slightly soluble in alcohol, more readily soluble in chloroform and acetone. A 0·1 per cent. solution causes blistering when retained in contact with the skin. *Externally*. Rubefacient and vesicant. Rarely used internally as it is very toxic and gives rise to severe symptoms of gastro-intestinal irritation.
Coccus	No dose.	Cochineal. Is the dried female coccus insect, containing eggs and larvæ. The insects, at certain periods of the year, infest a type of cactus plant. After fecundation they increase in size and develop the red colouring matter. They are brushed off the

Animal Products—*continued*

Substance	Dose	Properties and Remarks
Coccus—*continued*		leaves, killed by exposure to steam sprays or sulphur fumes, and dried in the sun. Of the two commercial varieties black grain and silver grain, the former are killed by heat which destroys the silvery waxy coating, and the latter variety by sulphur fumes. The insects are purplish-black in colour, about $\frac{1}{8}$ in. long, irregularly oval in shape, and transversely wrinkled. They contain about 10 per cent. carminic acid and are only employed as a colouring agent.
Gelatinum	No dose.	Gelatin. Obtained by the action of boiling water on animal tissues, such as skin, tendons, ligaments, and bones, and drying the evaporated solution in air. In transparent sheets or shreds, either colourless or pale yellowish. Little odour and taste. Does not dissolve in cold water, but gradually swells and softens when immersed in water and absorbs from 5 to 10 times its weight of the liquid. If the mixture is heated, the gelatin dissolves, forming a thick liquid which sets to a jelly on cooling. Insoluble in alcohol. A 1 per cent. or 2 per cent. solution in normal saline has been injected as a hæmostatic. Largely used as a basis for capsules, pastilles, and lamellæ.
Adeps	No dose.	Purified Lard. The purified internal fat of the pig. A soft, white, greasy substance, used as an ointment base.
Adeps Benzoinatus ..	No dose.	Benzoinated Lard. Plain lard is melted, 3 per cent of powdered benzoin added and digested for one hour at 60° C., strained, and allowed to cool.

Substance	Dose	Properties and Remarks
Adeps Benzoinatus—*continued*		The benzoic acid dissolved out of the benzoin acts as a preservative and lessens the tendency towards rancidity. Ointment base.
Adeps Lanæ ..	No dose.	Wool Fat. The purified wax of sheep's wool deprived of water. A pale yellow, sticky, greasy substance, with a faint characteristic odour. It is one of the most absorbent of ointment bases, and can take up almost its own weight of water. Emollient.
Adeps Lanæ Hydrosus	No dose.	Lanolin. Hydrous Wool Fat. Is Adeps Lanæ with 30 per cent. of water. Similar in appearance and properties to wool fat, but is softer and not so sticky. Emollient and ointment base.
Cera Flava	No dose.	Yellow Beeswax. Prepared from the honeycombs of the hive bee, after removal of the honey. The wax is separated by melting the combs in boiling water, straining, and pouring into moulds. A firm, yellowish-brown solid, with a granular but not crystalline fracture. Agreeable, honey-like odour. Insoluble in water, soluble in ether, chloroform, and oils. Used as a hardening agent for plasters and ointments.
Cera Alba	No dose.	White Beeswax. Prepared by bleaching the yellow wax. Thin layers of wax are exposed to the bleaching action of air, moisture and sunlight. When the surface loses its colour, it is re-shredded, and the process repeated until the wax is white. It can also be bleached by chemicals. Met with in flat, circular discs weighing about 1 oz. each. A hardening agent for ointments and suppositories.

Animal Products—*continued*

Substance	Dose	Properties and Remarks
Sevum	No dose.	Suet. The internal abdominal fat of the sheep. A firm, white, greasy solid; almost without odour, and having a bland, fatty taste. Gives firmness to mercury ointment, and in India and the East is used as a substitute for lard in order to give a firmer product.

The Paraffins

The official paraffins are mixtures of hydrocarbons; that is, they contain the elements carbon and hydrogen only.

Petroleum wells and springs are to be found in many parts of the world, and from these a complex mixture of paraffins is obtained. The crude product is subjected to many refining processes of fractional distillation and bleaching. The B.P. paraffins are not single compounds, each contains a number of compounds in intimate mixture or solution. For example, liquid paraffin is a mixture of various liquid hydrocarbons ranging from $C_{16}H_{34}$ to $C_{21}H_{44}$. The liquid varieties of paraffin are termed " Mineral oils " on account of their greasy nature, but they differ materially from both fixed and volatile oils.

Paraffins are very stable substances and are not subject to rancidity or oxidation, a property which renders them very suitable for use as ointment bases.

Paraffin	Dose	Properties and Remarks
Paraffinum Liquidum	½–1 fl. oz.	Liquid Paraffin. Medicinal Paraffin. A mixture of liquid hydrocarbons occurring as a thick, colourless, transparent, oily fluid. No odour or taste. Insoluble in water and alcohol, but is itself an excellent solvent of many organic substances. Administered alone or as an emulsion as an internal lubricant. Also employed as a vehicle for insoluble salts for intramuscular injection, and as a basis for nose and throat sprays.

Paraffin	Dose	Properties and Remarks
Paraffinum Durum ..	No dose.	Hard Paraffin. Paraffin Wax. A mixture of solid hydrocarbons. A colourless or white translucent solid of crystalline structure. No odour or taste. Employed as an ointment base, also as a protective application to burns.
Paraffinum Molle Album.	No dose.	White Soft Paraffin. White Vaseline. A soft, white, greasy substance, without odour or taste. A non-absorbent ointment base employed for many white ointments. As it is bleached by powerful chemicals, which may not be entirely removed during refining, it should not be used for eye ointments.
Paraffinum Molle Flavum.	No dose.	Yellow Soft Paraffin. Yellow Vaseline. Petroleum Jelly. A soft, yellow, greasy solid. Practically free from odour and taste. A non-irritant and non-absorbent ointment base. Can be sterilized by heating at 150° C. for one hour.

The Soaps

A soap is the compound which results from the interaction between certain caustic alkalis and animal fats or vegetable oils. The soap is usually made by boiling the fat or oil with a solution of the alkali and " salting out " the resulting soap ; glycerin is also produced at the same time. When Sodium Hydroxide is the alkali used, a " hard " soap is formed ; if Potassium Hydroxide is employed, the result is a " soft " soap. None of the official soaps have any dosage although hard soap is sometimes given internally as a laxative or to increase the activity of other purgatives.

Soap	Properties and Remarks
Sapo Animalis ..	Curd Soap. A sodium soap prepared from animal fats. A yellowish or greyish-white solid, almost free from odour. Easily reduced to powder when dried. Sparingly soluble in cold water, soluble in hot water and alcohol. A useful pill excipient for resins and volatile oils.

The Soaps—*continued*

Soap	Properties and Remarks
Sapo Durus	Hard Soap. A sodium soap prepared from olive oil. A greyish-white to greenish-white solid ; almost odourless. Readily powdered when dried. Soluble in water and alcohol. A constituent of many cathartic pills, the activity of which it increases. Good excipient for resins and volatile oils, also employed as a plaster base.
Sapo Mollis	Soft Soap. A potassium soap prepared from olive oil, which contains the glycerin produced during manufacture. A soft, yellowish-white to green solid. Somewhat greasy to the touch, and nearly transparent. Soluble in water and alcohol. A solution in ether (Ether Soap) is employed as an antiseptic for surgical preparation of the skin. A constituent of a number of liniments.

The Dyestuffs

Substance	Dose	Properties and Remarks
Iodophthaleinum ..	$\frac{1}{3}$–$\frac{1}{2}$ grain per pound of body weight up to a total of 75 grains. Up to 45 grains by intravenous injection.	A blue or violet-blue, crystalline powder. No odour ; taste saline and astringent. Soluble 1 in 7 of water. Contains from 61 to 62 per cent. of combined iodine. When administered by mouth or intravenous injection, it is excreted by the liver into the gall bladder, rendering it opaque to X-rays. Radiographs may be obtained 14 to 18 hours after the dose has been given. Solutions may be sterilized by Tyndallization or filtration.
Acriflavina	$\frac{1}{2}$–$1\frac{1}{2}$ grs.	Acriflavine. A coal tar product occurring as an orange-red or red crystalline powder, with an acid taste. Soluble in water (1 in 3) and alcohol, forming a deep orange solution. Powerful wound antiseptic. Occasionally used internally as a urinary antiseptic.

Substance	Dose	Properties and Remarks
Indicarminum ..	¾–1½ grs. intramuscularly, ⅛–¼ gr. intravenously.	Indigo Carmine. Prepared by the action of sulphuric acid on indigo. An odourless, blue powder or granules, with a coppery lustre and a saline taste. It is precipitated from aqueous solution by sodium chloride. Employed as a test for kidney efficiency, the blue colour appearing in the urine 10 minutes or so after injection if the kidneys are functioning normally. Solutions are sterilized by heating in an autoclave or by Tyndallization.
Methylthioninæ Chloridum.	1–5 grs.	Methylene Blue. A dark-greenish crystalline powder, with a metallic lustre, or as a dull green or brown amorphous powder. Soluble in water and alcohol. Local antiseptic in gonorrhœa. Internal antiseptic to the urinary tract; the urine becomes blue and then green in about 30 minutes, and the drug has been used as a test for renal efficiency. Administered in pills, capsules, tablets, or as a simple solution.
Phenolphthaleinum	1–5 grs.	Phenolphthalein occurs as a white or yellowish powder or crystals. No odour or taste. It dissolves in alkaline solutions to form a red liquid which is decolorized by acids. Almost insoluble in water, soluble in alcohol. Administered in cachets or tablets, also in emulsion form with liquid paraffin as an effective purgative without griping.
Fluoresceinum Solubile.	No dose.	Soluble Fluorescein. An odourless and tasteless, orange-red powder. Freely soluble in water and alcohol, the aqueous solution has a distinct green fluorescence even when greatly diluted. Employed as a diagnostic agent in ophthalmic practice. When a solution is dropped into the eye, a green stain is produced in places where the mucous membrane has been injured.

The Sugars

Sugars are organic compounds belonging to the carbohydrate class; that is, they contain the elements carbon, hydrogen and oxygen only, the last two being in the same proportion as in water (2 atoms of hydrogen to 1 of oxygen). Sugars are of the general chemical formula $C_6H_{12}O_6$ or $C_{12}H_{22}O_{11}$, the former being known as monosaccharides, and the latter disaccharides.

Sugar	Properties and Remarks
Dextrosum	Medicinal Glucose (Anhydrous). Prepared by purifying commercial glucose. A white, crystalline or granular powder. No odour, sweet taste. Very soluble in water, less readily in alcohol. Dextrose has a variety of uses in medicine; it is administered by mouth, injection, or rectum, in febrile and wasting diseases where the normal food intake is insufficient. It is often given before administration of general anæsthetics, and also in cases of post-operative shock. Solutions may be sterilized by heating in an autoclave, by Tyndallization, or by filtration.
Glucosum Liquidum	Liquid Glucose. A mixture of several sugars obtained by the action of sulphuric acid on starch in the presence of steam. An almost colourless, odourless, thick, syrupy fluid, with a sweet taste. Mixes in all proportions with water, only partly soluble in alcohol. Its chief use is as a pill excipient; it is also added to certain iron preparations to retard oxidation.
Lactosum	Lactose. Saccharum Lactis. Milk Sugar. Sugar of Milk. A white, odourless, crystalline powder, prepared from the whey of milk. Soluble 1 in 7 of water. Mildly laxative and diuretic. Largely used in dispensing as a diluent for potent powders, and and as an inert substance for the standardization of many B.P. vegetable products. Also employed in humanization of cow's milk for infants.
Lævulosum	Lævulose. Fructose. A natural sugar found associated with dextrose in fruits and honey. A white or cream-coloured, hygroscopic, crystalline powder. No odour, sweet taste. Is more readily assimilated than other sugars and is administered in large doses in certain wasting diseases. Tolerated by some diabetic patients when other carbohydrates are inadmissible, and has also been used as a test for liver efficiency.

Sugar	Properties and Remarks
Sucrosum	Cane Sugar. Refined Sugar. Obtained from the expressed juice of the sugar-cane or sugar-beet. Colourless, odourless, crystals or masses, or as a white powder; sweet taste. Very soluble in water (2 in 1), forming a clear, colourless syrup. Chiefly employed as a sweetening agent, and as a preservative.

The Cocaine Substitutes

These are complex organic compounds prepared by synthesis. They are employed as local anæsthetics in substitution for cocaine, and have the advantage of being less toxic than the alkaloid.

Substance	Dose	Properties and Remarks
Amylocainæ Hydrochloridum.	$\frac{1}{3}$–$\frac{3}{4}$ gr. by mouth or subcutaneous injection. $\frac{1}{3}$–1$\frac{1}{2}$ grs. intraspinal injection.	Stovaine. A white crystalline powder, with a bitter taste followed by temporary anæsthesia of the tongue. Soluble 1 in 2 of water, the solution should be protected from light. Employed in all forms of local anæsthesia but particularly for intraspinal (intrathecal) injection, it is less toxic than cocaine, but is liable to produce local irritation. Solutions for injection may be sterilized by Tyndallization or by filtration, and the containing vessel should comply with the B.P. limits for alkalinity of the glass.
Procainæ Hydrochloridum.	$\frac{1}{2}$–2 grs. by mouth. Up to 15 grs. by subcutaneous, and up to 2$\frac{1}{2}$ grs. by intraspinal injection.	Ethocaine. A similar compound is known under the name of Novocaine. Planocaine. A colourless, crystalline powder. No odour; taste slightly bitter, followed by temporary anæsthesia of the tongue. Soluble 1 in 1 of water. Employed in all forms of local anæsthesia for surgical and dental use, being less toxic and less irritant than cocaine. Solutions may be sterilized by Tyndallization or filtration. Should be stored in alkali-free glass containers.

The Cocaine Substitutes—*continued*

Substance	Dose.	Properties and Remarks
Orthocaina	1½–3 grs.	Orthocaine. A white or faintly yellow, crystalline powder. No odour or taste. Sparingly soluble in water. May be applied to burns or painful ulcers of the skin in the form of a dusting powder or ointment as a local anodyne and antiseptic. May be given internally to relieve gastric pain.
Benzocaina	5–10 grs.	Known under the trade name of Anæsthesine. A white crystalline powder; no odour, slightly bitter taste followed by numbness. Slightly soluble in water (1 in 2,500). Employed mainly as a local anæsthetic for dusting on ulcerated surfaces. Given internally in cachet form to relieve gastric pain.

Synthetic Hypnotics and Sedatives

Substance	Dose	Properties and Remarks
Phenobarbitonum ..	½–2 grs.	Phenobarbital. Luminal. A white crystalline powder; no odour, taste slightly bitter. Soluble about 1 in 1,000 of water. Administered in tablet or cachet form as a sedative and hypnotic, its specific use is in Epilepsy.
Phenobarbitonum Solubile.	½–2 grs.	Soluble Phenobarbital. Sodium Luminal. A white, hygroscopic powder; no odour, bitter taste. Very soluble in water, the solution being alkaline. Action similar to that of Phenobarbital.
Barbitonum	5–10 grs.	Veronal. Malonurea. Barbital. A white, crystalline powder; faintly bitter taste. Soluble in water (1 in 170). Administered in powder, tablet, or cachet as a general hypnotic, especially in nervous insomnia.

Substance	Dose	Properties and Remarks
Barbitonum Solubile	5–10 grs.	Soluble Barbital. Medinal. Similar in appearance to Barbitonum. Has a similar action to Barbitonum but is more rapid owing to its greater solubility (1 in 6). Solutions may be sterilized by heating in an autoclave, by Tyndallization or by filtration.
Carbromalum ..	5–15 grs.	Uradal. Adalin. A white, crystalline powder; little odour or taste. Very sparingly soluble in water. Administered in tablet or cachet form as a sedative and hypnotic. Less toxic, but less active than Barbitonum.
Chlorbutol	5–20 grs.	Trade name—Chloretone. In colourless crystals; odour and taste musty and camphoraceous. Soluble 1 in 125 of water. A sedative and anodyne, it is employed to allay seasickness and post-operative vomiting. Externally it is a local anæsthetic and antiseptic.
Chloralis Hydras ..	5–20 grs.	Chloral Hydrate. Colourless, flat, diamond-shaped crystals. Characteristic sour odour; bitter pungent taste. Soluble in less than 1 part of water and alcohol. Powerful hypnotic and sedative.
Methylsulphonal ..	5–20 grs.	Trional. White crystalline powder or lustrous scales, with a slightly bitter taste. Soluble 1 in 320 of water. A hypnotic, administered in tablet or cachet form.
Sulphonal	5–20 grs.	Colourless crystals, little odour and taste. Soluble 1 in 450 of water. A hypnotic with little depressant action, and does not often induce habit-formation.
Paraldehydum ..	30–120 m.	Paraldehyde. A clear, colourless liquid, with an unpleasant ethereal odour, and acrid, disagreeable

Synthetic Hypnotics and Sedatives.—*continued*

Substance	Dose	Properties and Remarks
Paraldehydum—*cond.*		taste. Soluble 1 in 9 of water. Should be stored in small, well-closed, completely filled bottles, in a cool place and protected from light. Solidifies in cold weather and should be liquefied before using. A hypnotic resembling chloral hydrate in action, but is less depressant to the heart.

The Organic Arsenic Compounds

The four organic arsenic compounds are complex salts containing from 20 to 27 per cent. of combined arsenic.

The arsphenamines have a specific action in the treatment of syphilis, and it should be noted that whereas Neoarsphenamine can only be given by intravenous injection, Sulpharsphenamine can be administered both by the subcutaneous and intramuscular routes. These compounds are distributed in sealed glass ampoules from which the air has been excluded or replaced by an inert gas. Acetarsol is also used in the treatment of syphilis, and has the advantage of being active when given by mouth.

Compound	Dose	Properties and Remarks
Sulpharsphenamina	1½–10 grs. by subcutaneous or intramuscular injection.	Sulphostab (Boots). Sulpharsenol. A yellow dry powder containing approximately 20 per cent of arsenic. Should not be used if it has become darker in colour. Freely soluble in water. Antisyphilitic. A sterile solution is prepared by dissolving the powder in sterilized water under aseptic conditions.
Neoarsphenamina ..	2¼–14 grs. by intravenous injection.	Neosalvarsan. Novarsenobenzol. N.A.B. An antisyphilitic compound, similar in appearance and properties to Sulpharsenol. Solutions for injection are prepared as above.
Acetarsol	1–4 grs.	Acetarsone. Stovarsol. A white crystalline powder containing not less than 27 per cent. and not more than 27·4 per cent of arsenic.

Substance	Dose	Properties and Remarks
Acetarsol—*contd.*		Insoluble in water, soluble in dilute alkalis. It has the advantage over the arsphenamines of being active when given by mouth, although a soluble form may also be administered by injection. Used in the treatment of syphilis, malaria, amœbic dysentery and yaws.
Tryparsamidum ..	15–30 grs. by subcutaneous, intramuscular, or intravenous injection.	Tryparsamide. A colourless, odourless, crystalline powder, containing between 25·1 per cent. and 25·5 per cent. of arsenic. Freely soluble in water. Should be stored in small, well-closed containers, protected from light, and kept in a cool place. Sterile solutions are made by dissolving the powder in sterilized water under strict aseptic conditions. Used in the treatment of sleeping sickness and in syphilitic affections of the nervous system.

Miscellaneous Organic Substances (Solids)

Substance	Dose	Properties and Remarks
Histaminæ Phosphas Acidus.	$\frac{1}{120}$–$\frac{1}{60}$ gr. by subcutaneous injection.	Histamine Phosphate. A colourless, crystalline substance, soluble in 4½ parts of water. It is a product of protein decomposition, and is found in small amount in extract of ergot. Solutions may be sterilized by heating in an autoclave, by Tyndallization, or by filtration. It has a powerful but transient action on the uterine muscle, but its chief use is as a diagnostic agent in anæmias and in conditions of achlorhydria.
Saccharinum Solubile	½–2 grs.	Soluble Saccharin. A white, crystalline powder; taste intensely sweet. Freely soluble in water (1 in 1½). Sweetening agent, substitute for sugar in diabetes.

Miscellaneous Organic Substances (Solids)—*continued*

Substance	Dose	Properties and Remarks
Erythritylis Tetranitras Dilutus.	½–2 grs.	Erythrol Tetranitrate (50 per cent.). A mixture of equal parts of pure erythrityl tetranitrate and lactose. The dose, therefore, corresponds to ¼ to 1 grain of the pure substance. Erythrityl tetranitrate is very unstable and is liable to explode on percussion, and so lactose is added to make it safe to handle. The dilute substance is a white, odourless powder, which should be protected from light and stored in a cool place. Vaso-dilator.
Iodoformum ..	½–3 grs.	Shining, lemon-yellow crystals, or powder. Disagreeable, persistent odour and taste. Insoluble in water, soluble in chloroform and oils. Antiseptic and alterative. Given internally in pills or gelatin capsules. Used locally in suppository form.
Phenol	1–3 grs.	Carbolic Acid. A coal tar product occurring in colourless, needle crystals. The crystals are deliquescent, and become pinkish on exposure to moist air. Characteristic odour ; sweet, burning taste. The crystals are liquefied by the addition of 10 per cent. water, but addition of further water causes a separation into two layers, and complete solution is not effected until a dilution of 1 in 13 is reached. Also soluble in glycerin, alcohol, and oils. Is not a true acid and does not redden blue litmus. *Externally*. Antiseptic. Germicide. Deodorant. Local anæsthetic. *Internally*. Given as an intestinal antiseptic in pill form.
Resorcinol	1–5 grs.	Resorcin. Colourless, or nearly colourless, needle crystals or powder. Faint odour ; taste sweetish

Substance	Dose	Properties and Remarks
Resorcinol—*contd.*		and pungent followed by bitterness. Soluble in less than 1 part of water and alcohol. Powerful antiseptic. Largely used as a constituent of ointments for the treatment of scaly skin diseases.
Trinitrophenol ..	1–5 grs.	Picric Acid. Carbazotic Acid. A derivative of phenol occurring in bright yellow crystals or powder. Little odour; very bitter taste. Soluble about 1 in 90 of water, the solution being bright yellow and staining the skin. Picric acid explodes if heated rapidly or on percussion, and for dispensing purposes the crystals are stored mixed with an equal weight of water. Rarely used internally, but externally is a valuable antiseptic. A 1 per cent. solution is used as a dressing for burns, and a solution in alcohol is employed for skin sterilization before operation.
Chiniofonum ..	1–8 grs. and 15–75 grs. by rectal injection.	Pulvis Chiniofoni. Yatren. Quinoxyl. A light yellow powder containing the active substance mixed with sodium bicarbonate. Taste bitter, afterwards sweetish. Soluble with effervescence 1 in 25; solutions are decomposed by boiling. Administered by mouth and by rectal injection as an antiseptic in amœbic dysentery.
Betanaphthol ..	5–10 grs.	Naphthol. White or nearly white, crystalline scales or powder. Faint odour resembling phenol, taste sharp and pungent. Sparingly soluble in water (1 in 1000), freely in alcohol. Administered in cachets or tablet form as an intestinal antiseptic. Externally in ointment form is antiseptic and stimulant in chronic skin diseases.

Miscellaneous Organic Substances (Solids)—*continued*

Substance	Dose.	Properties and Remarks
Amidopyrina ..	5–10 grs.	Amidopyrine. Pyramidon. Small colourless crystals, or white crystalline powder. No odour; little taste. Soluble 1 in 19 of water. Antipyretic. Analgesic.
Phenacetinum ..	5–10 grs.	Small colourless, glistening, scaly crystals; no odour, faintly bitter taste. Very sparingly soluble in water (1 in 1700). Antipyretic and analgesic. A constituent of many well-known proprietary headache and neuralgia powders.
Phenazonum	5–10 grs.	Antipyrin. Small, colourless, flat crystals, or white powder. No odour; slightly bitter taste. Freely soluble in water (1 in 1·2). Antipyretic and analgesic. Used in influenza and infantile whooping cough.
Ichthammol	5–10 grs.	Ichthyol. Ammonium Ichthosulphonate. Prepared by the destructive distillation of a rocky shale which consists largely of the remains of fish and marine animal life. An almost black, thick, tarry liquid; strong characteristic odour. Soluble in water and glycerin. Used internally and externally as an antiseptic and stimulant in the treatment of eczema and other skin diseases. As an ointment is useful in acute rheumatism of the joints and in erysipelas.
Cinchophenum ..	5–10 grs.	Quinophan. Atophan. White or yellowish-white powder or crystals. No odour, slightly bitter taste. Insoluble in water. Is used to increase the rate of excretion of uric acid and its use is indicated in acute gout and rheumatic affections.
Hexamina	10–30 grs.	Hexamine. Urotropine. Colourless crystals, or white crystalline powder. Faint sour odour; taste sweetish afterwards bitter. Freely soluble in water (1 in 1½).

Substance	Dose	Properties and Remarks
Hexamina—*contd.*		Solutions may be sterilized by filtration. Antiseptic to the urinary tract.
Urea	15–240 grs.	Carbamide. Colourless, transparent crystals. No odour ; cool, saline taste. Freely soluble in water and alcohol. Urea is a normal constituent of the urine and is diuretic in action.
Chloramina	No dose.	Chloramine-T. White crystals or crystalline powder. Faint chlorine odour ; bitter unpleasant taste. Decomposes slowly on exposure to air, liberates chlorine, and becomes yellow. Soluble 1 in 7 of water. Used in solution as an antiseptic, acting by liberation of chlorine.
Chrysarobinum ..	No dose.	Chrysarobin. A light yellowish-brown powder without odour or taste. Insoluble in water. An antiparasitic used in the treatment of psoriasis and ringworm.
Pyroxylinum ..	No dose.	Made by steeping pure cotton in a mixture of concentrated nitric and sulphuric acids for 3 minutes, afterwards thoroughly washing free from acid and drying in a warm room. Should be stored loosely packed in a cool place, protected from light, and it may be kept moistened with methylated spirit. It is highly inflammable. The basis of Collodium Flexile.

Miscellaneous Organic Substances (Liquids)

Substance	Dose	Properties and Remarks
Phenol Liquefactum	1–3 m.	Liquefied Phenol. Liquefied Carbolic Acid. Is phenol liquefied by the addition of water, and contains 80 per cent. phenol. A colourless liquid becoming pinkish on keeping. Has the same action as the solid substance.

Miscellaneous Organic Substances (Liquids)—*continued*

Substance.	Dose	Properties and Remarks
Cresol	1–3 m.	Cresylic Acid. A pale, straw-coloured liquid, becoming brown and darker on keeping. Odour resembles phenol; pungent taste. Soluble 1 in 50 of water, freely soluble in organic solvents. Should be stored in amber-coloured bottles. Antiseptic both internally and externally. Largely employed as a germicide in the form of the saponified solution known as Lysol.
Chloroformum ..	1–5 m.	May be made by distilling a mixture of acetone, bleaching powder and water. A clear, colourless, volatile liquid; characteristic odour, sweet and pungent taste. Non-inflammable. Should be stored in well-stoppered bottles, protected from light, in order to prevent decomposition. Soluble 1 in 200 of water; freely soluble in alcohol and organic solvents. General anæsthetic by inhalation. Gastric sedative by mouth. Anodyne and rubefacient externally.
Amylis Nitris ..	2–5 m. inhaled.	A clear, yellow liquid with a penetrating (pear) odour, and aromatic, pungent taste. It is inflammable and very volatile. Should be stored in small, well-stoppered bottles; in a cool, dark place. Insoluble in water. Usually administered by breaking a small glass capsule and inhaling the vapours, but sometimes given by mouth in soluble capsules containing ½–1 minim. Vaso-dilator, reduces blood pressure.
Creosotum	2–10 m.	A colourless or pale yellow oily liquid, obtained by the distillation of wood tar. Penetrating, tarry odour; burning taste. Almost insoluble in water; soluble in organic solvents. Should be kept

Substance	Dose	Properties and Remarks
Creosotum—*continued*		in well-stoppered containers, protected from light. Powerful antiseptic and deodorant. Given internally in pill or capsule form as an expectorant and bronchial sedative.
Guaiacol	5–10 m.	A colourless, oily liquid, or colourless crystals. Penetrating, tarry odour; pungent, burning taste. Soluble 1 in 80 of water, freely soluble in alcohol. An antiseptic and deodorant, and is often used in place of creosote for internal administration in chest diseases.
Methyl Salicylas ..	5–15 m.	Artificial Oil of Wintergreen. A colourless, oily fluid, with a pleasant, aromatic odour, and a sweetish, pungent taste. Slightly soluble in water, soluble in organic solvents. Anti-rheumatic internally, usually given in capsule form to avoid gastric disturbance. Externally anodyne and rubefacient in sciatica and rheumatism.
Terebenum	5–15 m.	Terebene. A colourless, oily fluid, obtained from oil of turpentine. Agreeable turpentine odour, aromatic taste. Insoluble in water, soluble in alcohol. Antiseptic. Deodorant. Expectorant.
Æther	15–60 m.	Ether. Made by the controlled distillation of a mixture of sulphuric acid and alcohol. A colourless, very mobile, transparent liquid. Very volatile and highly inflammable. Strong, characteristic odour and taste. A mixture of ether vapour with air or oxygen is explosive in contact with a flame. Should be stored in the cool, in well-stoppered bottles, protected from light. Soluble 1 in 8½ of water, mixes in all proportions with alcohol and chloroform.

Miscellaneous Organic Substances (Liquids)—*continued*

Substance	Dose	Properties and Remarks
Æther—*continued*		Rapid stimulant in cases of collapse, either by mouth or injection. Used for cleansing skin areas before operation.
Carbonei Tetrachloridum.	30–60 m.	Carbon Tetrachloride. A heavy colourless, volatile liquid, with a characteristic odour resembling chloroform and a burning taste. Non-inflammable. Insoluble in water. Anthelmintic for hookworm.
Glycerinum	60–120 m. by mouth, 30–120 m. by rectal injection.	Glycerin. Glycerol. Obtained by the action of superheated steam on fats and fixed oils. A clear, colourless, syrupy liquid. No odour ; sweet taste followed by a sensation of warmth. Hygroscopic. Mixes in all proportions with water and alcohol. An excellent solvent of many organic and inorganic drugs. Demulcent and laxative internally. Emollient externally.
Æther Anæstheticus	No dose.	Anæsthetic ether is ether from which certain impurities have been removed. Is similar in appearance and properties to ether. General anæsthetic by inhalation.
Æthylis Chloridum	No dose.	Ethyl Chloride. A gas at ordinary temperatures, but usually supplied as a liquid in special tubes. A clear, colourless, very volatile and inflammable liquid. Local anæsthetic, employed direct from the tube, as a fine spray. Administered by inhalation as a general anæsthetic, its action is rapid but transient.
Acetonum	No dose.	Acetone. Colourless, transparent, mobile and volatile liquid. Very inflammable. Characteristic odour ; pungent, sweetish taste. Used as a solvent of cantharidin in Liquor Epispasticus, also used in the manufacture of chloroform.

Substance	Dose	Properties and Remarks
Pix Carbonis Præparata.	No dose.	Prepared Coal Tar. A purified form of commercial coal tar. A nearly black, thick liquid, with a strong tarry odour. Almost insoluble in water. Antiseptic and stimulant. Used as a lotion or ointment for eczema, psoriasis, and other skin diseases.

The Gases

The four gases described in the Pharmacopœia are intended to be administered by inhalation, and for the sake of convenience are supplied, under pressure, in stout metal cylinders. As an aid to rapid recognition, cylinders have the name or chemical symbol of the gas stencilled or painted on the shoulder, and the body is painted in accordance with the colour scheme referred to in Regulations for the Medical Services of the Army, 1938, Appendix 23.

Gas	Properties and Remarks
Æthylenum ..	Ethylene. A colourless, inflammable gas, with a faint sweetish odour. Forms an explosive mixture in certain proportions with air or oxygen. Employed as a general anæsthetic the gas is administered in admixture with oxygen. It is a safe and rapid anæsthetic, but there is danger from fire and explosion.
Carbonei Dioxidum ..	Carbon Dioxide. A colourless, odourless gas, about 1½ times heavier than air. It is a powerful respiratory stimulant, and oxygen with 5 to 10 per cent. of Carbon dioxide is of great value when respiration is failing. The gas, in solid form is known as "dry ice" or "Carbon Dioxide Snow," and is used to destroy warts and nævi.
Nitrogenii Monoxidum	Nitrous Oxide. Laughing Gas. A colourless gas, heavier than air; characteristic odour, faintly sweet taste. Used as a safe anæsthetic, particularly in dental practice. Anæsthesia lasts about 40 to 50 seconds, and a concentration of at least 80 per cent. of the gas is necessary.
Oxygenium	Oxygen. Colourless, odourless, and tasteless gas. Oxygen inhalations are indicated in conditions of anoxæmia (oxygen deficiency) whether it be caused by disease (pneumonia, bronchitis, etc.) or by poisoning (carbon monoxide poisoning).

The Alcohols

The alcohols are a large group of organic compounds which are derived from paraffins by replacement of hydrogen atoms by one or more OH (hydroxyl) groups.

The B.P. alcohols are all products of one alcohol, namely Ethyl Alcohol or ethyl hydroxide (C_2H_5OH), which is obtained commercially as the result of fermentation of sugar solutions.

Alcohol	Properties and Remarks
Alcohol	Alcohol 95 per cent. This replaces the Spiritus Rectificatus (90 per cent.) of the B.P. 1914. It is a mixture containing 95 per cent. ethyl alcohol and 5 per cent. water. It occurs as a transparent, colourless, mobile liquid. Volatile and highly inflammable. Pleasing characteristic odour; burning taste. Mixes in all proportions with water, and is an excellent solvent of organic compounds and vegetable substances. The official diluted strengths of alcohol contain 90, 80, 70, 60, 50, 45, 25, and 20 per cent. of ethyl hydroxide, respectively.
Alcohol Dehydratum	Dehydrated Alcohol. Absolute Alcohol. Is alcohol containing not more than 1 per cent. of water. Similar in appearance and properties to alcohol.
Spiritus Methylatus Industrialis.	Industrial Methylated Spirit. A mixture of 19 volumes of alcohol (95 per cent.) with 1 volume of wood naphtha. Similar in appearance and properties to alcohol, but it has the acrid odour of the wood spirit. This spirit is now largely used in pharmacy for— (*a*) Liniments and other preparations intended exclusively for external use. (*b*) The preparation of certain extracts and resins, provided that in every case no alcohol remains in the finished product.

Vitamin Products

From comparatively early times it has been recognized that a well-balanced diet containing a proportion of fresh vegetables, fruits, and fats, is necessary to ensure normal development and to maintain health. It has also been noted that a diet deficient in one or other of these natural foods is responsible for certain forms of disease, but it was only during the last half century that scientific investigation has revealed the reason.

In the days of sailing ships, it was observed that, during long voyages, sailors necessarily fed on preserved foods, contracted scurvy; furthermore, that the symptoms of the

disease were rapidly alleviated when fresh fruits and vegetables were introduced into the diet. Scurvy was stamped out in the British Navy by the daily issue of 1½ oz. of lime juice.

Since that time, it has been found that other diseases, pellagra, beri-beri, rickets, etc., are also due to a deficiency of foods containing certain vital substances which have been called **vitamins.**

Vitamins are present in minute quantities in milk, fats, fresh fruits, green vegetables, and cereals, and at least five such substances have been isolated.

An alphabetical nomenclature has been adopted, and the vitamins A, B, C, D, and E, are known. Vitamin B has now been subdivided into two substances styled B_1 and B_2.

Vitamin A. This is a fat-soluble substance found in animal fats and oils like butter, milk, and cod liver oil. It is essential to the growth of animal life, and deficiency leads to wasting and a tendency to respiratory and other infections.

Vitamin B_1. A water-soluble vitamin present in yeast and in the germ of cereals (rice, wheat, etc.). Deficiency of B_1 leads to beri-beri, a disease very prevalent in Eastern Countries where rice forms a staple article of the diet. The vital germ of the cereal containing the vitamin is discarded when the cereal is polished, and thus the human body is starved of an essential food product.

Vitamin B_2. Found chiefly in yeast, milk, certain vegetables and animal tissues. A diet deficient in B_2 causes pellagra.

Vitamin C. A water-soluble vitamin contained in certain growing fruits and vegetables. The fresh juice of the lemon, lime, orange, grape fruit, pineapple, and tomato are particularly rich in this substance. Although absent from dried grain it reappears when the grain is allowed to germinate.

This substance has now been identified as ascorbic acid which is an active antiscorbutic.

Vitamin D. A fat-soluble vitamin found in animal fats, particularly in cod liver and other fish oils, milk, and eggs.

Deficiency of vitamin D is the cause of infantile rickets. This disease, induced by insufficient deposition of calcium salts in the bones, leads to softening of the bones and deformity of the limbs (bow-legs, etc.). The disease is common in northern lands, and less prevalent in sunny climates. This is because the ultra-violet rays of sunlight are capable of synthesizing the vitamin in the body, although it may still be deficient in the diet.

Ergosterol, a substance found in yeast and in the fixed oil in the grains of ergot, was found to be rich in vitamin D after

it had been irradiated with ultra-violet rays, and a Liquor Ergosterolis Irradiati was introduced into the B.P. 1932; this has now been superseded by the pure crystalline substance Calciferol.

Vitamin E. Some vegetable oils and animal fats contain a substance, provisionally known as vitamin E, which is an essential to the reproduction of animal life. Animals suffering from a deficiency of this vitamin in the diet have a tendency to degeneration of the organs of reproduction with consequent sterility.

The following vitamin products have been introduced into the Pharmacopœia by the Addendum of December, 1936.

Acidum Ascorbicum. Ascorbic Acid. Vitamin C. Anti-scurvy vitamin.

Obtained from the ripe fruit of Capsicum annuum (Paprika) and other vegetable sources, or may be prepared by synthesis.

It occurs in minute, colourless crystals, with an acid taste resembling that of lemon juice. It is readily soluble in water, and is stable when stored in well-closed glass containers. Solutions of the acid, especially if they become alkaline, deteriorate rapidly in contact with air, and become inactive.

Deficiency of this vitamin causes scurvy in human beings after about four months, which is rapidly cured by adding fresh fruits and vegetables to the diet or by the administration of ascorbic acid.

Dosage.

Prophylactic—a daily dose of $\frac{2}{5}$ to $\frac{4}{5}$ grain, corresponding to 500 to 1,000 antiscorbutic units.

Therapeutic—a daily dose of $1\frac{1}{2}$ to 4 grains, corresponding to 2,000 to 5,000 units.

Calciferol. Vitamin D. Anti-rachitic vitamin.

This substance replaces Liquor Ergosterolis Irradiati of the B.P. 1932, and is the active substance produced by the ultra-violet irradiation of ergosterol in solution.

It occurs in colourless, needle crystals. Insoluble in water; soluble in alcohol and vegetable oils. The crystals should be kept in hermetically sealed glass vessels, from which air has been excluded or replaced by an inert gas, protected from light, and stored in a cool place.

Vitamin D is essential for the proper calcification of bone during growth, and deficiency causes rickets.

Dosage.

Prophylactic dose for infants—a daily dose of $\frac{1}{2400}$ to $\frac{1}{1200}$ grain, corresponding to 1,000 to 2,000 anti-rachitic units.

Therapeutic dose for infants—a daily dose of $\frac{1}{1200}$ to $\frac{1}{800}$ grain, equivalent to 2,000 to 3,000 units.

Liquor Calciferolis. Solution of Calciferol.

A solution of calciferol in a suitable vegetable oil, such as arachis oil, containing 3,000 units of activity in 1 gramme.

A 1 per cent. suspension of calciferol in arachis oil is maintained at a temperature of 40 degrees and carbon dioxide gas is passed through to aid solution of the active ingredient.

The solution should be kept in a well-closed container, protected from light, and stored in a cool place.

Action—as for Calciferol.

Dosage.

Prophylactic dose for infants—a daily dose of 5–10 minims corresponding to 1,000 to 2,000 units of activity.

Therapeutic dose for infants—a daily dose of 10–15 minims corresponding to 2,000 to 3,000 units.

Oleum Morrhuæ. Cod Liver Oil.

Described in the section devoted to fixed oils. It contains not less than 600 units of vitamin A activity and 85 units of vitamin D activity in 1 gramme.

Pulvis Vitamin B_1. Anti-beri-beri or Anti-neuritic Vitamin.

A cream-coloured powder ; almost odourless and tasteless. It is prepared from rice-polishings, yeast, wheat embryo, and other suitable materials. The solution containing the active element is adsorbed with fuller's earth to form a powder.

Employed as a preventive of and a therapeutic agent in the treatment of beri-beri.

Dosage.

Prophylactic—daily dose of 15–30 grains, equivalent to 100 to 200 units of activity.

Therapeutic—Daily dose of 30–90 grains, corresponding to 200 to 600 units of activity.

POSOLOGICAL TABLES

Acetarsol	1 to 4 grains.
Acetum Scillæ	10 to 30 minims.
Acidum Aceticum Dilutum ..	30 to 60 minims.
,, Acetylsalicylicum	5 to 15 grains.
,, Ascorbicum	*Prophylactic* (daily) $\frac{2}{3}$ to $\frac{1}{2}$ grain. *Therapeutic* (daily) $1\frac{1}{2}$ to 4 grains.
,, Benzoicum	5 to 15 grains.
,, Boricum	5 to 15 grains
,, Citricum	5 to 30 grains.
,, Hydrobromicum Dilutum	15 to 60 minims.
,, Hydrochloricum Dilutum ..	5 to 60 minims.
,, Hydrocyanicum Dilutum ..	2 to 5 minims.
,, Hypophosphorosum Dilutum	5 to 15 minims.
,, Lacticum	5 to 20 minims.
,, Oleicum	5 to 15 minims.
,, Phosphoricum Dilutum ..	5 to 60 minims.
,, Salicylicum	5 to 10 grains.

Acidum Sulphuricum Dilutum ..	5 to 60 minims.
,, Tannicum	5 to 10 grains.
,, Tartaricum	5 to 30 grains.
Acriflavina	½ to 1½ grains.
Adrenalina	$\frac{1}{60}$ to $\frac{1}{120}$ grain, by injection.
Æther	15 to 60 minims.
Agar	60 to 240 grains.
Aloe	2 to 5 grains.
Aloinum	¼ to 1 grain.
Alumen	5 to 10 grains.
Amidopyrina	5 to 10 grains.
Ammonii Bicarbonas	5 to 10 grains.
,, Carbonas	5 to 10 grains.
,, Chloridum	5 to 60 grains.
Amylis Nitris	2 to 5 minims, by inhalation.
Amylocainæ Hydrochloridum ..	⅓ to ¾ grain, by mouth and by subcutaneous injection.
	⅓ to 1½ grains, by intrathecal injection.
Antimonii et Potassii Tartras	$\frac{1}{32}$ to ⅛ grain.
	½ to 1 grain, emetic dose.
,, et Sodii Tartras	½ to 2 grains, by intravenous injection.
Antitoxinum Diphthericum	*Prophylactic*—500 to 1,000 units, by injection.
	Therapeutic—10,000 to 20,000 units, by injection.
,, Œdematiens	*Prophylactic*—20,000 units, by injection.
	Therapeutic—50,000 to 100,000 units, by injection.
,, Staphylococcicum ..	5,000 to 20,000 units, by injection.
,, Tetanicum	*Prophylactic*—1,000 to 2,000 units, by injection.
	Therapeutic—20,000 to 40,000 units, by injection.
,, Vibriosepticum ..	*Prophylactic*—5,000 units, by injection.
	Therapeutic—10,000 to 20,000 units, by injection.
,, Welchicum	*Prophylactic*—4,000 units, by injection.
	Therapeutic—10,000 to 20,000 units, by intravenous injection.
Apomorphinæ Hydrochloridum ..	$\frac{1}{64}$ to $\frac{1}{32}$ grain, expectorant dose $\frac{1}{32}$ to ⅛ grain, hypnotic and emetic doses, by subcutaneous injection.
Aqua Anethi Concentrata	5 to 15 minims.
,, ,, Destillata	½ to 1 fluid ounce.
,, Camphoræ	½ to 1 fluid ounce.
,, Chloroformi	½ to 1 fluid ounce.
,, Cinnamomi Concentrata ..	5 to 15 minims.
,, ,, Destillata ..	½ to 1 fluid ounce.
,, Menthæ Piperitæ Concentrata	5 to 15 minims.
,, ,, ,, Destillata	½ to 1 fluid ounce.
Argenti Nitras	⅛ to ¼ grain.
Arseni Triiodidum	$\frac{1}{16}$ to ¼ grain.
Arseni Trioxidum	$\frac{1}{60}$ to $\frac{1}{12}$ grain.
Asafœtida	5 to 15 grains.

Atropina	$\frac{1}{240}$ to $\frac{1}{60}$ grain.
Atropinæ Sulphas	$\frac{1}{240}$ to $\frac{1}{60}$ grain.
Balsamum Peruvianum	5 to 15 minims.
,, Tolutanum	5 to 15 grains.
Barbitonum	5 to 10 grains.
Barbitonum Solubile	5 to 10 grains.
Belladonna Pulverata	½ to 3 grains.
Belladonnæ Radix	½ to 2 grains.
Benzocaina	5 to 10 grains.
Benzoinum	10 to 30 grains.
Betanaphthol	5 to 10 grains.
Bismuthi Carbonas	10 to 30 grains.
Bismuthi et Sodii Tartras	1 to 3 grains, by intramuscular injection.
Bismuthi Oxychloridum	10 to 30 grains.
	1½ to 3 grains, by intramuscular injection.
Bismuthi Salicylas	10 to 30 grains.
	1 to 2 grains, by intramuscular injection.
Bismuthum Præcipitatum	1½ to 3 grains, by intramuscular injection.
Borax	5 to 15 grains.
Buchu	15 to 30 grains.
Caffeina	2 to 5 grains.
Caffeina et Sodii Benzoas	5 to 15 grains.
	2 to 5 grains, by injection.
Calciferol	*Prophylactic* (daily) for an infant $\frac{1}{2400}$ to $\frac{1}{1200}$ grain.
	Therapeutic (daily) for an infant $\frac{1}{1200}$ to $\frac{1}{800}$ grain.
Calcii Carbonas	15 to 60 grains.
,, Chloridum	10 to 30 grains.
	½ to 1½ grains, by intramuscular injection.
	5 to 15 grains, by intravenous injection.
,, Chloridum Hydratum	1 to 3 grains, by intramuscular injection.
	10 to 30 grains, by intravenous injection.
,, Gluconas	30 to 60 grains.
,, Hydroxidum	5 to 15 grains.
,, Lactas	15 to 60 grains.
,, Phosphas	10 to 30 grains.
Calumba	10 to 30 grains.
Camphora	2 to 5 grains.
	1 to 3 grains, by subcutaneous injection.
Capsicum	½ to 2 grains.
Carbonei Tetrachloridum	30 to 60 minims.
Carbromalum	5 to 15 grains.
Cardamomum	10 to 30 grains.
Carum	10 to 30 grains.
Caryophyllum	2 to 5 grains.
Cascara Sagrada	20 to 60 grains.
Cassia	60 to 120 grains.
Catechu	5 to 15 grains.
Chiniofonum	1 to 8 grains.
	15 to 75 grains, by rectal injection.

Chloralis Hydras	5 to 20 grains.
Chlorbutol	5 to 20 grains.
Chloroformum	1 to 5 minims.
Cinchona	5 to 15 grains.
Cinchophenum	5 to 10 grains.
Cinnamomum	5 to 20 grains.
Cocaina	$\frac{1}{8}$ to $\frac{1}{4}$ grain.
Cocainæ Hydrochloridum	$\frac{1}{8}$ to $\frac{1}{4}$ grain.
Codeina	$\frac{1}{4}$ to 1 grain.
Codeinæ Phosphas	$\frac{1}{4}$ to 1 grain.
Colchici Cormus	2 to 5 grains (of the dried corm).
Colchici Semen	2 to 5 grains.
Colocynthis	2 to 5 grains.
Confectio Sennæ	60 to 120 grains.
Confectio Sulphuris	60 to 120 grains.
Copaiba	10 to 30 minims.
Coriandrum	5 to 15 grains.
Creosotum	2 to 10 minims.
Cresol	1 to 3 minims.
Creta	15 to 60 grains.
Cupri Sulphas	$\frac{1}{4}$ to 2 grains.
	5 to 10 grains (emetic doses).
Diamorphinæ Hydrochloridum	$\frac{1}{24}$ to $\frac{1}{8}$ grain.
Digitalis Pulverata	$\frac{1}{2}$ to $1\frac{1}{2}$ grains (repeated dose).
	3 to 10 grains (single dose).
Elixir Cascaræ Sagradæ	30 to 60 minims.
Emetinæ et Bismuthi Iodidum	1 to 3 grains.
Emetinæ Hydrochloridum	$\frac{1}{2}$ to 1 grain, by injection.
Ephedrinæ Hydrochloridum	$\frac{1}{4}$ to $1\frac{1}{2}$ grains.
Ergota Præparata	5 to 15 grains.
Ergometrina	$\frac{1}{120}$ to $\frac{1}{60}$ grain.
	$\frac{1}{240}$ to $\frac{1}{120}$ grain, intramuscular injection.
	$\frac{1}{480}$ to $\frac{1}{240}$ grain, intravenous injection.
Ergotoxinæ Æthanosulphonas	$\frac{1}{120}$ to $\frac{1}{60}$ grain, by subcutaneous or intramuscular injection.
Erythritylis Tetranitras Dilutus	$\frac{1}{2}$ to 2 grains (representing $\frac{1}{4}$ to 1 grain of pure Erythrityl Tetranitrate).
Eucalyptol	1 to 3 minims.
Extractum Belladonnæ Liquidum	$\frac{1}{4}$ to 1 minim.
,, Belladonnæ Siccum	$\frac{1}{4}$ to 1 grain.
,, Cascaræ Sagradæ Liquidum	30 to 60 minims.
,, Cascaræ Sagradæ Siccum	2 to 8 grains.
,, Cinchonæ	2 to 8 grains.
,, Cinchonæ Liquidum	5 to 15 minims.
,, Colchici Liquidum	2 to 5 minims.
,, Colchici Siccum	$\frac{1}{4}$ to 1 grain.
,, Colocynthidis Compositum	2 to 8 grains.
,, Ergotæ Liquidum	10 to 20 minims.
,, Fellis Bovini	5 to 15 grains.
,, Filicis	49 to 90 minims.
,, Gentianæ	2 to 8 grains.
,, Glycyrrhizæ	10 to 30 grains.
,, Glycyrrhizæ Liquidum	30 to 60 minims.
,, Hamamelidis Liquidum	30 to 60 minims.

Extractum Hepatis Liquidum ..	1 fluid ounce.
,, Hepatis Siccum ..	The quantity equivalent to 225 grammes, or about half-a-pound, of fresh liver.
,, Hyoscyami Liquidum ..	3 to 6 minims.
,, Hyoscyami Siccum ..	¼ to 1 grain.
,, Ipecacuanhæ Liquidum	½ to 2 minims.
	10 to 30 minims (emetic dose).
,, Krameriæ Siccum ..	5 to 15 grains.
,, Malti	60 to 240 minims.
,, Malti cum Oleo Morrhuæ	60 to 240 minims.
,, Nucis Vomicæ Liquidum	1 to 3 minims.
,, Nucis Vomicæ Siccum	¼ to 1 grain.
,, Opii Siccum	¼ to 1 grain.
,, Pituitarii Liquidum ..	2 to 5 units, by subcutaneous injection.
,, Senegæ Liquidum ..	5 to 15 minims.
,, Sennæ Liquidum ..	10 to 30 minims.
,, Stramonii Liquidum ..	½ to 3 minims.
,, Stramonii Siccum ..	¼ to 1 grain.
	1 to 8 grains, in post encephalitic and similar conditions.
Ferri Carbonas Saccharatus ..	10 to 30 grains.
,, et Ammonii Citras	20 to 40 grains.
,, et Quininæ Citras	5 to 15 grains.
,, Subchloridum Citratum ..	3 to 5 grains.
,, Sulphas	1 to 5 grains.
,, Sulphas Exsiccatus	½ to 3 grains.
Ferrum Redactum	1 to 10 grains.
Filix Mas	60 to 180 grains.
Fœniculum	5 to 10 grains.
Gentiana	10 to 30 grains.
Glycerinum	60 to 120 minims.
	30 to 120 minims, by rectal injection.
Glycerinum Acidi Borici	10 to 30 minims.
,, Acidi Tannici	10 to 30 minims
,, Aluminis	30 to 60 minims.
,, Boracis	30 to 60 minims.
,, Phenolis	5 to 15 minims.
Glycyrrhiza	15 to 60 grains.
Guaiacol	5 to 10 minims.
Hexamina	10 to 30 grains.
Histaminæ Phosphas Acidus ..	$\frac{1}{120}$ to $\frac{1}{60}$ grain, subcutaneous injection.
Homatropinæ Hydrobromidum ..	$\frac{1}{64}$ to $\frac{1}{32}$ grain.
Hydrargyri Iodidum Rubrum ..	$\frac{1}{32}$ to $\frac{1}{16}$ grain.
,, Oxycyanidum	$\frac{1}{12}$ to $\frac{1}{6}$ grain, intramuscular injection.
	$\frac{1}{6}$ grain, by intravenous injection.
,, Perchloridum	$\frac{1}{32}$ to $\frac{1}{16}$ grain.
,, Subchloridum	½ to 3 grains.
	½ to 1 grain, intramuscular injection.
Hydrargyrum	½ to 3 grains.
	½ to 1 grain, intramuscular injection.
Hydrargyrum cum Creta	1 to 5 grains.
Hyoscinæ Hydrobromidum ..	$\frac{1}{200}$ to $\frac{1}{100}$ grain.
Hyoscyamus	3 to 6 grains.

Ichthammol	5 to 10 grains.
Indicarminum	¾ to 1½ grains, by subcutaneous or intramuscular injection.
	⅛ to ¼ grain, by intravenous injection.
Infusum Aurantii Concentratum ..	30 to 60 minims.
,, Aurantii Recens	½ to 1 fluid ounce.
,, Buchu Concentratum ..	60 to 120 minims.
,, Buchu Recens	1 to 2 fluid ounces.
,, Calumbæ Concentratum	30 to 60 minims.
,, Calumbæ Recens ..	½ to 1 fluid ounce.
,, Caryophylli Concentratum	30 to 60 minims.
,, Caryophylli Recens ..	½ to 1 fluid ounce.
,, Digitalis Recens	90 to 300 minims.
	1 to 4 fluid ounces (single dose).
,, Gentianæ Compositum Concentratum	30 to 60 minims.
,, Gentianæ Compositum Recens	½ to 1 fluid ounce.
,, Quassiæ Concentratum ..	30 to 60 minims.
,, Quassiæ Recens	½ to 1 fluid ounce.
,, Senegæ Concentratum ..	30 to 60 minims.
,, Senegæ Recens	½ to 1 fluid ounce.
,, Sennæ Concentratum ..	30 to 120 minims.
,, Sennæ Recens	½ to 2 fluid ounces.
Injectio Bismuthi	8 to 15 minims, intramuscular injection.
,, Bismuthi Oxychloridi ..	15 to 30 minims, intramuscular injection.
,, Bismuthi Salicylatis ..	10 to 20 minims, intramuscular injection.
,, Ferri	15 to 30 minims, intramuscular injection.
,, Hydrargyri	5 to 10 minims, intramuscular injection.
,, Hydrargyri Subchloridi ..	10 to 20 minims, intramuscular injection.
,, Mersalyli	8 to 30 minims.
Insulinum	5 to 100 units, by subcutaneous injection.
Iodoformum	½ to 3 grains.
Iodophthaleinum	⅓ to ½ grain per pound of body weight up to 75 grains.
	Up to 45 grains, by intravenous injection.
Ipecacuanha Pulverata	½ to 2 grains.
	15 to 30 grains (emetic dose).
Ipomœa	5 to 20 grains.
Jalapa Pulverata	5 to 20 grains.
Kaolinum	½ to 2 ounces.
Krameria	10 to 30 grains.
Liquor Adrenalinæ Hydrochloridi	2 to 8 minims, subcutaneous injection.
,, Ammoniæ Dilutus	10 to 20 minims.
,, Ammonii Acetatis Dilutus..	¼ to 1 fluid ounce.
,, Ammonii Acetatis Fortis ..	15 to 60 minims.
,, Arsenicalis	2 to 8 minims.
,, Arseni et Hydrargyri Iodidi	5 to 15 minims.

Liquor Calciferolis	*Prophylactic* (daily) for an infant—5 to 10 minims. *Therapeutic* (daily) for an infant—10 to 15 minims.
,, Calcii Hydroxidi	1 to 4 fluid ounces.
,, Ferri Perchloridi	5 to 15 minims.
,, Glycerylis Trinitratis ..	½ to 2 minims.
,, Hydrargyri Perchloridi ..	30 to 60 minims.
,, Hydrogenii Peroxidi ..	30 to 120 minims.
,, Iodi Aquosus	5 to 15 minims.
,, Iodi Mitis	5 to 30 minims.
,, Iodi Simplex	3 to 15 minims.
,, Magnesii Bicarbonatis ..	1 to 2 fluid ounces.
,, Morphinæ Hydrochloridi ..	5 to 30 minims.
,, Quininæ Ammoniatus ..	30 to 60 minims.
,, Strychninæ Hydrochloridi ..	3 to 12 minims.
Lobelia	1 to 3 grains.
Magnesii Carbonas Levis	10 to 60 grains.
,, Carbonas Ponderosus ..	
,, Oxidum Leve	
,, Oxidum Ponderosum ..	
,, Sulphas	30 to 240 grains.
Menthol	½ to 2 grains.
Methylis Salicylas	5 to 15 minims.
Methylsulphonal	5 to 20 grains.
Methylthioninæ Chloridum ..	1 to 5 grains.
Mistura Magnesii Hydroxidi ..	60 to 240 minims.
Mistura Sennæ Composita	1 to 2 fluid ounces.
Morphinæ Hydrochloridum ..	⅛ to ⅓ grain.
Morphinæ Tartras	⅛ to ⅓ grain.
Mucilago Acaciæ	60 to 240 minims.
Mucilago Tragacanthæ	60 to 240 minims.
Myristica	5 to 10 grains.
Myrrha	5 to 15 grains.
Neoarsphenamina	2½ to 14 grains, by intravenous injection.
Nux Vomica Pulverata	1 to 4 grains.
Oleum Amygdalæ	½ to 1 fluid ounce.
,, Anethi	1 to 3 minims.
,, Anisi	1 to 3 minims.
,, Arachis	½ to 1 fluid ounce.
,, Cajuputi	1 to 3 minims.
,, Cari	1 to 3 minims.
,, Caryophylli	1 to 3 minims.
,, Chenopodii	3 to 15 minims.
,, Cinnamomi	1 to 3 minims.
,, Coriandri	1 to 3 minims.
,, Eucalypti	1 to 3 minims.
,, Gossypii Seminis	½ to 1 fluid ounce.
,, Hydnocarpi	5 to 15 minims, increasing gradually to 60 minims.
,, Hydnocarpi Aethylicum ..	By subcutaneous and intramuscular injection—30 minims, increasing gradually to 75 minims.
,, Lavandulæ	1 to 3 minims.
,, Limonis	1 to 3 minims.
,, Lini	½ to 1 fluid ounce.
,, Menthæ Piperitæ	1 to 3 minims.
,, Morrhuæ	*Prophylactic*—15 to 30 minims, three times daily. *Therapeutic*—45 to 90 minims, three times daily.

Oleum Myristicæ	1 to 3 minims.
,, Olivæ	½ to 1 fluid ounce.
,, Ricini	60 to 240 minims.
,, Rosmarini	1 to 3 minims.
,, Santali	5 to 15 minims.
,, Santali Australiensis	5 to 15 minims.
,, Sesami	½ to 1 fluid ounce.
,, Terebinthinæ	3 to 10 minims.
	120 to 240 minims (anthelmintic dose).
Opium Pulveratum	½ to 3 grains.
Orthocaina	1½ to 3 grains.
Oxymel	30 to 120 minims.
Oxymel Scillæ	30 to 60 minims.
Pancreatinum	3 to 10 grains.
Paraffinum Liquidum	¼ to 1 fluid ounce.
Paraldehydum	30 to 120 minims.
Pelletierinæ Tannas	2 to 8 grains.
Pepsinum	5 to 10 grains.
Phenacetinum	5 to 10 grains.
Phenazonum	5 to 10 grains.
Phenobarbitonum	½ to 2 grains.
Phenobarbitonum Solubile	½ to 2 grains.
Phenol	1 to 3 grains.
Phenol Liquefactum	1 to 3 minims.
Phenolphthaleinum	1 to 5 grains.
Physostigminæ Salicylas	$\frac{1}{100}$ to $\frac{1}{50}$ grain.
Pilocarpinæ Nitras	$\frac{1}{120}$ to $\frac{1}{15}$ grain.
Pilula Aloes	4 to 8 grains.
,, Aloes et Asafœtidæ	4 to 8 grains.
,, Aloes et Ferri	4 to 8 grains.
,, Colocynthidis et Hyoscyami	4 to 8 grains.
,, Ferri Carbonatis	5 to 30 grains.
,, Hydrargyri	4 to 8 grains.
,, Rhei Composita	4 to 8 grains.
Pix Liquida	2 to 10 grains.
Plumbi Acetas	½ to 2 grains
Podophylli Resina	¼ to 1 grain.
Podophyllum	2 to 10 grains.
Podophyllum Indicum	2 to 10 grains.
Potassii Acetas	15 to 60 grains.
,, Bicarbonas	15 to 60 grains.
,, Bromidum	5 to 30 grains.
,, Carbonas	2 to 5 grains.
,, Chloras	5 to 10 grains.
,, Citras	15 to 60 grains.
,, Iodidum	5 to 30 grains.
,, Nitras	5 to 15 grains.
,, Permanganas	1 to 3 grains.
,, Tartras Acidus	15 to 60 grains.
Procainæ Hydrochloridum	½ to 2 grains. By subcutaneous injection—up to 15 grains. By intrathecal injection—up to 2½ grains.
Prunus Serotina	15 to 30 grains.
Pulvis Cretæ Aromaticus	10 to 60 grains.
,, Cretæ Aromaticus cum Opio	10 to 60 grains.
,, Effervescens Compositus	193 grains.
,, Glycyrrhizæ Compositus	60 to 120 grains.

Pulvis Ipecacuanhæ et Opii	5 to 10 grains.
,, Jalapæ Compositus	10 to 60 grains.
,, Rhei Compositus	10 to 60 grains.
,, Tragacanthæ Compositus	10 to 60 grains.
,, Vitamini B_1	*Prophylactic* (daily)—15 to 30 grains. *Therapeutic* (daily)—30 to 90 grains.
Quassia	2 to 8 grains.
Quillaia	1 to 3 grains.
Quinidinæ Sulphas	3 to 10 grains.
Quininæ Bisulphas	1 to 10 grains.
Quininæ Dihydrochloridum	1 to 10 grains. 5 to 10 grains, by intravenous and intramuscular injection.
Quininæ et Æthylis Carbonas	1½ to 15 grains.
Quininæ Hydrochloridum	1 to 10 grains.
Quininæ Sulphas	1 to 10 grains.
Quininæ Tannas	1½ to 15 grains.
Resorcinol	1 to 5 grains.
Rheum	3 to 15 grains.
Saccharinum Solubile	½ to 2 grains.
Salicinum	5 to 15 grains.
Santoninum	1 to 3 grains.
Scammoniæ Resina	½ to 3 grains.
Scilla	1 to 3 grains.
Senega	6 to 12 grains.
Sennæ Folium	10 to 30 grains.
Sennæ Fructus	10 to 30 grains.
Serpentaria	¾ to 1½ grains.
Serum Antidysentericum (Shiga)	4,000 to 10,000 units by injection.
Serum Antipneumococcicum I	50,000 to 150,000 units by intravenous injection.
Serum Antipneumococcicum II	50,000 to 150,000 units by intravenous injection.
Sodii Benzoas	5 to 30 grains.
,, Bicarbonas	15 to 60 grains.
,, Bromidum	5 to 30 grains.
,, Carbonas	5 to 15 grains.
,, Carbonas Exsiccatus	2 to 5 grains.
,, Citras	15 to 60 grains.
,, et Potassii Tartras	120 to 240 grains.
,, Iodidum	5 to 30 grains.
,, Nitris	½ to 2 grains.
,, Phosphas	30 to 240 grains.
,, Phosphas Acidus	30 to 60 grains.
,, Phosphas Effervescens	60 to 240 grains.
,, Salicylas	10 to 30 grains.
,, Sulphas	30 to 240 grains.
,, Sulphas Effervescens	60 to 240 grains.
,, Thiosulphas	5 to 15 grains, by subcutaneous, intramuscular or intravenous injection.
Spiritus Ætheris	15 to 60 minims.
,, Ætheris Nitrosi	15 to 60 minims.
,, Ammoniæ Aromaticus	15 to 60 minims.
,, Cajuputi	5 to 30 minims.
,, Camphoræ	5 to 30 minims.
,, Chloroformi	5 to 30 minims.
,, Menthæ Piperitæ	5 to 30 minims.

Stramonium	½ to 3 grains.
Strophanthinum	$\frac{1}{240}$ to $\frac{1}{60}$ grain, by intramuscular or intravenous injection.
Strychninæ Hydrochloridum ..	$\frac{1}{32}$ to $\frac{1}{8}$ grain.
Styrax	10 to 30 grains.
Sulpharsphenamina	1½ to 10 grains, by subcutaneous or intramuscular injection.
Sulphonal	5 to 20 grains.
Sulphur Præcipitatum	15 to 60 grains.
Sulphur Sublimatum	15 to 60 grains.
Syrupus Aurantii	30 to 120 minims.
,, Ferri Iodidi	30 to 120 minims.
,, Ferri Phosphatis Compositus	30 to 120 minims.
,, Ferri Phosphatis cum Quinina et Strychnina ..	30 to 60 minims.
,, Limonis	30 to 120 minims.
,, Pruni Serotinæ	30 to 120 minims.
,, Scillæ	30 to 60 minims.
,, Sennæ	30 to 120 minims.
,, Tolutanus	30 to 120 minims.
,, Zingiberis	30 to 120 minims.
Tabella Glycerylis Trinitratis ..	1 or 2 tablets.
Terebenum	5 to 15 minims.
Theobromina et Sodii Salicylas ..	10 to 20 grains.
Theophyllina et Sodii Acetas ..	2 to 5 grains.
Thymol	½ to 2 grains.
	15 to 30 grains (anthelmintic dose).
Thyroideum	½ to 5 grains.
Thyroxinsodium	$\frac{1}{640}$ to $\frac{1}{64}$ grain.
Tinctura Asafœtidæ	30 to 60 minims.
,, Aurantii	30 to 60 minims.
,, Belladonnæ	5 to 30 minims.
,, Benzoini Composita ..	30 to 60 minims.
,, Calumbæ	30 to 60 minims.
,, Capsici	5 to 15 minims.
,, Cardamomi Composita ..	30 to 60 minims.
,, Catechu	30 to 60 minims.
,, Cinchonæ	30 to 60 minims.
,, Cinchonæ Composita ..	30 to 60 minims.
,, Cocci	5 to 15 minims.
,, Colchici	5 to 15 minims.
,, Digitalis	5 to 15 minims.
	30 to 90 minims (single dose).
,, Gentianæ Composita ..	30 to 60 minims.
,, Hyoscyami	30 to 60 minims.
,, Ipecacuanhæ	10 to 30 minims.
	½ to 1 fluid ounce (emetic doses).
,, Krameriæ	30 to 60 minims.
,, Limonis	30 to 60 minims.
,, Lobeliæ Ætherea	5 to 15 minims.
,, Myrrhæ	30 to 60 minims.
,, Nucis Vomicæ	10 to 30 minims.
,, Opii	5 to 30 minims.
,, Opii Camphorata	30 to 60 minims.
,, Quassiæ	30 to 60 minims.
,, Quillaiæ	30 to 60 minims.

Tinctura Rhei Composita	30 to 60 minims.
,, Scillæ	5 to 30 minims.
,, Senegæ	30 to 60 minims.
,, Stramonii	5 to 30 minims.
,, Strophanthi	2 to 5 minims.
,, Tolutana	30 to 60 minims.
,, Valerianæ Ammoniata ..	30 to 60 minims.
,, Zingiberis Fortis	5 to 10 minims.
,, Zingiberis Mitis	30 to 60 minims.
Totaquina	1 to 10 grains.
Toxinum Diptericum Calefactum	3 minims, by intradermal injection.
Toxinum Diptericum Diagnosticum	3 minims, by intradermal injection.
Trinitrophenol	1 to 5 grains.
Tryparsamidum	15 to 30 grains, by subcutaneous, intramuscular or intravenous injection.
Tuberculinum Pristinum	*Diagnostic*—$\frac{1}{60}$ to $\frac{1}{12}$ minim, by subcutaneous injection. *Therapeutic*—$\frac{1}{6000}$ minim, gradually increased, by subcutaneous injection.
Urea	15 to 240 grains.
Vaccinum Typho-paratyphosum ..	0·5 mil. (first dose) } By subcutaneous injection. 1·0 mil. (second dose after 7 to 10 days interval).
Vaccinum Vacciniæ	1 minim, by scarification.
Valeriana	5 to 15 grains.
Zinci Oxidum	5 to 10 grains.
Zinci Sulphas	1 to 3 grains 10 to 30 grains (emetic doses).
Zingiber	5 to 15 grains.

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The Alkaloids (7)

The general properties and characteristics of the pure alkaloids have already been described in the Materia Medica section.

Alkaloid	Dose	Properties and Remarks
Atropina	$\frac{1}{240}$–$\frac{1}{60}$ gr.	An alkaloid from Belladonna and other plants of the same natural order. In colourless, needle crystals, or minutely crystalline powder. Soluble 1 in 500 of water, freely soluble in alcohol. It diminishes the body secretions when taken internally ; also anodyne and mydriatic.

Alkaloid	Dose	Properties and Remarks
Ergometrina ..	$\frac{1}{120}$–$\frac{1}{60}$ gr. By injection— $\frac{1}{240}$–$\frac{1}{120}$ gr. intramuscularly, $\frac{1}{480}$–$\frac{1}{240}$ gr. intravenously.	A recently isolated alkaloid from ergot; it is probably the most active of the ergot alkaloids. Colourless crystals, becoming coloured on exposure to air and light. Taste slightly bitter. Slightly soluble in water forming a solution which exhibits a blue fluorescence. It promotes contraction of the uterine muscle and is employed in childbirth.
Cocaina	$\frac{1}{8}$–$\frac{1}{4}$ gr.	A colourless, crystalline alkaloid from coca leaves. Has a bitter taste followed by a sensation of tingling and numbness. Soluble about 1 in 1300 of water, soluble 1 in 10 of alcohol. Local anæsthetic and mydriatic.
Codeina	$\frac{1}{4}$–1 gr.	An alkaloid obtained from opium, or by chemical action on morphine. Colourless crystals, or crystalline powder, having a bitter taste. Soluble 1 in 120 of water and 1 in 2 of alcohol. Should be stored in well-closed containers, protected from light. Mild hypnotic. Sedative in the cough of phthisis.
Caffeina	2–5 grs.	An alkaloid from tea or coffee; also prepared synthetically. In fine, white, silky crystals, matted together into tufts like cotton wool. Bitter taste. Soluble 1 in 80 of water. In medicinal doses it has a general stimulating action on the nerves and muscles, including the heart; it is also a diuretic.
Totaquina	1 to 10 gr.	Totaquine. A mixture of the alkaloids of Cinchona Bark. It contains not less than 70 per cent. of alkaloids, of which not less than one-fifth is quinine. It was introduced to provide a cheap substitute for quinine in India, but it possesses no other advantage over the alkaloid. A pale yellowish or brownish powder; bitter taste. Insoluble in water.

Alkaloid	Dose	Properties and Remarks
Theophyllina ..	No dose.	An alkaloid found associated with Theobromine in tea. It occurs as a white crystalline powder with a bitter taste. Soluble 1 in 120 of water. It is diuretic in action, but its only official use is as a constituent of Injectio Mersalyli in which it prevents decomposition of the mercury compound.

The Alkaloidal Salts (27)

Most of these salts are prepared by neutralizing the pure alkaloid with a dilute solution of the corresponding acid. For example, cocaine hydrochloride is prepared by neutralizing cocaine with a dilute solution of hydrochloric acid, and subsequent crystallization.

Like the pure alkaloids, most of the salts are white and crystalline, and they are much more soluble in water than the alkaloids from which they are made. By reason of this increased solubility the salts can be employed in medicine to a far greater extent than the pure alkaloids ; for example, they can be administered by hypodermic injection.

Most alkaloidal salts undergo changes on exposure to air and sunlight, and they should be preserved by storing in well-stoppered, alkali free, glass bottles of a dark amber colour, and kept in a cool place.

Alkaloidal Salt	Dose	Properties and Remarks
Atropinæ Sulphas ..	$\frac{1}{240}$–$\frac{1}{60}$ gr.	Colourless crystals, or white microcrystalline powder. Bitter taste. Soluble 2 in 1 of water. Lessens the body secretions when taken internally ; also sedative and mydriatic. Solutions may be sterilized by filtration or Tyndallization.
Hyoscinæ Hydrobromidum. ..	$\frac{1}{200}$–$\frac{1}{100}$ gr.	Scopolamine. Colourless, transparent crystals. Rather bitter, acrid taste. Soluble about 1 in 2 of water. Solutions may be sterilized by Tyndallization or filtration.

The Alkaloidal Salts (27)—*continued*

Alkaloidal Salt	Dose	Properties and Remarks
Hyoscinæ Hydrobromidum—*contd.*		Is used to produce partial anæsthesia in childbirth, the method being known as "twilight sleep." In general its action is that of a sedative and hypnotic.
Ergotoxinæ Aethanosulphonas.	$\frac{1}{120}$–$\frac{1}{60}$ gr. by subcutaneous or intramuscular injection.	A salt of an ergot alkaloid—Ergotoxine. Colourless, needle crystals, which must be stored in an atmosphere of nitrogen in sealed tubes, protected from light. Employed to increase uterine contractions following labour. Solutions may be sterilized by Tyndallization or filtration.
Physostigminæ Salicylas	$\frac{1}{100}$–$\frac{1}{50}$ gr.	Eserine. The salicylate of an alkaloid obtained from Calabar beans. Colourless or faintly yellow crystals, which gradually become pinkish on exposure to air and light. Soluble 1 in 100 of water. Solutions may be sterilized by Tyndallization or filtration. Its main use is as a myotic. Internally it has a depressant action on the spinal cord and respiratory centres.
Apomorphinæ Hydrochloridum ..	$\frac{1}{64}$–$\frac{1}{32}$ gr. expectorant. $\frac{1}{32}$–$\frac{1}{8}$ gr. Hypnotic and emetic dose by subcutaneous injection.	Greyish-white, glistening microcrystalline powder, becoming greenish on exposure to air and light. Soluble 1 in 50 of water. Should be stored protected from light, and should be rejected if it gives an emerald-green colour when dissolved in water. The solution decomposes if overheated. Sterilization should be effected by Tyndallization or filtration. Expectorant. Powerful emetic. Hypnotic.
Homatropinæ Hydrobromidum.	$\frac{1}{64}$–$\frac{1}{32}$ gr.	Colourless, crystalline powder, with a bitter taste. Soluble in 6 parts of water. Solutions may be sterilized by filtration or Tyndallization. Is a mydriatic like Atropine, but is less powerful, and its action passes off in about 24 hours.

Alkaloidal Salt	Dose	Properties and Remarks
Strychninæ Hydrochloridum.	$\frac{1}{32}$–$\frac{1}{8}$ gr.	Colourless, prismatic crystals. Intensely bitter and persistent taste. Soluble in about 40 parts of water; the solution may be sterilized by heating in an autoclave, by Tyndallization, or by filtration. Cardiac, respiratory, and general stimulant.
Diamorphinæ Hydrochloridum.	$\frac{1}{24}$–$\frac{1}{8}$ gr.	Heroin. White, crystalline powder, having a bitter taste. Soluble 1 in 2 of water. Sterilization may be effected by filtration or Tyndallization. Narcotic and sedative, like Morphine. Is mainly used to relieve the distressing cough of phthisis and other respiratory and lung diseases.
Pilocarpinæ Nitras ..	$\frac{1}{20}$–$\frac{1}{6}$ gr.	The nitrate of an alkaloid from Jaborandi leaves. Colourless crystals, or white crystalline powder. Soluble 1 in 8 of water. Solutions are sterilized by Tyndallization or filtration. It increases the salivary secretions (sialagogue), also the stomach secretions. Powerful diaphoretic.
Cocainæ Hydrochloridum.	$\frac{1}{8}$–$\frac{1}{4}$ gr.	Colourless, transparent crystals Bitter taste followed by sensation of tingling and numbness of the tongue. Very soluble in water (2 in 1); solutions are sterilized by Tyndallization or filtration. Local anæsthetic and mydriatic.
Morphinæ Hydrochloridum.	$\frac{1}{8}$–$\frac{1}{3}$ gr.	Slender, glistening, needle crystals, or crystalline powder. Bitter taste. Soluble 1 in 25 of water; solutions are sterilized by autoclave, Tyndallization or filtration. Narcotic. Anodyne.
Morphinæ Tartras ..	$\frac{1}{8}$–$\frac{1}{3}$ gr.	Minute needle crystals or crystalline powder. Bitter taste. Soluble in 11 parts of water; the solution may be sterilized by Tyndallization or filtration. Narcotic. Anodyne.

The Alkaloidal Salts (27)—*continued*

Alkaloidal Salt	Dose	Properties and Remarks
Codeinæ Phosphas ..	¼–1 gr.	Colourless, fine needle crystals, or crystalline powder. Bitter taste. Soluble in 3½ parts of water. Mild hypnotic. Sedative expectorant. Is not habit-forming like Morphine and Heroin.
Ephedrinæ Hydrochloridum.	¼–1½ gr.	The salt of an alkaloid from the Chinese plant—Ma huang. Colourless crystals, or crystalline powder. Soluble 1 in 5 of water. Cardiac and respiratory stimulant. Largely used to relieve the spasm of asthma, also employed in hay fever and catarrhal conditions.
Emetinæ Hydrochloridum.	½–1 gr. by injection.	The hydrochloride of the alkaloid Emetine, the active principle of Ipecacuanha. Colourless, crystalline powder, with a bitter taste. Becomes faintly yellow on exposure to light. Readily soluble in water and alcohol. Solutions are sterilized by Tyndallization or filtration. Specific in the treatment of amœbic dysentery. Expectorant. Emetic.
Pelletierinæ Tannas	2–8 grs.	A mixture of tannates of the alkaloids from Pomegranate bark. A light yellow, amorphous powder. Soluble 1 in 700 of water. Vermicide—has a specific toxic action on tapeworm.

Quinine Salts and Quinidine

All the Quinine salts are stomach tonics in small doses, chiefly on account of their bitterness. They have a specific action on the malaria parasite (antiperiodic) and are also antipyretics. Externally they are antiseptic. In addition, Quinidine Sulphate is used in certain disorders of the heart.

Alkaloidal Salt	Dose	Properties and Remarks
Quininæ Dihydrochloridum.	1–10 grs. 5–10 grs. by intravenous or intra-muscular injection.	Quinine Bihydrochloride. Quinine Acid Hydrochloride. A white crystalline powder, with a very bitter taste. Soluble in less than 1 part of water; solutions may be sterilized by heating in an autoclave, by Tyndallization, or by filtration. This is the most suitable of the quinine salts for intravenous or intramuscular injection.
Quininæ Hydrochloridum.	1–10 grs.	White, silky, glistening, needle crystals. Gradually becomes yellowish on exposure to air and light. More soluble (1 in 32) and more readily absorbed than the sulphate, also less irritant to the stomach. Sterilization—Autoclaving, filtration, Tyndallization.
Quininæ Sulphas ..	1–10 grs.	Colourless, silky, needle crystals. Intensely bitter and persistent taste. Soluble 1 in 800 of water, 1 in 65 of alcohol. One grain requires the addition of 1 minim of dilute Sulphuric Acid to dissolve it.
Quininæ Bisulphas ..	1–10 grs.	Quinine Acid Sulphate. Contains quinine in combination with twice as much acid as in the normal salt. Small, white, needle crystals, becoming yellowish on exposure to light. Soluble in about 10 parts of water.
Quininæ Tannas ..	1½–15 grs.	A pale yellow or yellowish-white, amorphous powder. Taste astringent and only slightly bitter. Very slightly soluble in water. Especially useful for children owing to its comparative freedom from bitterness.

Quinine Salts and Quinidine—*continued*

Alkaloidal Salt	Dose	Properties and Remarks
Quininæ et Æthylis Carbonas.	1½–15 grs.	Quinine Ethyl Carbonate. Slender, needle crystals, matted together into tufts. Darkens on exposure to light. Little taste. Only slightly soluble in water. As it is almost tasteless it can be given to children more readily than the sulphates or hydrochlorides.
Quinidinæ Sulphas ..	3–10 grs.	White needle crystals, with an intensely bitter taste. Soluble 1 in 90 of water.

Compound Alkaloidal Preparations

These are preparations containing an alkaloid or alkaloidal salt mixed, or loosely combined, with some other active compound. The object in most cases is to increase the therapeutic activity of the alkaloid.

Preparation	Dose	Properties and Remarks
Emetinæ et Bismuthi Iodidum.	1–3 grs.	A complex iodide of Emetine and Bismuth, occurring as an orange-red powder. Taste bitter and acrid. Insoluble in water and alcohol. Largely used in the treatment of dysentery. Administered by mouth it causes nausea and vomiting, and is therefore given in pill form and these should be enteric coated.
Quininæ et Æthylis Carbonas.	1½–15 grs.	See under the Quinine salts.
Theophyllina et Sodii Acetas.	2–5 grs.	Theocin. White crystalline powder; bitter taste. Soluble 1 in 25 of water. Powerful diuretic, frequently administered in cachets.
Caffeina et Sodii Benzoas.	5–15 grs. and 2–5 grs. by injection.	A white powder with slightly bitter taste. Completely soluble in 4 parts of water; dissolves in 1 part of warm water, part of the caffeine being deposited on cooling. A solution for injection may be sterilized by heating in an autoclave, by Tyndallization or filtration.

Preparation	Dose	Properties and Remarks
Caffeina et Sodii Benzoas—*continued*		Cardiac and respiratory stimulant, also diuretic.
Theobromina et Sodii Salicylas.	10–20 grs.	Diuretin. A white, amorphous powder; taste sweetish and alkaline. Soluble in 1 part of water. Powerful diuretic.

The Vinegar (1)

This is a liquid preparation of Squills in which acetic acid is employed as the solvent and vehicle.

Vinegar	Dose	Strength	Composition and Remarks
Acetum Scillæ ..	10–30 m.	10 per cent.	Squills, macerated with Dilute Acetic Acid. Expectorant.

The Acids (23)

The twenty-three acids of the B.P. have been subdivided into—

8 solid acids,
6 concentrated liquid acids (no dose),
9 liquid acids with doses.

Acidum Ascorbicum (vitamin C) is described in the section on vitamin products.

Eight Solid Acids

Acid	Dose	Properties and Remarks
Acidum Tannicum ..	5–10 grs.	Tannic Acid. Tannin. Light-brown, glistening scales, or powder, obtained from Galls. Characteristic odour; taste strongly astringent. Soluble 1 in 1 of water and alcohol. Powerful astringent, but rarely used internally. The official Glycerin is used as a paint in sore throat.

Eight Solid Acids—*continued*

Acid	Dose	Properties and Remarks
Acidum Tannicum—*continued*		A 1 per cent. or 2 per cent. aqueous solution is employed as a spray in the treatment of burns.
Acidum Salicylicum	5–10 grs.	Small, colourless crystals, or feathery crystalline powder. Taste at first sweetish, afterwards acrid and leaving a burning sensation in the throat. Soluble 1 in 500 of water, and 1 in 3½ of alcohol. Antiseptic. Antirheumatic. For internal administration it has been replaced by Sodium Salicylate and Aspirin.
Acidum Acetylsalicylicum.	5–15 grs.	Aspirin. Small, colourless, needle crystals, or white crystalline powder. Slightly acid taste; faint, acetic odour. Soluble in 300 parts of water. Antipyretic. Analgesic. Antirheumatic. A constituent of headache, neuralgia, and influenza powders.
Acidum Benzoicum ..	5–15 grs.	Colourless, light, feathery crystals. Either odourless, or with a faint aromatic odour when obtained from benzoin. Soluble in 450 parts of water and 3 parts of alcohol. Antiseptic. Expectorant. Diuretic.
Acidum Boricum ..	5–15 grs.	Boric Acid. Boracic Powder. White, pearly flakes, or soft white powder. Taste feebly acid and bitter, with a sweetish after-taste. Soluble 1 in 25 of water; 1 in 30 of alcohol. Mildly antiseptic, largely used as a dusting powder and in eye lotions.
Acidum Citricum ..	5–30 grs.	The acid principle of Lemon Juice. Large colourless, or slightly yellowish crystals, or white powder. Sharp, acid taste. Soluble in less than 1 part of water. Sialagogue. Refrigerant.

Acid	Dose	Properties and Remarks
Acidum Tartaricum . .	5–30 grs.	Large colourless crystals, or white powder, with a sharp, acid taste. Soluble in less than 1 part of water. Sialagogue. Refrigerant. Saline aperient.
Acidum Trichloraceticum.	No dose.	Trichloracetic Acid. Colourless crystals or crystalline masses, with a characteristic, pungent odour. Deliquescent; very soluble in water (9 in 1). Used externally as a caustic application to warts. Powerful disinfectant.

Six Concentrated Acids (No Dose)

Acid	Strength	Properties and Remarks
	Per cent.	
Acidum Hydrochloricum.	32	A concentrated solution of Hydrochloric Acid gas in water. A colourless, fuming liquid, having an irritant, pungent odour.
Acidum Aceticum . .	33	Prepared by diluting the Glacial Acid.
Acidum Nitricum . .	70	A colourless liquid, which develops a reddish-brown colour with age. It evolves irritant, corrosive fumes. In the concentrated form is only employed as a caustic for removing warts, or as an application to gangrenous tissue. Stains skin and clothing a bright yellow.
Acidum Phosphoricum	89	A clear, colourless, syrupy liquid.
Acidum Sulphuricum	95	Oil of Vitriol. A heavy, colourless, oily-looking fluid. Powerfully corrosive. Evolves great heat when added to water, and dilution must be done very gradually and with great care.
Acidum Aceticum Glaciale.	99	Glacial Acetic Acid. A clear, colourless liquid which crystallizes to a glassy mass on cooling. Pungent, vinegar odour. A good solvent of organic substances such as Cantharidin, Resins, etc. Commonly used for removing corns and warts.

Nine Liquid Acids (With Doses)

Acid	Dose	Strength	Properties and Remarks
		Per cent.	
Acidum Hydrocyanicum Dilutum.	2–5 m.	2	Dilute Prussic Acid. An aqueous solution of hydrogen cyanide gas produced by distilling a mixture of potassium ferrocyanide with dilute sulphuric acid. A clear, colourless liquid, with a characteristic "bitter-almond" odour. It is unstable, and should be stored in small quantities in well-filled, stoppered, tinted bottles, in a cool place. It is usual to keep the bottles inverted in order to prevent loss of strength, and the container should be gently shaken **before** the stopper is loosened. It is a very powerful and deadly poison, and is never administered without previous dilution. Employed as a **sedative** to the stomach and in troublesome coughs.
Acidum Hypophosphorosum Dilutum.	5–15 m.	10	Clear, colourless liquid. Used in the preparation of Syrupus Ferri Iodidi to retard oxidation.
Acidum Oleicum ..	5–15 m.	—	Obtained from fixed oils and fats by the action of superheated steam. A yellowish, oily liquid, with a faint rancid odour and taste. It darkens on exposure to air. Used in making Oleated Mercury (Hydrargyri Oleatum).
Acidum Lacticum ..	5–20 m.	87·5	A colourless, syrupy liquid; no odour, sour taste. Caustic externally. Internally administered in some forms of dyspepsia.
Acidum Hydrochloricum Dilutum	5–60 m.	10	Clear, colourless liquids, made by diluting the stronger acids. They are tonic and astringent in action.
Acidum Phosphoricum Dilutum.			
Acidum Sulphuricum Dilutum			

Acid	Dose	Strength	Properties and Remarks
		Per cent	
Acidum Hydrobromicum Dilutum.	15–60 m.	10	Clear, colourless liquid. Sedative and hypnotic, said to be less depressant than the bromides.
Acidum Aceticum Dilutum.	30–60 m.	6	Made by diluting the Glacial Acid. Mild diuretic and expectorant.

The Waters—Aquæ (10)

The official waters chiefly contain aromatic substances in solution, and are mainly used as mild carminatives, and as vehicles in mixtures and other liquid preparations.

There are several methods of preparation according to the nature of the active ingredient.

1. Distillation Process.

Three aromatic waters are directed to be made by distillation. These are :

Aqua Anethi Destillata.
Aqua Cinnamomi Destillata.
Aqua Menthæ Piperitæ Destillata.

The first two are distilled from the crude drug according to the following formula :

Crude drug	.. ..	100 parts
Water	.. .. ..	2,000 ,,
Distil	..	1,000 ,,

The drug is crushed and placed in a still with the water. Distillation is allowed to proceed until half the water employed has been collected as the distillate. It is then set aside for 12 hours and filtered. The distilled portion contains the volatile oil of the drug in solution, and constitutes the official aqua. It will be noticed that a considerable excess of water is employed to prevent charring of the drug during the process, which would render the product harsh and unpalatable.

Peppermint water (Aqua Menthæ Piperitæ Destillata) is

made in exactly the same way, but using the volatile oil instead of the crude drug, in the following proportions :

Volatile oil	.. ..	1 part
Water ..	.. ..	1,500 parts
Distil	..	1,000 ,,

2. Alternate Process.

This is a rapid method of preparing a water which eliminates the lengthy distillation process required by No. 1 above.

The general recipe is :

Volatile oil	.. ..	1 part
Powdered talc	.. ..	A sufficient quantity
Water ..	.. ..	up to 500 parts.

The oil is triturated with a sufficient quantity of powdered talc, kieselguhr, or pulped filter paper, gradually add water to volume, and filter clear. The talc, etc., being insoluble in water merely absorbs the oil and aids its diffusion by dividing it into minute globules capable of more ready solution. Filtration removes the talc together with any undissolved oil, leaving sufficient of the latter in solution to give the product a distinctive odour and taste. Waters made by this process remain clear and bright for a longer time than the distilled preparations, but are inferior in flavour.

3. Concentrated Waters.

The three aromatic waters directed to be made by distillation are also obtainable in a handy concentrated form. The recipe is :

Volatile oil	.. ..	20 parts
Alcohol (90 per cent.)	..	600 ,,
Distilled water up to	..	1,000 ,,

The oil is dissolved in alcohol and the water added in successive small amounts, shaking vigorously after each addition. Then add 50 parts of talc powder, shake vigorously, set aside for a few hours, and filter. These waters then are concentrated solutions of the oil in a dilute alcohol, and require to be diluted with 39 times their volume of distilled water to produce a product of equal strength to the distilled variety.

Dispensing Note.—If the prescriber specifies a " distilled water " in the prescription, the dispenser has no option but

to dispense one. If, however, the term distilled is not used, it is optional to employ a water made by any of the above processes.

Aqua Flor. Aurantii (Orange Flower Water), although not described in the Pharmacopœia, is used as a flavouring agent in the preparation of Syrupus Ferri Phosphatis Compositus B.P. (Parrish's Chemical Food).

Water	Dose	Properties and Remarks
	Two Unmedicated Waters	
Aqua Destillata ..	No dose.	Is water distilled from natural waters, free from dissolved gases and mineral salts, and from matter in suspension.
Aqua Sterilisata ..	No dose.	A natural water is distilled from a glass still (or one in which the distillate does not come into contact with copper) which has been cleansed immediately before distillation. The first portion of the distillate is rejected and the remainder collected in a sterilized neutral glass container. The container is closed so as to exclude bacteria, either by means of a sterile plug of non-absorbent cotton wool wrapped in gauze, by fusion of the glass, or other equally efficient means, and immediately sterilized by **heating in an autoclave.** Sterilized water which is kept in a container closed with cotton wool must be used within one month after its preparation. If the vessel has been closed by fusion of the glass or some other equally effective method, it may be stored for a longer period. If the whole of the contents of a container is not used when the container is opened, the remainder may be stored as described above, provided that the container is immediately both closed again so as to exclude bacteria and sterilized by **heating in an autoclave.**

The Waters—Aquæ—*continued*

Water	Dose	Properties and Remarks
Aqua Sterilisata—*contd.*		An **emergency method of sterilization** when an autoclave is not available is to place the freshly distilled water in a sterilized neutral glass container, close the vessel so as to exclude bacteria by a plug of sterile non-absorbent cotton wool wrapped in gauze, and **boil for thirty minutes.** Water sterilized in this way must be used within 24 hours of its preparation.

Water	Dose	Strength	Properties and Remarks
		Three Concentrated Waters	
Aqua Anethi Concentrata. **Aqua Cinnamomi Concentrata.** **Aqua Menthæ Piperitæ Concentrata.**	5–15 m.	2 per cent. oil.	Composition : The volatile oil, Alcohol, Distilled water.
		Three Distilled Waters	
Aqua Anethi Destillata.	½–1 fl. oz.	10 per cent	Dill fruit and water.
Aqua Cinnamomi Destillata.	½–1 fl. oz.	10 per cent.	Bruised cinnamon bark and water.
Aqua Menthæ Piperitæ Destillata.	½–1 fl. oz.	0·1 per cent.	Oil of peppermint and water.
Aqua Camphoræ ..	½–1 fl. oz.	0·1 per cent.	Camphor, alcohol, distilled water. Dissolve the camphor in alcohol and add this solution to the water a few drops at a time, shaking after each addition until the precipitated camphor is dissolved.
Aqua Chloroformi ..	½–1 fl. oz.	0·25 per cent. (1 in 400).	Chloroform and distilled water. Dissolve by vigorous shaking.

The Poultice (1)

This is a fairly stiff paste which is spread on lint and applied to the chest and back in pleurisy and pneumonia. A similar preparation is known under the trade name of "Antiphlogistine."

Cataplasma Kaolini. No dose. 52·7 per cent.
Composition: Kaolin, Boric Acid, Methyl Salicylate, Oil of peppermint, Thymol, Glycerin.
Mix finely sifted kaolin and boric acid with the glycerin, heat to 120 degrees for one hour, allow to cool, add the oil of peppermint and thymol dissolved in methyl salicylate, and mix well together.

The Collodium (1)

This is a liquid preparation of syrupy consistence, containing pyroxylin in solution. It is intended for external application to small wounds and abrasions, and forms a protective, antiseptic covering. The volatile solvent rapidly evaporates leaving a film of insoluble pyroxylin, which does not readily wash off.

Collodium Flexile. No dose. 2 per cent. pyroxylin.
Composition: Pyroxylin, Colophony, Castor Oil, Alcohol, Ether.

The Confections (2)

These are soft pastes, containing medicinal ingredients, with flavouring agents, sweetened and preserved with some form of sugar. Old names for such preparations were **conserves** or **electuaries.**

Confection	Dose	Strength	Composition and Remarks
Confectio Sennæ	grs. 60–120	per cent. 10	Figs, Prunes, Tamarinds — Boil with part of water for 4 hours. Rub the soft pulp through a hair sieve. Sugar, Cassia, Extract of Liquorice — Mix these with the pulp, warming if necessary. Senna powder, Coriander powder — Add mixed powders gradually and adjust consistence by addition or evaporation of water.

The Confections—*continued*

Confection	Dose	Strength	Composition and Remarks
Confectio Sulphuris	60–120 grs.	per cent. 45	3 *solids*. Precipitated sulphur. Tragacanth. Cream of tartar. 3 *liquids*. Tincture of orange. Syrup. Glycerin.

The Elixir (1)

The official elixir is an aromatic preparation of Cascara, rather more palatable than the liquid extract.

Elixir Cascaræ Sagradæ. 30–60 m. 1 in 1. Cascara sagrada, Liquorice, Light magnesium oxide, soluble Saccharin, Oil of aniseed, Oil of coriander, Alcohol, Glycerin, and Distilled water.

The Plasters (4)

Plasters are solid, adhesive preparations intended for external application. The plaster is usually formed into cylindrical rolls weighing 8 oz. each. When required for use, the necessary amount of plaster substance is melted and evenly spread upon some suitable material, such as calico or leather.

Plaster	Strength	Composition	Remarks
Emplastrum Cantharidini.	0·2 per cent.	Cantharidin. Acetone. Castor oil. Yellow beeswax. Wool fat.	Blistering Plaster. A blister is formed in from 6 to 9 hours. A yellowish plaster of the consistence of a stiff ointment.
Emplastrum Belladonnæ.	0·25 per cent. alkaloids.	Belladonna root exhausted by percolation with Alcohol and Water, evaporated to the consistence of a firm extract, and added to previously melted Colophony plaster. Action—local anodyne.	
Emplastrum Colophonii.	10 per cent.	Colophony (Resin). Hard soap. Lead plaster.	Resin plaster or Adhesive plaster.
Emplastrum Plumbi.	—	Lead monoxide. Olive oil. Water.	Boil the ingredients together to form lead soap (Lead oleate). A local stimulant and resolvent. Diachylon plaster.

The Extracts (32)

Extracts are solid, semi-solid, or liquid preparations containing all the active principles from vegetable or animal tissues in a concentrated form.

The general method of preparation is to exhaust the drug of its active constituents by a process of maceration or percolation with a suitable solvent, and to concentrate the product by evaporation, either to a definite volume of liquid, to a soft mass, or to dryness.

Alcohol is employed in the manufacture of most extracts, either as a solvent or preservative.

Extractum Filicis. Made by exhausting the Male Fern rhizome with ether, and evaporating to a thick, greenish, oily and resinous liquid. The percentage strength is adjusted with olive oil.

Extractum Colocynthidis Compositum contains two other active ingredients beside Colocynth, and is the only compound extract of the B.P.

Animal Extracts. The extracts of Ox Bile, Pituitary Gland, and the two Liver extracts, are made from animal tissues.

Standardized Extracts. Certain extracts, chiefly those containing poisonous alkaloids, are made to contain a definite percentage strength of active ingredient to ensure a uniform system of dosage. After the extract has been prepared, the percentage strength of active principle is assayed, and the product either weakened or strengthened to conform with the B.P. standard. Thus, no matter whether the original sample of drug be rich or poor in active principle, the resulting extract is always of standard strength.

The extract of Pituitary Gland is standardized by biological methods.

List of Standardized Extracts

Extract. Hyoscyami Liquid. ..	0·05	per cent.	alkaloid
Extract. Ergotæ Liquid.	0·06	,,	,,
Extract. Stramonii Liquid.	0·25	,,	,,
Extract. Colchici Liquid.	0·3	,,	,,
Extract. Belladonnæ Liquid. ..	0·75	,,	,,
Extract. Nucis Vomic. Liquid. ..	1·5	,,	,,
Extract. Ipecacuanhæ Liquid. ..	2	,,	,,
Extract. Cinchonæ Liquid.	5	,,	,,
Extract. Filicis	25	,,	filicin

Extract. Pituitarii Liquid (biologically standardized) contains 10 units per millilitre.

List of Standardized Extracts—*continued*

Extract. Hyoscyami Sicc.	0·3	per cent.	alkaloid
Extract. Stramonii Sicc.	1	,,	,,
Extract. Colchici Sicc.	1	,,	,,
Extract. Belladonna Sicc.	1	,,	,,
Extract. Nucis Vomic. Sicc. ..	5	,,	,,
Extract. Cinchonæ.	10	,,	,,
Extract. Opii Sicc.	20	,,	morphine

Dry and Soft Extracts (14)

Extract	Dose	Strength	Remarks
Six Standardized Extracts with a Dose of ¼ to 1 grain.			
Extractum Hyoscyami Siccum.	¼–1 gr.	0·3 per cent. alkaloids.	Strength adjusted with powdered hyoscyamus leaves.
Extractum Stramonii Siccum.	¼–1 gr.	1 per cent. alkaloids.	Strength adjusted with starch.
	Special dose in post-encephalitic and similar conditions—1 to 8 grs.		
Extractum Belladonnæ Siccum.	¼–1 gr.	1 per cent. alkaloids.	Strength adjusted with powdered belladonna leaves.
Extractum Colchici Siccum.	¼–1 gr.	1 per cent. colchicine.	Strength adjusted with lactose.
Extractum Nucis Vomicæ Siccum.	¼–1 gr.	5 per cent. strychnine.	Strength adjusted with calcium phosphate.
Extractum Opii Siccum.	¼–1 gr.	20 per cent. morphine.	Strength adjusted with calcium phosphate.
Four Extracts with a Dose of 2 to 8 Grains.			
Extractum Cinchonæ.	2–8 grs.	10 per cent. alkaloids.	Strength adjusted with glycerin.
Extractum Cascaræ Sagradæ Siccum.	2–8 grs.	—	—
Extractum Gentianæ.	2–8 grs.	—	—
Extractum Colocynthidis Compositum.	2–8 grs.	25 per cent. about.	Macerate **colocynth** in alcohol for 4 days and evaporate to dryness; then add **aloes, scammony resin, curd soap,** and **cardamoms.**

Extract	Dose	Strength	Remarks
Four Extracts—Miscellaneous Doses			
Extractum Krameriæ Siccum.	5–15 grs.	—	A reddish-brown, dry extract.
Extractum Fellis Bovini.	5–15 grs.	—	Purified Ox Bile. A dark, yellowish-green, plastic substance obtained by purifying and evaporating fresh Ox Bile.
Extractum Glycyrrhizæ.	10–30 grs.	—	Soft, black extract.
Extractum Hepatis Siccum.	The quantity equivalent to 225 grammes (about ½ lb.) of fresh liver.	—	Dry Liver Extract. An extract prepared from fresh ox or sheep liver containing the specific principle which increases the number of red blood corpuscles in persons suffering from pernicious anæmia. A light-brown, hygroscopic powder with a meat-like odour and taste. Should be stored in sealed glass tubes in a cool place, each tube containing the equivalent of 225 grammes of fresh liver. Contains one-tenth of its weight of sodium chloride to keep it as a free-running powder. Employed in the treatment of pernicious anæmia it causes a marked increase in the red blood cell count.

Liquid Extracts (18)

Extract	Dose	Strength	Remarks
10 Standardized Liquid Extracts			
Extractum Belladonnæ Liquidum.	¼–1 m.	0·75 per cent. alkaloids.	A dark brown liquid obtained from belladonna root by a percolation process.
Extractum Ipecacuanhæ Liquidum.	½–2 m. and 10–30 m. emetic.	2 per cent. alkaloids.	

Liquid Extracts—*continued*

Extract	Dose	Strength	Remarks
Extractum Stramonii Liquidum.	½–3 m.	0·25 per cent. alkaloids.	
Extractum Nucis Vomicæ Liquidum.	1–3 m.	1·5 per cent. strychnine.	
Extractum Colchici Liquidum.	2–5 m.	0·3 per cent. colchicine.	Made from the seeds by percolation.
Extractum Hyoscyami Liquidum.	3–6 m.	0·05 per cent. alkaloids.	
Extractum Cinchonæ Liquidum.	5–15 m.	5 per cent. alkaloids.	The solid Extract of Cinchona dissolved in a mixture of Hydrochloric Acid, Glycerin, Alcohol, and Distilled Water.
Extractum Ergotæ Liquidum.	10–20 m.	0·06 per cent. alkaloids.	Rapidly deteriorates, and should be stored in completely-filled containers, and kept as cool as possible. The alkaloidal content must not fall below 0·04 per cent.
Extractum Filicis	45–90 m.	25 per cent. filicin.	Although obtained by percolation with ether, there is none of the solvent in the finished product. A thick, dark green, oily and resinous liquid, frequently containing a granular deposit.
Extractum Pituitarii Liquidum.	2–5 units by subcutaneous injection.	10 units per millilitre.	This is a sterile aqueous extract of the posterior lobes of the pituitary bodies of oxen and other animals. It is a clear, colourless liquid, and is put up in alkali-free glass ampoules or rubber-capped bottles. It should be stored at as low a temperature as possible above its freezing point, and must not be used later than 18 months from date of manufacture. It greatly stimulates plain muscle, particularly the uterus, and arterial blood vessels.

Extract	Dose	Strength	Remarks
Unstandardized Liquid Extracts (8)			
Extractum Senegæ Liquidum.	5–15 m.	1 in 1.	
Extractum Sennæ Liquidum.	10–30 m.	1 in 1.	
Extractum Cascaræ Sagradæ Liquidum.	30–60 m.	1 in 1.	
Extractum Glycyrrhizæ Liquidum.	30–60 m.	—	
Extractum Hamamelidis Liquidum.	30–60 m.	1 in 1.	
Extractum Malti . .	60–240 m.	—	A yellowish-brown, thick liquid obtained from the malted grain of barley, by digesting in water and evaporating in vacuo. Agreeable odour; sweet taste. A valuable nutritive.
Extractum Malti cum Oleo Morrhuæ.	60–240 m.	10 per cent. of oil by weight (15 per cent. by vol.)	Cod Liver Oil and Malt. An easily digested nutritive, valuable in wasting diseases.
Extractum Hepatis Liquidum.	1 fl. oz.	—	A selected fraction of an alcoholic extract of ox or sheep liver dissolved in a mixture of Glycerin, Alcohol, and Distilled water. One fluid ounce is the equivalent of 8 oz. of fresh liver.

Dermatological Pastes (2).

Gelatinum Zinci. Gelatin of Zinc. Unna's Paste.

No dose. Strength 15 per cent.

A firm jelly prepared from finely sifted Zinc oxide, Gelatin, Glycerin, and Distilled water.

A soothing application in eczema. Requires to be melted before use.

Pasta Zinci Oxidi Composita. Compound Zinc Oxide Paste.

No dose. Strength 25 per cent.

Composed of Zinc oxide, Starch, and soft white Paraffin.

Lassar's Paste is a similar preparation but contains 2 per cent. Salicylic acid in addition.

The Glycerins (6)

These are liquid preparations with a basis of glycerin, in which an active principle is dissolved, usually with the aid of gentle heat. The Glycerin of Starch is a semi-solid jelly.

Although only Glycerin Amyli has no dose, the Glycerins are mostly used as throat paints or as local antiseptics and astringents.

Glycerin is an excellent solvent of certain organic and inorganic drugs which do not readily dissolve in water, *e.g.* acid boric and phenol. In addition it possesses slight antiseptic properties and, on account of its viscosity, it adheres to the mucous membrane to which it is applied, keeping it moist and affording prolonged contact of the medicinal agent with the affected part.

Solutions of phenol in glycerin are not nearly so caustic as are aqueous solutions of similar strength, hence, when diluting the official Glycerinum Phenolis (16 per cent.), glycerin should be used and not water.

Glycerin	Dose	Strength	Composition
		Per cent.	
Glycerinum Amyli	No dose.	8·5	Starch, Distilled water and Glycerin. Demulcent and absorbent.
Glycerinum Phenolis.	5–15 m.	16	Phenol and Glycerine—dissolve with gentle heat. Antiseptic.
Glycerinum Acidi Tannici.	10–30 m.	15	Tannic acid dissolved in Glycerin with gentle heat. Astringent.
Glycerinum Acidi Borici.	10–30 m.	31	Boric acid dissolved in Glycerin by the aid of heat. Mild antiseptic.
Glycerinum Boracis	30–60 m.	12	Borax dissolved in Glycerin. Mild antiseptic.
Glycerinum Aluminis.	30–60 m.	13	Potash alum, Distilled water and Glycerin. Astringent.

The Infusions (17)

The list of official infusions may readily be divided into (*a*) Nine Fresh Infusions, and (*b*) Eight Concentrated Infusions.

Fresh Infusions. Aqueous solutions of the active principles of crude drugs, obtained by steeping in boiling or cold water for the prescribed time.

General Method of Preparation. The drug is broken up or reduced to coarse powder, placed in an infusion pot, and boiling distilled water poured over. After standing for the stated time, the preparation is directed to be strained whilst hot, **but is not made up to any definite volume.**

The time of infusion is 15 minutes except in the case of Senega and Calumba, which are infused for 30 minutes.

Cold Water Infusions. Two infusions are prepared with cold water—**Infusion Calumba,** because the root contains starch which would form a jelly with boiling water, and **Infusion Quassia,** the active principles of which are so freely soluble in water that cold water is employed to prevent too concentrated a solution being made.

Concentrated Infusions.

All the fresh infusions have a corresponding concentrated infusion except **Infusion Digitalis** which must always be freshly prepared.

These concentrated infusions are made by a process of maceration or percolation with a dilute alcohol or distilled water, the latter having alcohol added as a preservative. The percentage of alcohol in the final product varies between 20 and 25 per cent. The composition is so arranged that the product is eight times the strength of the fresh infusion and, on being diluted with seven volumes of distilled water, yields a preparation approximately equivalent in strength, but not in flavour, to the fresh infusion.

Dispensing Note. When fresh (Recens) infusions are prescribed they must be so dispensed, and they should be used within 12 hours of making. If the fresh infusion is not definitely specified, it is optional whether the fresh, or the concentrated suitably diluted, be used, except that the Infusion of Digitalis must always be freshly prepared.

Infusion	Dose	Strength	Composition and Remarks
		Nine Fresh Infusions.	
Infusum Digitalis Recens.	90–300 m. repeated, and 1–4 fl. oz. single dose.	0·4 per cent. international standard powder.	The powdered leaves infused in distilled water. The infusion must be used within 12 hours.
Infusum Quassiæ Recens.	½–1 fl. oz.	1 per cent.	A cold water infusion.

The Infusions—*continued*

Infusion	Dose	Strength	Composition and Remarks
Infusum Gentianæ Compositum Recens.	½–1 fl. oz.	1¼ per cent.	Gentian, Orange and Lemon peels, and Distilled water.
Infusum Caryophylli Recens.	½–1 fl. oz.	2½ per cent.	
Infusum Aurantii Recens.	½–1 fl. oz.	5 per cent.	
Infusum Calumbæ Recens.	½–1 fl. oz.	5 per cent.	A cold water infusion. Infused for 30 minutes.
Infusum Senegæ Recens.	½–1 fl. oz.	5 per cent.	Infused for 30 minutes.
Infusum Buchu Recens.	1–2 fl. oz.	5 per cent.	
Infusum Sennæ Recens.	½–2 fl. oz.	10 per cent.	Senna, Ginger, and Distilled water.
	Eight Concentrated Infusions		
Infusum Quassiæ Concentratum.	30–60 m.	8 per cent.	Made by a maceration process, and adjusted to volume.
Infusum Gentianæ Compositum Concentratum.	30–60 m.	10 per cent.	Maceration process.
Infusum Caryophylli Concentratum.	30–60 m.	20 per cent.	Maceration process.
Infusum Aurantii Concentratum.	30–60 m.	40 per cent.	Maceration process.
Infusum Calumbæ Concentratum.	30–60 m.	40 per cent.	Macerated and adjusted to volume.
Infusum Senegæ Concentratum.	30–60 m.	40 per cent.	Percolated and adjusted to volume.
Infusum Sennæ Concentratum.	30–120 m.	80 per cent.	Percolated and adjusted to volume.
Infusum Buchu Concentratum.	60–120 m.	40 per cent.	Percolated and adjusted to volume.

The Injections (8)

The official injections contain either a metal or a metallic salt in solution or suspension; they are intended to be administered by intramuscular injection except the Sodium Chloride and Acacia preparation, which is to be given intravenously. These preparations are to be prepared with all aseptic precautions and instructions as to the method by which they may be sterilized are included.

Injection	Dose	Strength	Composition and Remarks
Injectio Sodii Chloridi et Acaciæ.	—	0·9 per cent. Sod. Chlor., 6 per cent. Acacia.	A sterile solution of Acacia in normal saline. Sterilized by heating in an autoclave. Administered intravenously in treatment of shock and severe hæmorrhage.
Injectio Hydrargyri.	5–10 m. by intramuscular injection.	10 per cent. Hg.	Mercurial Cream. Composed of Mercury, Wool fat, Camphor, Creosote, Olive oil. Prepared under aseptic conditions but not otherwise sterilized. Antisyphilitic.
Injectio Bismuthi	8–15 m. intramuscularly.	20 per cent.	Bismostab. Composed of Precipitated metallic Bismuth, Dextrose, Cresol and Sterilized Water. Sterilize by heating in an autoclave or by Tyndallization. Antisyphilitic.
Injectio Mersalyli	8–30 m.	10 per cent.	Mersalyl, Theophylline, Sodium hydroxide, and Sterilized Water. Sterilize by Tyndallization. Diuretic.
Injectio Bismuthi Salicylatis.	10–20 m. intramuscularly.	10 per cent.	Composed of Bismuth salicylate, Camphor, Phenol, and Olive oil. Sterilize by heating in an autoclave or by Tyndallization. Antisyphilitic.
Injectio Hydrargyri Subchloridi.	10–20 m. intramuscularly.	5 per cent.	Calomel Injection. Calomel, Wool fat, Camphor, Creosote and Olive oil. Prepared with all aseptic precautions, but not otherwise sterilized. Antisyphilitic.
Injectio Bismuthi Oxychloridi.	15–30 m. intramuscularly.	10 per cent.	Composed of Bismuth oxychloride, Dextrose, Cresol, and Sterilized water. Sterilize by Tyndallization. Antisyphilitic.

The Injections—*continued*

Injection	Dose	Strength	Composition and Remarks
Injectio Ferri ..	15–30 m. intra-muscularly	30 m. contain about one-tenth grain Iron.	Freshly precipitated Iron hydroxide is dissolved in Citric Acid solution, and neutralized with dilute solution of Ammonia. Sterilize by heating in an autoclave or by Tyndallization. Used in the treatment of anæmias.

The Lamellæ (Eye Discs) (4)

Eye Discs or Lamellæ are thin, flat discs, for ophthalmic use, and contain a minute quantity of an alkaloidal salt in each. The disc is used by placing it on the inner surface of the lower eyelid by means of a moistened camel hair pencil, where it dissolves in the lachrymal fluid.

The basis for eye discs is made from Gelatin, Glycerin, and Distilled water, in the following proportions :

Gelatin	18 grammes.
Glycerin	2 ,,
Distilled water	88 ,,

Mix the glycerin and distilled water, and allow the gelatin to soak in this mixture for 5 minutes or until thoroughly softened, transfer to a water bath and dissolve by the aid of gentle heat, and adjust the weight to 100 grammes by the addition of distilled water. The mixture, when cool, sets to a firm jelly.

Preparation of the Discs.

The recipe for Lamella Cocainæ is as follows :

Cocaine hydrochloride ..	1·642 grammes.
Lamella basis	15 ,,

Weigh out the prescribed amount of basis, place in a porcelain dish over a water bath and warm sufficiently to melt it. Add the cocaine salt and stir until dissolved. While the basis is melting, take a sheet of plate glass 10 centimetres square and having a raised edge, and, so that the mixture will flow evenly over the surface, a thin coat of white beeswax is applied. The best method of applying the wax coating is to pour a suspension of white wax in ether over the tile, and allow the volatile ether to evaporate. Then, when the cocaine has

dissolved, pour the mixture on to the tile, and dry in a dust-free, aseptic atmosphere at 36° C.

Carefully separate the gelatin film and from it cut discs 3·175 millimetres (about $\frac{1}{8}$ in.) in diameter.

Lamella	Amount of Alkaloidal Salt in each Disc	Weight each Disc	Remarks
Lamella Atropinæ.	$\frac{1}{5000}$ gr. Atropine sulphate.	$\frac{1}{50}$ gr.	Mydriatic. The pupils remain dilated for 2 to 4 days.
Lamella Physostigminæ.	$\frac{1}{1000}$ gr. Physostigmine salicylate.	$\frac{1}{50}$ gr.	Myotic.
Lamella Homatropinæ.	$\frac{1}{100}$ gr. Homatropine hydrobromide.	$\frac{1}{32}$ gr.	Mydriatic, pupils remain dilated 6 to 24 hours.
Lamella Cocainæ	$\frac{1}{50}$ gr. Cocaine hydrochloride.	$\frac{1}{20}$ gr.	Local anæsthetic and mydriatic.

The Liniments (7)

Liniments are preparations of an oily or spiritous nature, intended to be rubbed into the skin except Liniment Aconite, which should only be painted on. The liniments are anodyne or rubefacient in action, and they all contain camphor. Liniment of Turpentine is a saponified emulsion. In the liniments containing alcohol, this may be replaced by Industrial Methylated Spirit diluted so as to be of equivalent alcoholic strength.

Liniment	Strength	Composition
Linimentum Aconiti	1 in 2.	Aconite root, Camphor and Alcohol.
Linimentum Belladonnæ.	0·375 per cent. alkaloids.	Belladonna root, Camphor, Alcohol, and Distilled water.
Linimentum Saponis	8 per cent.	Opodeldoc. Soft soap, Camphor, Oil of rosemary, Distilled water, and Alcohol.
Linimentum Camphoræ Ammoniatum	12½ per cent.	Compound Liniment of Camphor. Camphor, Oil of lavender, strong solution of Ammonia and Alcohol.
Linimentum Camphoræ	20 per cent.	Camphorated Oil. Camphor dissolved in Olive oil.
Linimentum Terebinthinæ Aceticum	44½ per cent.	Oil of turpentine, Glacial acetic acid, Liniment of camphor.
Linimentum Terebinthinæ.	65 per cent.	Soft soap, Camphor, Oil of turpentine, and Distilled water.

The Solutions (30)

The official Liquors are mostly aqueous preparations containing alkaloidal salts, metallic salts, animal substances, etc., in solution.

All have distilled water as the solvent and vehicle except :

Liquor Epispasticus which has Acetone as the vehicle.

Liquor Calciferolis which has Arachis oil as the vehicle.

Liquor Iodi Simplex which has Alcohol 95 per cent. as the vehicle.

Liquor Iodi Fortis
Liquor Iodi Mitis
Liquor Glyceryl Trinitratis
Liquor Picis Carbonis
} All made with Alcohol 90 per cent.

Liquor Quininæ Ammoniatus made with Alcohol 60 per cent.

Liquor Calciferolis is a vitamin product and is described in the section dealing with this subject.

Liquor	Dose	Strength	Composition and Remarks
		Five 1 per cent Liquors.	
These contain 1 per cent. (*w/v*) of active drug, or 1 grain in 110 minims.			
		Per cent.	
Liquor Glycerylis Trinitratis.	½–2 m.	1	Solution of Nitroglycerine. A clear, colourless liquid containing 1 per cent. of Glyceryl trinitrate in Alcohol 90 per cent. Vaso-dilator.
Liquor Arsenicalis.	2–8 m.	1	Fowler's Solution. Composed of Arsenic trioxide, Solution of potassium hydroxide, Dilute hydrochloric acid and Distilled water. A clear, colourless, **neutral** solution (compare with corresponding preparation of B.P. 1914 which was reddish and alkaline).
Liquor Strychninæ Hydrochloridi.	3–12 m.	1	Contains Strychnine hydrochloride, Alcohol, and Distilled water. A clear, colourless solution with an intensely bitter and persistent taste.
Liquor Arseni et Hydrargyri Iodidi.	5–15 m.	1	Donovan's Solution. Composed of Arsenic triiodide, Red mercuric iodide and Distilled water. A clear colourless, or pale yellow liquid.
Liquor Morphinæ Hydrochloridi.	5–30 m.	1	Morphine hydrochloride, Dilute hydrochloric acid, Alcohol and Distilled water.

Liquor	Dose	Strength	Composition and Remarks
Four Iodine Solutions. Liquor Iodi Fortis and Liquor Iodi Mitis take the place of the Strong and Weak Tinctures of the 1914 B.P.			
		Per cent.	
Liquor Iodi Simplex.	3–15 m.	9	A solution of Iodine in Alcohol 95 per cent. A deep red liquid.
Liquor Iodi Aquosus.	5–15 m.	5	Lugol's Solution. Iodine, Potassium iodide, and Distilled water.
Liquor Iodi Mitis.	5–30 m.	2½	Weak " Tincture " of Iodine. Iodine, Potassium iodide, Distilled water and Alcohol.
Liquor Iodi Fortis.	No dose.	10	Strong " Tincture " of Iodine. Iodine, Potassium iodide, Distilled water and Alcohol.

Liquor	Dose	Strength	Composition and Remarks
Eleven Liquors (Various doses and strengths).			
Liquor Calciferolis. (See the section on Vitamin Products.)			
Liquor Adrenalinæ Hydrochloridi.	2–8 m. by subcutaneous injection.	0·1 per cent.	Adrenalin Solution. Adrenalin, Chlorbutol, Sodium chloride, Dilute hydrochloric acid and Distilled water. Sterilize by heating in a closed container at 80° for 1 hour. A clear, colourless liquid, which should be stored in well-filled, well-closed alkali-free glass containers, protected from light, and kept in a cool place. Vaso-constrictor. Hæmostatic. Relieves the spasm of asthma.
Liquor Ferri Perchloridi.	5–15 m.	15 per cent.	A clear, reddish-brown liquid, with acid reaction.
Liquor Ammoniæ Dilutus.	10–20 m.	10 per cent.	A solution of Ammonia gas in distilled water. Clear, colourless, strongly alkaline liquid. Pungent, choking odour. Stimulant, but must not be given without previous dilution.
Liquor Ammonii Acetatis Fortis.	15–60 m.	57·5 per cent.	Made by neutralizing Glacial acetic acid with Solution of Ammonia and Ammonium carbonate. Diaphoretic.

The Solutions—*continued*

Liquor	Dose	Strength	Composition and Remarks
Liquor Hydrargyri Perchloridi.	30–60 m.	0·1 per cent. (1 in 1000)	A clear, colourless solution of Mercuric chloride (Corrosive Sublimate) in Distilled water. The solution should be stored protected from light.
Liquor Quininæ Ammoniatus.	30–60 m.	2 per cent.	Corresponds to the Ammoniated Tincture of Quinine B.P. 1914. A clear, colourless solution, with ammoniacal odour and bitter taste. Composed of Quinine sulphate, Dilute Solution of ammonia, and Alcohol 60 per cent. When diluted with water, quinine is precipitated. A popular prophylactic against colds and influenza.
Liquor Hydrogenii Peroxidi.	30–120 m.	3 per cent.	Hydrogen Peroxide. A clear, colourless solution with a slightly acid taste. Should be stored in a bottle closed with a glass stopper or paraffined cork, protected from light, and kept in a cool place. The 3 per cent. solution contains 10 volumes of available oxygen. Antiseptic. Deodorant.
Liquor Ammonii Acetatis Dilutus.	¼–1 fl. oz.	7·2 per cent.	A 1 in 8 dilution of the stronger liquor.
Liquor Magnesii Bicarbonatis.	1–2 fl. oz.	2–5 per cent.	Fluid Magnesia. A clear, colourless, alkaline fluid. Antacid.
Liquor Calcii Hydroxidi	1—4 fl. oz.	1 per cent.	Lime Water. A solution of Calcium Hydroxide in Distilled water. The hydroxide is present in excess and it does not at all dissolve, but the solution should contain not less than 0·15 per cent. A clear, colourless alkaline solution.

Liquor	Strength	Composition and Remarks
	Eleven No-dose Liquors.	
Liquor Epispasticus . .	0·4 per cent.	Blistering Fluid. Composed of Cantharidin, Castor oil, Colophony and Acetone. A colourless liquid with odour of Acetone. Vesicant.
Liquor Sodæ Chlorinatæ Chirurgicalis.	0·5 to 0·55 per cent. chlorine.	Dakin's Solution. Chlorinated lime, Sodium carbonate, Boric acid, and Distilled water. Made by dissolving sodium carbonate in distilled water and adding, with constant stirring, to previously powdered chlorinated lime. Shake occasionally during 20 minutes, set aside for a further 10 minutes, decant, and filter. To the clear filtrate add the boric acid and shake till dissolved. Must be freshly prepared. A valuable antiseptic solution.
Liquor Sodii Chloridi Physiologicus.	0·9 per cent.	Normal Saline. A simple solution of sodium chloride in distilled water, isotonic with the blood serum. Used intravenously to counteract shock and as a temporary replacement for blood lost by hæmorrhage. The solution may be sterilized by heating in an autoclave, by Tyndallization or filtration.
Liquor Plumbi Subacetatis Dilutus.	1·25 per cent. stronger liquor.	Goulard's Lotion. Similar in appearance and properties to the stronger liquor. Should be freshly diluted with recently boiled and cooled distilled water. Tap water gives a cloudy solution due to precipitation.
Liquor Potassii Hydroxidi.	5 per cent.	Liquor Potassæ. A clear, colourless, alkaline solution. Should be stored in green glass bottles. Used for the saponification of fats and fixed oils.
Liquor Iodi Fortis . .	10 per cent.	(See under the Iodine Liquors.)
Liquor Picis Carbonis	20 per cent.	Solution of Coal Tar. Is a 20 per cent. solution of Coal tar saponified by an alcoholic solution of Quillaia bark. A dark brown, tarry solution.

The Solutions—*continued*

Liquor	Strength	Composition and Remarks
Liquor Plumbi Subacetatis Fortis ..	25 per cent.	Goulard's Extract. Composed of Lead acetate, Lead monoxide, and Distilled water. Clear, colourless, alkaline liquid. Sweetish, astringent taste. Becomes turbid on exposure to air (by absorption of carbon dioxide) or on mixing with tap water. Astringent.
Liquor Ammoniæ Fortis.	32·5 per cent.	A concentrated solution of Ammonia gas in Distilled water. A colourless liquid, with a pungent, choking odour. Strongly alkaline and corrosive. Blisters the skin and mucous surfaces.
Liquor Formaldehydi	37–41 per cent.	Formalin solution. A colourless, aqueous solution of formaldehyde gas. Pungent, irritant odour and burning taste. Antiseptic.
Liquor Cresolis Saponatus.	50 per cent.	Lysol. A saponified Cresol solution composed of Cresol, Linseed oil, Potassium hydroxide, and Distilled water. An amber or reddish-brown liquid, with an odour of cresol. Mixes in all proportions with water and alcohol. Disinfectant and antiseptic.

The Lotion (1)

The B.P. lotion is a mercurial preparation known as Black Wash. It contains black Mercurous Oxide in suspension and is used as an application to syphilitic lesions.

Lotio Hydrargyri Nigra. 0·7 per cent. Mercurous chloride (Calomel), Glycerin and Lime water.

The Honeys (4)

The Honeys of the B.P. are syrupy preparations having a basis or vehicle of honey.

Preparation of Honey. Most flowers contain a sugary liquid called nectar, which is secreted by glands situated at the base of the petals. Bees suck up this fluid and store it temporarily in a distended portion of the gullet (corresponding

to the " crop " in the fowl). Here it is acted upon by a ferment—**invertin**—which converts the cane sugar of the nectar into a mixture of invert sugars, mostly dextrose and lævulose. This invert sugar is deposited in the hive and serves as food for the young bees. The honey is collected and purified.

Honey	Dose	Strength	Composition and Remarks
Mel Depuratum	No dose.	Specific gravity 1·36.	Pure honey, melted, purified by depuration, strained, and adjusted to specific gravity 1·36 by addition of water. A pale yellowish, syrupy liquid. Becomes solid and crystalline in the cold. Aromatic odour; sweet taste.
Mel Boracis ..	No dose.	10 per cent.	Borax, Glycerin, and Honey. Antiseptic. A useful application in infantile " thrush."
Oxymel ..	30–120 m.	—	Acetic acid, Distilled water and Honey.
Oxymel Scillæ.	30–60 m.	5 per cent. squills.	Squills, Acetic acid, Distilled water, and Honey. Expectorant.

The Mixtures (2)

Mixture	Dose	Strength	Composition and Remarks
Mistura Magnesii Hydroxidi.	60–240 m.	8·25 per cent.	Cream of Magnesia. Magnesium sulphate, Sodium hydroxide, Light magnesium oxide, Distilled water. A suspension of Magnesium hydroxide in water. Antacid and purgative.
Mistura Sennæ Composita.	1–2 fl. oz.	25 per cent. Mag. Sulph.	Black Draught. Magnesium sulphate, Liquid extract of liquorice, Compound tincture of cardamoms, Aromatic spirit of ammonia. Fresh infusion of senna.

The Mixtures—*continued*

Mixture	Dose	Strength	Composition and Remarks
			Dissolve magnesium sulphate in warm fresh infusion, add the liquid ingredients, and make up to volume with infusion. Purgative.

The Mucilages (2)

Mucilages are thick liquid preparations, being solutions of gum in water. They are chiefly used to emulsify oils and resins, and to suspend insoluble powders in mixtures.

Mucilage	Dose	Strength	Composition and Remarks
		Per cent.	
Mucilago Acaciæ.	60–240 m.	40	Acacia gum dissolved in Chloroform water, which acts as a preservative. Rapidly rinse the gum in cold water to free it from dust, then dissolve in chloroform water, in a closed vessel. Strain.
Mucilago Tragacanthæ	60–240 m.	1¼	Tragacanth, Alcohol, and Chloroform water. Rinse the bottle round with the alcohol, add the powdered gum and shake to diffuse. Add the chloroform water as quickly as possible and shake vigorously.

The Eye Ointments (Oculenta) (7)

Ointments specially prepared for the eyes (Oculenta) are new to the B.P.

The particular base with which these preparations are to be made is prepared as follows :

90 parts of yellow soft paraffin and 10 parts of wool fat are melted together, and filtered whilst hot through coarse filter paper held in a hot-water funnel. The mixture is sterilized by heating in a hot-air oven at 150° C. for one hour. Note that yellow soft paraffin is preferred to the white variety ;

during the bleaching of the latter substance the sulphur dioxide employed may be incompletely removed, which would result in an irritant base.

This base should be used for the preparation of all eye ointments, the active ingredient being added as follows :

Alkaloidal Salts. The amount required for 100 grammes of the preparation is placed in a sterilized mortar, and the smallest quantity of distilled water in which it will dissolve is added. Then gradually incorporate sufficient of the melted base to produce 100 grammes, and continue trituration until cold.

Drugs other than Alkaloidal Salts. Weigh out sufficient of the drug for 100 grammes of the preparation, place in a sterilized mortar, and triturate with a very little of the melted base until quite smooth. Gradually add sufficient of the base to produce 100 grammes, and continue the trituration until cold.

The choice of drug to be incorporated, and the percentage strength, will be stated by the prescriber, but in the case of the following drugs, if no particular strength is specified, the percentage shall be as stated in the following list:

Oculentum	Strength	Active Ingredient
	Per cent.	
Oculentum Hyoscinæ	0·125	Hyoscine hydrobromide.
Oculentum Physostigminæ.	0·125	Physostigminæ salicylate.
Oculentum Atropinæ cum Hydrargyri Oxido.	0·125 1	Atropine sulphate, Yellow mercuric oxide.
Oculentum Atropinæ	0·25	Atropine sulphate.
Oculentum Cocainæ	0·25	Cocaine hydrochloride.
Oculentum Hydrargyri Oxidi.	1	Yellow mercuric oxide.
Oculentum Iodoformi	4	Iodoform.

Eye ointments are directed to be kept in small, well-closed containers, protected from light. The best means of dispensing to conform with these conditions is in collapsible tubes made of pure tin.

The Oils (31)

The oils of the B.P. may conveniently be divided into two groups :

(1) Fixed or Expressed Oils (12).
(2) Volatile or Essential Oils (19).

Fixed or Expressed Oils (12)

These oils are extracted from the seeds or fruits of plants, or from certain animal tissues, by expression (simple pressure). The seeds, etc., are placed in a large vat, subjected to forceful pressure, and the crude oil flows out. Only gentle heat may be used, if absolutely necessary, as such oils cannot be heated beyond a certain temperature without undergoing decomposition. On keeping, fixed oils tend to become rancid, that is, they develop acidity.

From a chemical point of view, fixed oils may be regarded as salts formed by the interaction of glycerin with one or other of the fatty acids—Oleic, Stearic, or Palmitic acid.

Oleum Morrhuæ (Cod Liver Oil) is the only official oil from an animal source.

General Properties of Fixed Oils.

(1) Thick, yellowish oils, with a rather unpleasant, rancid odour.

(2) Insoluble in water ; soluble in ether, chloroform and volatile oils.

(3) Non-volatile ; non-inflammable.

(4) When treated with a caustic alkali, a soap is formed, thus :

Olive Oil (Glyceryl oleate)	and +	Caustic Potash (Potassium hydroxide)	give gives	Soap (Potassium oleate)	and +	Glycerin. (Glyceryl hydroxide).

Oleum Iodisatum. Iodized Oil. No dose.

Is the fixed oil from poppy seeds which has been iodized by treatment with hydriodic acid. It contains 39 to 41 per cent. of combined iodine.

Colourless or pale yellow, clear, oily fluid ; odour resembling garlic, taste bland and oily. On exposure to air and sunlight it decomposes, and develops a dark brown colour. It is distributed in previously sterilized containers which are filled as completely as possible and sealed so as to exclude bacteria. Should be protected from light.

Employed as a contrast medium in X-ray work (particularly of the chest) as an aid to diagnosis.

A similar preparation is sold under the trade name of Lipiodol.

Oleum Theobromatis. Cocoa Butter. Cacao Butter. No dose.

A yellowish-white, solid fat. Odour resembling that of cocoa ; taste bland and agreeable. Used as a suppository base.

Oleum Hydnocarpi. Hydnocarpus Oil.

Dosage. By mouth 5 to 15 minims gradually increasing to 60 minims.

By subcutaneous or intramuscular injection, 30 minims gradually increasing to 75 minims.

A yellowish or brownish-yellow oil, or soft cream-coloured fat, expressed from the fresh, ripe, Hydnocarpus seeds. Slight odour ; acrid taste. Employed by mouth or injection in the treatment of leprosy. Has replaced the Chaulmoogra Oil of the B.P. 1914.

Oleum Hydnocarpi Æthylicum. Ethyl Esters of Hydnocarpus Oil.

Dosage. As for Hydnocarpus Oil.

A colourless or pale yellowish, mobile liquid, prepared by treating the fatty acids of Hydnocarpus oil with alcohol and subsequent purification.

The oil may be sterilized by heating in an autoclave, before injection.

Oleum Morrhuæ. Cod Liver Oil.

Dosage. Prophylactic, 15–30 minims three times daily. Therapeutic, 45–90 minims three times daily.

Strength. One gramme contains not less than 600 units of vitamin A activity and not less than 85 units of vitamin D activity.

Expressed from fresh cod livers at a temperature not exceeding 85° C., and from which solid fats have been removed by cooling to about 0° C., and filtering under pressure.

A pale yellow oil, with slightly fishy odour and taste. In addition to vitamins A and D it contains traces of iodine, bromine, and phosphorus. Should be stored in well-filled, well-closed containers, and protected from light.

Nutritive : especially useful in the treatment of rickets and other wasting diseases. Administered as the plain oil, emulsion, or in combination with Extract of Malt. A good building up food for weakly children, and can be introduced into the system by rubbing the oil into the skin, an important point when treating delicate children with weak digestive powers.

Oleum Ricini. Castor Oil. Dose : 60 to 240 minims.

Nearly colourless or pale yellow oil expressed from the castor oil seeds. Slight odour ; oily taste.

Emollient externally. Cathartic internally, given as the plain oil or in capsule.

Oleum Amygdalæ. Almond Oil. Dose : ½ to 1 fl. oz.

A pale yellow oil expressed from the seeds of bitter or sweet almonds. Little odour ; bland, nutty taste.

Oleum Arachis. Nut Oil, Ground Nut Oil, Pea Nut Oil. Dose : ½–1 fl. oz.

Oleum Sesami. Sesame Oil. Dose : ½–1 fl. oz.

Used as a substitute for olive oil in parts of the Empire where the latter is not readily procurable.

Oleum Olivæ. Olive Oil ; Sweet Oil. Dose : ½–1 fl. oz.

A pale yellow or greenish-yellow oil expressed from ripe olives. Slight odour ; bland taste. Demulcent and emollient externally. Gentle laxative internally.

Oleum Lini. Linseed Oil. Dose : ½–1 fl. oz.

Yellowish-brown oil, with a rancid odour. Gradually thickens on exposure to air, forming a hard transparent varnish. In B.P. preparations the boiled oil must not be used. Its only official use is as a constituent of Lysol (Liquor Cresolis Saponatus).

Oleum Gossypii Seminis. Cottonseed Oil. Dose : ½–1 fl. oz.

A pale yellow oil expressed from cotton seed.

Volatile or Essential Oils (19)

Volatile oils are obtained by distillation from various parts of plants. They are very different in chemical composition from fixed oils, and their flavour or aroma is caused by the presence of small amounts of such substances as alcohols, phenols, ketones, etc.

All the official volatile oils are products of distillation except **oil of lemon,** which is contained in glands in the outer peel of the fruit, and which is expressed therefrom by expert digital manipulation. Oil of Cade is obtained by a process of destructive distillation.

General Properties.

(1) Mobile liquids of various colours, possessing a pleasant, fragrant, or aromatic odour.

(2) Sparingly soluble in water ; freely soluble in alcohol.

(3) Completely volatilized by heat leaving no residue; inflammable.

(4) Do not form soaps when treated with caustic alkalis.

Oil	Dose	Properties and Remarks
Oleum Anethi ..	1–3 m.	Colourless or pale yellow oil, with a sweet aromatic taste. Carminative.
Oleum Anisi	1–3 m.	Colourless or pale yellowish oil, with a sweet aromatic taste. Carminative.
Oleum Cajuputi ..	1–3 m.	Bluish-green oil, with a pungent, camphoraceous odour and taste. Antispasmodic. Antiseptic.
Oleum Cari	1–3 m.	Colourless or pale yellow oil; sweet aromatic taste. Carminative. Antispasmodic.
Oleum Caryophylli ..	1–3 m.	Oil of Cloves. Pale yellow oil becoming reddish-brown with long keeping. Heavier than water. Pungent, aromatic odour; burning taste. Carminative. Antispasmodic. Used locally as an anodyne for toothache.
Oleum Cinnamomi ..	1–3 m.	A yellow oil turning reddish with age. Agreeable, aromatic odour; sweet, spicy taste. Carminative. Antispasmodic.
Oleum Coriandri ..	1–3 m.	Colourless or pale yellow; sweet, aromatic taste.
Oleum Eucalypti ..	1–3 m.	Eucalyptus Oil. Colourless, or pale yellow, mobile oil. Aromatic, camphoraceous odour; pungent taste with an after-sensation of cold. Valuable antiseptic and deodorant. Often used in the form of an inhalation or spray for influenza and bronchitis.
Oleum Lavandulæ ..	1–3 m.	Pale yellow oil. Fragrant odour; bitter taste.
Oleum Limonis ..	1–3 m.	Pale yellow oil. Fragrant odour; warm, rather bitter taste.
Oleum Menthæ Piperitæ.	1–3 m.	Oil of Peppermint. Almost colourless, mobile oil. Pungent, aromatic odour and taste followed by sensation of cold. Contains the stearoptene Menthol. Carminative. Antispasmodic.

Volatile or Essential Oils—*continued*

Oil	Dose	Properties and Remarks
Oleum Myristicæ ..	1–3 m.	Oil of Nutmeg. Colourless or pale yellow; aromatic, spicy odour and taste. A flavouring agent in Sal Volatile and Ammoniated Tincture of Valerian.
Oleum Rosmarini ..	1–3 m.	Colourless or pale yellow oil. Taste warm and camphoraceous. Carminative internally; also employed in washes and lotions as a stimulant to hair growth.
Oleum Terebinthinæ	3–10 m. and 120–240 m. (anthelmintic)	Oil of Turpentine. A colourless mobile liquid. Characteristic, not unpleasant odour; taste pungent and rather bitter. *Internally*—Diuretic, antiseptic, expectorant, anthelmintic. May be given in emulsion made with acacia, or in capsules. *Externally*—rubefacient. Turpentine enema is used to relieve flatulent distension.
Oleum Chenopodii ..	3–15 m.	Oil of American Wormseed. Colourless, or pale yellow oil, with a disagreeable, penetrating, camphoraceous odour, and a bitter, burning taste. Anthelmintic for roundworm and hookworm, usually given in capsule form, or on lump sugar, and followed after two hours by a purging dose of Epsom salts.
Oleum Santali ..	5–15 m.	Sandal Wood Oil. Pale yellow, thickish oil. Peculiar, aromatic odour; unpleasant taste. Given in emulsion or capsule form for gonorrhœa.
Oleum Santali Australiensis.	5–15 m.	Similar in appearance and properties to Oleum Santali, but is not so thick.

Two No-Dose Volatile Oils

Oleum Abietis ..	No dose.	Oil of Pine. Colourless or pale yellow oil. Aromatic, "pine" odour, and pungent taste.

Oil	Dose	Properties and Remarks
Oleum Abietis—*contd.*		*Internally*—Antiseptic and expectorant. Used in inhalations and sprays. *Externally*—Rubefacient.
Oleum Cadinum ..	No dose.	Oil of Cade. Juniper Tar Oil. A brownish-black, oily liquid. Tarry odour; bitter, acrid taste. A stimulating application in scaly skin diseases such as psoriasis and eczema.

The Pills (7)

Pills are soft, plastic masses, containing extracts, powdered drugs, and other active medicinal agents, made into a mass with suitable binding agents (excipients).

Most of the masses are dark brown in colour and are hardly distinguishable one from the other, but Mercury Pill is bluish-grey in colour. Aloes Pill (Caraway), Compound Colocynth Pill (Cloves), and Compound Rhubarb Pill (Peppermint), may be distinguished by the characteristic odour of the volatile oils they contain.

The general dose is 4 to 8 grains, and the only exception is Pilula Ferri Carbonatis (Blaud's Pill), the dose of which is 5 to 30 grains. The full dose cannot, of course, be given in one pill, and it is usual to take one or more five-grain pills as directed.

Pill	Dose	Strength	Composition
Pilula Aloes ..	4–8 grs.	58 per cent.	Aloes. Hard soap. Oil of caraway. Syrup of liquid glucose.
Pilula Aloes et Asafœtidæ.	4–8 grs.	30 per cent.	Aloes. Asafetida. Hard soap. Syrup of liquid glucose.
Pilula Aloes et Ferri.	4–8 grs.	20 per cent. aloes, 10 per cent. iron.	Aloes. Exsiccated ferrous sulphate. Cinnamon. Cardamom. Ginger. Syrup of liquid glucose.

The Pills (7)—*continued*

Pill	Dose	Strength	Composition
Pilula Coloeynthidis et Hyoscyami.	4–8 grs.	12·5 per cent. of each.	Colocynth. Aloes. Scammony resin. Curd soap. Oil of cloves. Dry extract of hyocyamus. Syrup of liquid glucose.
Pilula Hydrargyri.	4–8 grs.	33 per cent. Hg.	Blue Pill. Mercury. Liquorice. Glycerin. Syrup. Liquid glucose.
Pilula Rhei Composita.	4–8 grs.	25 per cent.	Rhubarb. Aloes. Myrrh. Hard Soap. Oil of peppermint. Syrup of liquid glucose.
Pilula Ferri Carbonatis.	5–30 grs.	20 per cent.	Blaud's Pill. Exsiccated ferrous sulphate. Exsiccated sodium carbonate. Tragacanth. Acacia. Liquid glucose. Distilled water. (Contains not less than 20 per cent. ferrous carbonate.)

The Powders (9)

This group consists mainly of admixtures of vegetable drugs in fine powder. Seidlitz Powder (Pulv. Effervescens Comp.), however, is a mixture of non-vegetable powders, and consists of two separate powders, one in blue and the other in white paper. The contents of the blue paper are dissolved in water, the contents of the white paper added, stirred rapidly, and taken while effervescing. "Grey Powder" also is non-vegetable, being a trituration of metallic Mercury with Chalk.

Powder	Dose	Strength	Composition.
Hydrargyrum cum Creta.	1–5 grs.	1 in 3.	Grey Powder. Not a mercury salt, but a trituration of metallic Mercury with Chalk (1 in 3). Intestinal antiseptic. Purgative. Diuretic. A safe preparation for children. Insoluble.
Pulvis Ipecacuanhæ et Opii.	5–10 grs.	10 per cent. opium.	Dover's Powder. Powdered ipecacuanha. Powdered opium. Lactose. A fawn-coloured powder. A favourite diaphoretic in early influenza and feverish colds.
Pulvis Cretæ Aromaticus cum Opio.	10–60 grs.	2½ per cent. opium.	Aromatic Powder of Chalk. Powdered opium. Astringent and antispasmodic—small doses can be given to children.
Pulvis Cretæ Aromaticus.	10–60 grs.	25 per cent.	Chalk. Cinnamon. Nutmeg. Clove. Cardamom. Sucrose. A pale brown aromatic powder. Mild astringent.
Pulvis Jalapæ Compositus.	10–60 grs.	30 per cent.	Jalap. Ginger. Cream of Tartar.
Pulvis Rhei Compositus.	10–60 grs.	25 per cent.	Gregory's Powder. Rhubarb. Heavy magnesium carbonate. Light magnesium carbonate. Ginger. A pale yellowish powder becoming reddish when damp.
Pulvis Tragacanthæ Compositus.	10–60 grs.	15 per cent.	Tragacanth. Acacia. Starch. Sucrose. A white powder used as a suspending agent in mixtures, and as a binding agent in pills.

The Powders—*continued*

Powder	Dose	Strength	Composition.
Pulvis Glycyrrhizæ Compositus.	60–120 grs.	16 per cent.	Compound Liquorice Powder. Senna. Liquorice. Sublimed sulphur. Fennel. Sucrose.
Pulvis Effervescens Compositus.	193 grs.	—	Seidlitz Powder. **In Blue Paper** (No. 1 *Powder*). Rochelle Salt (Sodium Potassium Tartrate), 116 grs. Sodium bicarbonate, 38½ grs. **In White Paper** (*No.* 2) *Powder*). Tartaric Acid, 38½ grs.

The Spirits (8)

These are clear, alcoholic preparations, the majority consisting of a volatile oil dissolved in alcohol 90 per cent. They are colourless or very pale yellow, except Spirit of Cajuput which is greenish. They are all intended for internal administration with the exception of Spiritus Methylatus Industrialis (Industrial Methylated Spirit).

Two spirits are compound—Spiritus Ammoniæ Aromaticus and Spiritus Ætheris Nitrosi—these are made by a process of distillation; all the remainder are simple solutions of the active ingredient in alcohol.

Spirits which contain a volatile oil, and also Spirit of Camphor, become turbid on dilution with water, owing to the precipitation of the dissolved substance on the change of vehicle.

Spirit	Dose	Strength	Composition.
Spiritus Chloroformi.	5–30 m.	5 per cent.	Simple solution of chloroform in Alcohol (90 per cent.).
Spiritus Camphoræ.	5–30 m.	10 per cent.	Camphor and Alcohol (90 per cent.).
Spiritus Cajuputi	5–30 m.	10 per cent.	Oil of Cajuput and Alcohol (90 per cent.).
Spiritus Menthæ Piperitæ.	5–30 m.	10 per cent.	Oil of Peppermint and Alcohol (90 per cent.).

Spirit	Dose	Strength	Composition
Spiritus Ætheris	15–60 m.	33 per cent.	Simple solution of Æther in Alcohol (90 per cent.). Used as the vehicle of Ethereal Tincture of Lobelia.
Spiritus Ætheris Nitrosi.	15–60 m.	1·25 to 2·5 per cent. of Ethyl nitrite.	Sweet Spirits of Nitre. A colourless liquid with a penetrating, apple-like odour. Acid to litmus; very prone to decomposition. Prepared by distilling a mixture of alcohol (90 per cent.), sulphuric and nitric acids, and copper turnings, and collecting the distillate in a receiver containing alcohol. Diuretic. Diaphoretic. Vaso-dilator.
Spiritus Ammoniæ Aromaticus.	15–60 m.	2½ per cent. Ammon. Carb. 5 per cent. Liq. Ammon. Ft.	Sal Volatile. A clear spirit containing Ammonium carbonate, Strong solution of ammonia, Oil of Lemon, Oil of Nutmeg, Distilled water, Alcohol (90 per cent.). Stimulant.
Spiritus Methylatus Industrialis.	No dose.	(See the table of The Alcohols.)	

The Suppositories (7)

Suppositories are small, conical masses, weighing about 15 grains, intended for the introduction of remedies per rectum. They consist of active ingredients incorporated with a fatty basis of oil of Theobroma. This solid oil is particularly suitable for suppository making as it does not become rancid, and rapidly melts at the normal body temperature. The melting point of the suppository mass may be raised to 37° if necessary by the addition of White Beeswax.

Glycerin suppository is made with a Gelatin basis, in various sizes, weighing from 15 to 120 grains.

The B.P. indicates that the dose of active remedy should be stated by the prescriber, but in the case of the following

suppositories, if the dose is not mentioned by the prescriber, the dose or strength will be as shown in the following list :

Suppository	Strength	Composition
Suppositorium Belladonnæ.	$\frac{1}{60}$ gr. alkaloids in each.	Evaporated liquid extract of Belladonna, and Oil of Theobroma.
Suppositorium Morphinæ.	$\frac{1}{4}$ gr. in each.	Morphine hydrochloride and Oil of Theobroma.
Suppositorium Phenolis.	1 gr. in each.	Phenol and Oil of Theobroma.
Suppositorium Acidi Tannici.	3 grs. in each.	Tannic acid and Oil of Theobroma.
Suppositorium Iodoformi.	3 grs. in each.	Iodoform and Oil of Theobroma.
Suppositorium Plumbi cum Opio. ..	3 grs. lead acetate and 1 gr. opium in each.	Lead acetate, Opium, and Oil of Theobroma.
Suppositorium Glycerini.	70 per cent.	Gelatin, Glycerin, and Distilled water. Soak the gelatin in water for 5 minutes or until thoroughly softened, drain well, add the glycerin and dissolve on a water bath. Adjust the final weight by evaporation of water.

The Syrups (12)

Syrups are strong aqueous solutions of Sucrose (Cane Sugar), containing medicinal ingredients. To some extent, sugar acts as a preservative as well as a sweetening agent, and in the case of the three Syrups of Iron it also inhibits oxidation of the iron salts.

Dosage :

2 no dose Syrups (Syrupus and Syrupus Glucosi Liquidi).
2 at 30–60 m. (Easton's and Squills).
8 at 30–120 m.

The Three Syrups of Iron

Syrupus Ferri Iodidi.

Dose : 30–120 m.

Strength :

5 per cent. Ferrous iodide, or $7\frac{1}{2}$ grs. in 120 m.

Composition :

Iron wire,
Iodine,
Dilute hypophosphorous acid,
Distilled water,
Syrup.

Preparation. Place the Iron wire, Iodine, and a part of the water into a flask, and warm gently to start the reaction. When the reaction is complete (when the brown froth on the surface turns white), heat on a water bath for 5 minutes, and whilst still hot, filter into the dilute acid. Rinse the flask and filter paper with a little boiling distilled water and add syrup to volume. The change in colour of the solution from brown to white shows that all the free iodine has been converted into ferrous iodide. The hypophosphorous acid is present as a preservative, and prevents decomposition of the ferrous salt.

Syrupus Ferri Phosphatis Compositus. Parrish's Chemical Food.

Dose :

30–120 m.

Strength :

120 m. contain $1\frac{1}{6}$ grain Ferrous phosphate, or 0·9 per cent.

Composition :

Iron wire,
Phosphoric acid,
Calcium carbonate,
Potassium bicarbonate,
Sodium phosphate,
Cochineal,
Sucrose,
Orange flower water,
Distilled water.

Preparation :

(i) Dilute a portion of the acid with water, add the iron wire, and heat gently on a water bath until dissolved.

(ii) Add this solution to calcium carbonate, potassium bicarbonate, and sodium phosphate previously triturated with the remainder of the acid and a little water.

(iii) Boil cochineal with water for 15 minutes, add sucrose, boil for 15 minutes, cool and strain.

(iv) Filter into the syrup the solution at (ii), add the orange flower water, and pass sufficient distilled water through the filter to produce the required volume. Set aside at least 48 hours, and filter if necessary.

Syprus Ferri Phosphatis cum Quinina et Strychnina.
Easton's Syrup.

Dose :
30–60 m.

Strengths :
In each 60 minims—1 gr. Ferrous phosphate, $\frac{4}{5}$ gr. Quinine sulphate, $\frac{1}{60}$ gr. Strychnine hyd.

Composition :
Iron wire,
Phosphoric acid,
Strychnine hydrochloride,
Quinine sulphate,
Syrup,
Glycerin,
Distilled water.

Preparation :
(i) Dilute the acid with twice the volume of distilled water, add this to the iron wire contained in a flask, and heat on a water bath until the iron is completely dissolved.

(ii) Triturate the strychnine and quinine with water, add the acid solution at (i) and dissolve.

(iii) Filter the solution into the mixture of syrup and glycerin, and pass sufficient distilled water through the filter to produce required volume.

Syrup	Dose	Strength	Composition
		Two No-Dose Syrups.	
Syrupus.	No dose.	66·7 per cent.	Sucrose and Distilled water.
Syrupus Glucosi Liquidi.	No dose.	33·3 per cent.	Liquid Glucose and Syrup.
		Two 30–60 minim Syrups	
Syrupus Scillæ.	30–60 m.	45 per cent.	Vinegar of Squills, Sucrose, Distilled water.
Syrupus Ferri Phosphatis cum Quinina et Strychnina.	30–60 m.		

Powder	Dose	Strength	Composition.
Eight 30–120 minim Syrups.			
Syrupus Tolutanus.	30–120 m.	2½ per cent.	Balsam of Tolu, Sucrose, and Distilled water.
Syrupus Zingiberis.	30–120 m.	5 per cent.	Strong tincture of Ginger and Syrup.
Syrupus Limonis.	30–120 m.	6 per cent.	Lemon peel, Alcohol, Citric acid and Syrup (maceration process).
Syrupus Aurantii	30–120 m.	12½ per cent.	Tincture of Orange and Syrup.
Syrupus Pruni Serotinæ.	30–120 m.	15 per cent.	Wild Cherry Bark, Sucrose, Glycerin, Distilled water (percolation process).
Syrupus Sennæ	30–120 m.	25 per cent.	Liquid extract of Senna, Oil of Coriander, Sucrose and Distilled water.
Syrupus Ferri Iodidi.	30–120 m.		
Syrupus Ferri Phosphatis Compositus.	30–120 m.		

The Tablet (1)

Tabella Glycerylis Trinitratis. Tabellæ Trinitrini. Tablet of Nitroglycerine.

Dose. 1 or 2 tablets.

Contains $\frac{1}{130}$ grain of Glyceryl trinitrate in a chocolate basis.

Action. Vaso-dilator.

The Tinctures (34)

Tinctures are alcoholic preparations containing the active principles of the more important crude drugs in solution. They are all of vegetable origin, except tincture of Cochineal. Ethereal Tincture of Lobelia is exceptional in that it has a vehicle of Spirits of Ether.

Methods of Preparation.

(1) **Simple solution.** Eight tinctures are made by mixing or dissolving an active ingredient in the alcoholic vehicle.

(2) **Maceration.** The bruised or powdered drug is placed in well-stoppered glass vessel together with the whole of the vehicle (called the **menstruum**) and allowed to stand for 7 days, during which time it is shaken occasionally. At the

end of this time the clear supernatant liquid is poured off and reserved, and the exhausted crude drug (known as the **marc**) is pressed in a tincture press to obtain a further volume of liquid. The expressed and the reserved liquids are mixed together, and clarified by subsidence or filtration. The resulting liquid is the official tincture. Ten tinctures are made by this process.

Tinctures prepared by the simple maceration process are not made up to any definite volume, but a further six tinctures are obtained by maceration and subsequent adjustment to volume. This latter process is employed with drugs which yield a gummy or resinous residue which cannot be subjected to expression, and the final stage consists of repeated washings with menstruum to produce a measured volume of tincture.

(3) **Percolation.** The powdered drug is moistened with a prescribed portion of the menstruum and set aside in a closed vessel for 4 hours, to swell the drug and allow the solvent to penetrate the tissues. It is then packed into a percolator, and sufficient of the menstruum added to thoroughly saturate the ingredients and leave about a 1 in. layer above. When the liquid begins to drip through, close the vent (to prevent further percolation) and allow to macerate for 24 hours. Then percolation is begun and proceeded with until three-quarters of the required volume has been reached, further quantities of menstruum being added as required. Reserve the liquid in the percolator, remove and press the marc. Mix the two liquids, make up to the required volume, and strain or filter if necessary.

The percolator used in the process consists of an upper conical portion which fits into the neck of a lower receiving vessel. In old type vessels it is necessary to tie a piece of muslin over the lower end of the cone-shaped portion to prevent the drug from falling through. Modern types are provided with a drilled tap, which allows percolation to be started or stopped at will. The packing of the drug must be performed very carefully and evenly, otherwise the menstruum will trickle through the less dense portions and the product will be under strength. During the preliminary 24 hours of maceration, the air vents cut in the neck of the percolator are turned away from each other ; this forms an air lock, and back pressure of air prevents the liquid from passing through into the receiver. When it is time for percolation to begin, the air vents are made to coincide (or the drilled tap is turned on) and the liquid passes through. The rate of percolation may be regulated by fine adjustment of the air vents, and should be so adjusted that the liquid passes through in a

series of drops ; a faster rate than this will mean a weakened product.

Tincture of Strophanthus undergoes preliminary maceration and percolation with light petroleum to dissolve out fats. The partially exhausted drug is then dried and the process repeated with alcohol to produce a tincture. There is no petroleum in the finished product.

Dosage of Tinctures.

2–5 m. Tincture of Strophanthus.
5–10 m. Strong Tincture of Ginger.
5–15 m. Tincture of Capsicum.
,, Cochineal.
,, Lobelia (Ethereal).
,, Colchicum.
,, Digitalis (also 30–90 m. single dose).
5–30 m. Tinctures of Belladonna, Opium, Stramonium, and Squills.
10–30 m. Tinctures of Nux Vomica.
,, Ipecacuanha (emetic ½–1 fl. oz.).
30–60 m. the remaining 21 tinctures.

Standardized Tinctures. Twelve tinctures are standardized as to strength. Of these, ten are standardized by chemical assay, but the Tinctures of Digitalis and Strophanthus are adjusted to conform with a biological standard.

Twelve Standardized Tinctures.

Tincture	Dose	Strength	Composition
Tinctura Strophanthi.	2–5 m.	—	Adjusted to possess a degree of activity equal to that of a standard tincture kept in the National Institute for Medical Research, London.
Tinctura Digitalis.	5–15 m. and 30–90 m. single dose.	1 unit of activity in 15 minims.	Powdered Digitalis leaves and Alcohol.
Tinctura Colchici.	5–15 m.	0·03 per cent. Colchicine.	Liquid extract and Alcohol.
Tinctura Belladonnæ.	5–30 m.	0·03 per cent. alkaloids.	Belladonna leaves and Alcohol.
Tinctura Opii.	5–30 m.	1 per cent. Morphine.	Laudanum. Opium, Distilled water and Alcohol.

Twelve Standardized Tinctures—*continued*

Tincture	Dose	Strength	Composition.
Tinctura Stramonii.	5–30 m.	0·025 per cent. alkaloids.	Liquid extract and Alcohol.
Tinctura Nucis Vomicæ.	10–30 m.	0·125 per cent. Strychnine.	Liquid extract, Distilled water and Alcohol.
Tinctura Ipecacuanhæ.	10–30 m. and ½–1 fl. oz. emetic.	0·1 per cent. alkaloids.	Liquid extract, Dilute acetic acid, Glycerin, Distilled water and Alcohol. Replaces, and is to be dispensed in place of Vinum Ipecacuanhæ of the B.P. 1914.
Tinctura Cinchonæ.	30–60 m.	1 per cent. alkaloids.	Extract and Alcohol.
Tinctura Cinchonæ Composita.	30–60 m.	0·5 per cent. alkaloids.	(See under Compound Tinctures.)
Tinctura Hyoscyami.	30–60 m.	0·005 per cent. alkaloids.	Liquid extract and Alcohol.
Tinctura Opii Camphorata.	30–60 m.	0·05 per cent. Morphine.	Paregoric. Tinct. Camph. Co. Tincture of opium, Benzoic acid, Camphor, Oil of Aniseed and Alcohol.

Five Compound Tinctures

Tincture	Dose	Strength	Composition
Tinctura Cinchonæ Composita.	30–60 m.	0·5 per cent. alkaloids.	Extract Cinchonæ. Dried Bitter-Orange Peel, Serpentary, Cochineal, Alcohol.
Tinctura Cardamomi Composita.	30–60 m.	1·4 per cent.	Cardamoms, Caraway, Cinnamon, Cochineal, Glycerin, Alcohol.
Tinctura Benzoini Composita.	30–60 m.	10 per cent.	Friar's Balsam. Benzoin, Storax, Aloes, Balsam of Tolu, Alcohol.
Tinctura gentianæ Composita.	30–60 m.	10 per cent.	Gentian, Dried Bitter-Orange Peel, Cardamoms, Alcohol.

Tincture	Dose	Strength	Composition
Tinctura Rhei Composita.	30–60 m.	10 per cent.	Rhubarb, Cardamoms, Coriander, Glycerin, Alcohol.

The remainder of the tinctures are simple solutions of the active principles of the drug named in alcohol.

Tincture	Dose	Strength	Remarks
Tinctura Zingiberis Fortis.	5–10 m.	50 per cent.	Essence of Ginger.
Tinctura Capsici.	5–15 m.	5 ,,	
Tinctura Cocci.	5–15 m.	10 ,,	
Tinctura Lobeliæ Ætherea.	5–15 m.	20 ,,	Lobelia and Spirit of Ether.
Tinctura Scillæ.	5–30 m.	10 ,,	
Tinctura Asafœtidæ.	30–60 m.	20 ,,	
Tinctura Aurantii.	30–60 m.	25 ,,	
Tinctura Calumbæ.	30–60 m.	10 ,,	
Tinctura Catechu.	30–60 m.	20 ,,	Catechu, Cinnamon, Alcohol.
Tinctura Krameriæ.	30–60 m.	20 ,,	
Tinctura Limonis.	30–60 m.	25 ,,	
Tinctura Myrrhæ.	30–60 m.	20 ,,	
Tinctura Quassiæ.	30–60 m.	10 ,,	
Tinctura Quillaiæ.	30–60 m.	5 ,,	
Tinctura Senegæ.	30–60 m.	20 ,,	
Tinctura Tolutana.	30–60 m.	10 ,,	
Tinctura Valerianæ Ammoniata.	30–60 m.	20 ,,	Valerian, Oil of Nutmeg, Oil of Lemon, Dilute Solution of Ammonia, Alcohol.
Tinctura Zingiberis.	30–60 m.	20 per cent. of strong tincture.	

The Lozenges (6)

(Trochisci)

Lozenges are flat tablets containing active remedies incorporated in a sweet basis, and intended to dissolve slowly in the mouth.

Four of the lozenges are prepared from a general basis composed of sucrose, acacia, tincture of tolu and distilled water, but the lozenges of Phenol and Bismuth contain the necessary binding ingredients as a part of the recipe.

Method of Preparation. The ingredients, in fine powder, are mixed together as in making a pill mass, alkaloidal salts being dissolved in a little distilled water before being added. The soft mass is filled into shallow moulds and baked hard in a hot-air oven at a moderate temperature.

Lozenge	Strength and Composition
Trochiscus Krameriæ et Cocainæ.	1 gr. Dry Extract of Krameria $\frac{1}{20}$ gr. Cocaine Hydrochlor } in each.
Trochiscus Morphinæ et Ipecacuanhæ.	$\frac{1}{10}$ gr. Powdered Ipecacuanha $\frac{1}{32}$ gr. Morphine Hydrochlor } in each.
Trochiscus Acidi Tannici.	$\frac{1}{2}$ gr. Tannic Acid in each.
Trochiscus Krameriæ.	1 gr. Dry Extract of Krameria in each.
Trochiscus Phenolis.	$\frac{1}{2}$ gr. Phenol in each. Composition :— Liquefied Phenol, Acacia, Tragacanth, Citric acid, Carmine, Sucrose, Distilled water.
Trochiscus Bismuthi Composita.	$2\frac{1}{4}$ gr. Bismuth carbonate in each. Composition :— Bismuth carbonate, Heavy Magnesium carbonate, Calcium carbonate, Acacia, Sucrose, Oil of rose, Distilled water.

The Ointments (19)

(Unguenta)

Ointments are soft greasy preparations, composed of an active ingredient in intimate mixture with one or other of the ointment bases.

Ointment Bases.

Adeps. The purified internal fat of the pig. Fairly absorbent, and used for those ointments in which the active remedy is required to penetrate the skin. Its disadvantage is that it tends to become rancid.

Adeps Benzoinatus. Lard in which Benzoin to the extent of 3 per cent. has been allowed to digest at 60° for one hour. The liquid lard dissolves out a portion of the benzoic Acid of the Benzoin, which acts as a preservative by retarding the rancidity referred to above.

Adeps Lanæ. The purified fat of sheep's wool, freed from water. It keeps well and is particularly absorbent. It is an ingredient of Unguentum Simplex, and is added to certain ointments for the purpose of absorbing liquid ingredients.

Adeps Lanæ Hydrosus (Lanolin). Similar to Wool Fat but contains 30 per cent. water.

Paraffinum Molle, Unguentum Paraffini, Unguentum Simplex. The paraffin bases are practically unchangeable and are not subject to rancidity. They are not absorbed below the skin surface, and are suitable for ointments in which surface effect only is required.

Sevum. The internal abdominal fat of the sheep. Used to give a firmer consistence to Unguentum Hydrargyri. Employed in place of the Lard bases in India and the East.

Seven Ointments of Mercury and its Compounds

Ointment	Strength	Composition and Remarks
Unguentum Hydrargyri Ammoniati.	5 per cent.	White Precipitate Ointment. Ammoniated Mercury and Simple Ointment. Anti-parasitic.
Unguentum Hydrargyri Nitratis Forte.	6·7 per cent. Hg.	Mercury, Nitric acid, Olive Oil, and Lard. Astringent and antiparasitic.
Unguentum Hydyrargyri Compositum.	12 per cent. Hg.	Scott's Dressing. Mercury Ointment, Camphor, Olive oil, and Yellow Beeswax. Stimulant and resolvent.
Unguentum Hydrargyri Subchloridi.	20 per cent.	Calomel Ointment. Calomel and Simple Ointment. Alterative and resolvent Used as a prophylactic to venereal disease.
Unguentum Hydrargyri Nitratis Dilutum.	20 per cent. stronger ointment.	Strong Ointment of Mercuric nitrate diluted with Yellow Soft Paraffin.
Unguentum Hydrargyri Oleati.	25 per cent.	Oleated Mercury and Simple Ointment. Used to introduce mercury into the system through the skin by inunction.
Unguentum Hydrargyri.	30 per cent.	Blue Ointment. Blue Unction. Mercury, Suet and Benzoinated Lard. Used to introduce mercury into the system by inunction. Antisyphilitic and antiparasitic.

The Ointments—*contd.*

Ointment	Strength	Composition and Remarks
	Lard Base Ointment	
Unguentum Acidi Tannici.	20 per cent.	Tannic acid, Glycerin, Yellow Beeswax and Benzoinated Lard. Astringent in hæmorrhoids.
	Simple Base Ointments	
Unguentum Chrysarobini.	4 per cent.	Chrysarobin and Simple Ointment. Antiparasitic.
Unguentum Sulphuris	10 per cent.	Sublimed Sulphur and Simple Ointment. Antiparasitic.
Unguentum Zinci Oxidi.	15 per cent.	Zinc Oxide and Simple Ointment. Absorbent. A soothing application in eczema and other skin diseases.
	Paraffin Base Ointments	
Unguentum Acidi Salicylici.	2 per cent.	Salicylic acid and White Paraffin Ointment. Antiseptic.
Unguentum Phenolis	3 per cent.	Phenol, White Beeswax, Lard, Hard and Soft Paraffins (White). Antiseptic.
Unguentum Acidi Borici.	10 per cent.	Boric Acid and White Paraffin Ointment. Mild antiseptic.
Unguentum Capsici.	25 per cent.	Capsicum, Lard, Hard and Soft Paraffins. Rubefacient.
Unguentum Zinci Oleatis.	50 per cent.	Zinc Sulphate, Hard Soap, Distilled Water, White Soft Paraffin. Absorbent in moist eczematous conditions.
Unguentum Simplex	—	Wool Fat, Hard and Soft Paraffins. A base for other ointments.
Unguentum Paraffini	—	White Beeswax, Hard Paraffin, Soft Paraffin (Yellow or White). A base for other ointments.
Unguentum Aquosum	—	Distilled water, Borax, Olive oil, White Beeswax, White Soft Paraffin. Emollient.

ANTITOXIC SERA AND VACCINES

General.

Bacteria are minute vegetable organisms, of microscopic size, capable of extremely rapid reproduction.

During many years of research it has beeen established that certain diseases are caused by the invasion of the body by these organisms. Bacteria which are able to invade the body and thus cause disease in man are termed **pathogenic,** whilst those which are not invasive and are not capable of causing disease are termed **non-pathogenic.**

Bacteria of various kinds, both pathogenic and non-pathogenic, continually obtain access to the system, in food and drink, in the inspired air, and by way of the mucous and skin surfaces. In a healthy person most of the organisms are rapidly destroyed by the defensive mechanism such as the digestive juices of the stomach and intestines, the secretions of the air passages, and the white cells of the blood when the organisms have penetrated to the blood stream. Thus every person has a natural protective power or resistance to the invasion of disease-causing bacteria, and if this resistance is lowered by ill-nourishment, exposure to extremes of temperature, undue fatigue, or other adverse conditions, bacteria are able to invade and multiply in the tissues.

The action of bacteria in causing disease is specific ; for example, the *Bacillus anthracis* is only capable of causing Anthrax infections, and the *Corynebacterium diphtheriæ* in producing the lesions peculiar to Diphtheria.

Various products have been evolved with the object, either of raising the natural resistance of the body to the invasion of bacteria, or of destroying the organisms after they have entered the tissues. These products, according to their nature, are called **antitoxins** and **vaccines.**

The employment of these two products varies according to the object in view. The immunity conveyed by antitoxic sera is called " **passive immunity** " and is transient, lasting for about 10 to 14 days. Antitoxic sera are, therefore, usually employed in the **treatment** of bacterial infections. On the other hand, the immunity following the injection of a vaccine is termed " **active or acquired immunity** " and is very much more permanent, extending over a period of from one to two years. Vaccines are, therefore, employed as **preventive** or **prophylactic** agents.

Antitoxic Sera.

The symptoms of disease caused by a pathogenic organism may be the result of the actual presence and multiplication of the bacteria in the tissues, or by the secretion of poisonous substances known as **toxins.** When the blood is invaded by such toxin-forming organisms, the natural defences are stimulated to produce substances capable of preventing multiplication of the organism or of neutralizing or destroying the activity of the toxin. These inactivating substances are called **antitoxins.**

Antitoxins can be produced in the serum of animals by injection of toxins, and this serum can be employed to inject into humans with the object of supplementing the natural resistance to disease. Should an individual contract an infection, injection of the appropriate antitoxic serum will greatly increase the power of the tissues to destroy the invading organism, or to inactivate the toxin. Although the value of antitoxic serums lies chiefly in the treatment of infections which have already become established, small doses may also be employed to confer a temporary immunity. Thus a prophylactic dose of Diphtheria Antitoxin might be given to the contacts of a case of this infection.

The Production of Antitoxins.

Horses and other animals are employed to produce antitoxin, and the process to be described for making Tetanus Antitoxin is applicable in general to all the others.

The Tetanus toxin is first obtained from the filtrate of a culture of the organism, *Bacillus tetani,* which has been grown in broth. A horse is injected with gradually increasing doses of the toxin over a period of months, the doses being graded according to the degree of reaction observed. After a time the animal can tolerate a dose of toxin which in ordinary circumstances would prove fatal. Samples of the serum are obtained and titrated for antitoxin, and when the blood has developed a sufficiently high antitoxic power the horse is bled and the serum is allowed to separate. The antitoxic serum is preserved by the addition of an antiseptic, and is put up in phials which are noted as containing a definite number of antitoxic units per millilitre (or c.c.).

The antitoxin thus prepared is administered by subcutaneous injection, and confers a temporary and specific immunity against the causative organism. It may be administered in small doses as a prophylactic against the disease, or in larger doses as a therapeutic agent.

The antitoxic sera mentioned in the Pharmacopœia are :

Antitoxinum Diphthericum.
,, Tetanicum.
,, Welchicum.
,, Œdematiens.
,, Staphylococcicum.
,, Vibriosepticum.
Serum Antidysentericum.
,, Antipneumococcicum I.
,, Antipneumococcicum II.

The three products in the above list designated " Serums " are very similar to antitoxins, but are produced in a slightly different manner. Briefly, the animal is injected with increasing doses of *cultures of the actual organisms*, and the serum develops immunizing bodies which have a specific therapeutic action in persons suffering from these infections.

Forms of the Antitoxic Sera.

Both antitoxins and serums are supplied in liquid and solid forms. The liquid forms are yellowish and transparent when freshly prepared, but they acquire a darker colour and a faint opalescence with age. Solid forms are yellowish-white powders or yellowish-brown flakes, which may be dissolved in ten parts of sterile water before injection. The liquid forms are preserved with an antiseptic, but the solid forms do not require this preservative. In the dried form antitoxin is much more stable than when it is liquid.

Storage. The sterile product, whether in liquid or dry form, is distributed in sterilized glass containers which are sealed so as to preserve sterility. These preparations should be stored at as low a temperature as possible above the freezing-point. Each batch of serum is given an expiry date which indicates that the number of units in each container will still be present at the end of the period during which it is intended to be used.

Labelling. The information on the wrapper of the package or on the label of the container varies a little according to the nature of the preparation, but usually includes the following points :

On the wrapper of the package, or label of the container.

(i) The form of the product, *i.e.* serum, dried serum, etc.
(ii) Whether intended for prophylactic or therapeutic use.
(iii) The date after which the preparation is not intended to be used.

On the label of the container.

(i) Total number of Units in the container. (Note.—2 International Units equal 1 U.S.P. Unit).

(ii) Either (*a*) the number of Units per gramme or millilitre or, (*b*) the total number of grammes of dried product or millilitres of liquid in the container.

Vaccines.

Some diseases, notably small-pox, scarlet fever, whooping cough, etc., do not often attack the same person twice ; that is, the acquired immunity to a recurrent attack is permanent. Further, a mild attack of such a disease may confer as complete an immunity as a severe form, and in many instances it would be of advantage to undergo a mild infection in order to obtain the resistance against the more serious form. This is really the underlying principle in vaccination against small-pox. The lymph employed causes a mild attack of cow-pox, which raises the antibody power of the blood and confers immunity against the allied small-pox for a period up to seven years. Inoculation against the typhoid group of fevers by means of a mixed typhoid and paratyphoid vaccine (T.A.B.) has resulted in a much lower incidence of the disease with a greatly reduced mortality rate.

Vaccine preparations mentioned in the B.P. are :

Vaccinum Typho-paratyphosum.
,, Vacciniæ.
Tuberculinum Pristinum.

Antitoxins and Serums (9)

Antitoxinum Diphthericum. Diphtheria Antitoxin.

Dosage : By injection.

Prophylactic.	*Therapeutic.*
500 to 1,000 units.	10,000 to 20,000 units.

A serum preparation containing the antitoxic principles which have the specific power of neutralizing the toxin of the diphtheria bacillus, *Corynebacterium diphtheriæ.*

Antitoxinum Tetanicum. Tetanus Antitoxin.

Dosage : By injection.

Prophylactic.	*Therapeutic.*
1,000 to 2,000 units.	20,000 to 40,000 units.

A serum containing the antitoxic principles which have the specific power of neutralizing the toxin of *Bacillus Tetani.*

Antitoxinum Welchicum. Gas-Gangrene Antitoxin (*perfringens*).

Dosage :

Prophylactic.	*Therapeutic.*
4,000 units by injection.	10,000 to 20,000 units by intravenous injection.

A serum containing the antitoxic principles which have the specific power of neutralizing the toxin formed by the *Bacillus perfringens*.

Used in cases of acute intestinal obstruction and of peritonitis, also used as a prophylactic against the development of gas-gangrene after injury.

Antitoxinum Œdematiens. Gas-Gangrene Antitoxin (*ædematiens*).

Dosage : By injection.

Prophylactic.	*Therapeutic.*
20,000 units.	50,000 to 100,000 units.

A serum preparation containing the antitoxic principles which have the specific power of neutralizing the toxin of *Clostridium ædematiens*.

Antitoxinum Vibriosepticum. Gas-Gangrene Antitoxin (*vibrion septique*).

Dosage : By injection.

Prophylactic.	*Therapeutic.*
5,000 units.	10,000 to 20,000 units.

A serum preparation containing the antitoxic principles which have the power of neutralizing the toxin of the *Clostridium* known as *Vibrion Septique*.

Antitoxinum Staphylococcicum. Staphylococcus Antitoxin.

Dosage : By injection, 5,000 to 20,000 units.

A serum preparation containing the antitoxic principles which have the specific power of neutralizing the toxin formed by certain strains of *Staphylococcus*.

Serum Antidysentericum (Shiga). Anti-dysentery Serum (Shiga).

Dosage : By injection, 4,000 to 10,000 units.

A serum preparation containing the immunizing substances, which have a specific therapeutic value, when injected into persons infected by the *Bacillus dysenteriæ* (Shiga).

Serum Antipneumococcicum I. Antipneumococcus Serum (Type I).

Dosage : By intravenous injection, 50,000 to 150,000 units.

A serum containing the immunizing substances which have a specific therapeutic value when injected into persons suffering from diseases due to *Diplococcus pneumoniæ* (Type I).

Serum Antipneumococcicum II. Antipneumococcus Serum (Type II).

Dosage : By intravenous injection, 50,000 to 150,000 units.

A serum containing the immunizing substances which have a specific therapeutic action when injected into persons suffering from diseases due to *Diplococcus pneumoniæ* (Type II).

Vaccines (3)

Vaccinum Typho-paratyphosum. Typhoid-paratyphoid Vaccine. T.A.B.

Dosage : By subcutaneous injection.

0·5 mil. (first dose).
1·0 mil. (second dose, after 7–10 days' interval).

A sterile suspension of the *killed* organisms *Bacillus typhosus Bacillus paratyphosus* A and B. One millilitre (or cubic centimetre) contains 1,000 million *B. typhosus* and 500 million each of *B. paratyphosus* A and B.

An antiseptic is added in sufficient strength to give a final concentration equal to 0·5 per cent. Phenol in germicidal power.

It should not be employed later than 18 months after date of manufacture.

The two doses confer a substantial immunity which lasts up to about two years.

Vaccinum Vacciniæ. Vaccine Lymph. Calf Lymph.

Dosage : 1 m. by scarification.

A sterile preparation of the substance obtained from the vesicles produced by the inoculation of vaccinia virus on the skin of healthy animals. Healthy calves of 3 to 6 months old are selected and are kept under scrupulously hygienic conditions. The skin of the animal is sterilized and scarified, and a vaccine lymph of known potency is applied over the incisions. Five days later, if good vesicles have been produced, the site of vaccination is washed and dried, the contents of the vesicles are removed under aseptic conditions, and treated

with Glycerin to reduce the number of living organisms to not more than 5,000 per millilitre. After testing, it is distributed into glass capillary tubes capable of holding only one dose.

Storage : When stored below 0°, potency is retained for long periods, but when stored above 10°, potency cannot be assured beyond 7 days.

Tuberculinum Pristinum. Old Tuberculin.

Dosage : By subcutaneous injection.

Diagnostic, $\frac{1}{60}$ to $\frac{1}{12}$ m.
Therapeutic $\frac{1}{60000}$ m., gradually increased.

This is the concentrated filtrate from a fluid medium on which *Bacillus tuberculosis* has been grown. It is a thick, transparent, yellowish fluid, with a honey-like odour.

It is employed chiefly for diagnostic purposes ; a therapeutic dose is also mentioned, but its value as a therapeutic agent is open to doubt.

The Schick Test

A test has been devised by means of which the susceptibility of individuals (particularly children) to diphtheria can be estimated.

The preparation used in the test is the toxin formed by the diphtheria organism—*Corynebacterium diphtheriæ*—in dilute form.

The test consists of injecting 0·2 mil. (3 m.) of the Schick Test Toxin (**Toxinum Diphthericum Diagnosticum**) into one arm, and a similar amount of the Schick Control (**Toxinum Diphthericum Calefactum**) into the other arm, and comparing the reactions. The Schick Control is toxin inactivated by heat.

The injections are given intradermally, that is to say, into, but not below the surface of the skin, on the flexor surface of the forearm so as to form a small wheal. The reactions are inspected daily until the fourth or fifth day after injection. If the individual is **not** susceptible to diphtheria the injected toxin is neutralized by the antitoxin in the blood and no reaction results. In susceptible persons the toxin is not neutralized and a red zone of inflammation which covers an area from 1 to 2 cms. in diameter is produced. The control arm in either case should show no reaction. A negative result (no reaction in either arm) infers that the person has a sufficiency of immunizing antitoxin present in the blood and is, therefore, not susceptible to diphtheria.

The control test is made in order to distinguish between a true reaction due to absence of antitoxin in the blood, and a false reaction caused by susceptibility to the protein matter injected.

A third preparation of the diphtheria toxin—**Toxinum Diphthericum Detoxicatum**—is a preparation, low in toxic power, used as a diphtheria prophylactic.

Toxinum Diphthericum Diagnosticum. Schick Test Toxin.

Dose : 3 m. intradermally.

A reagent used for the diagnosis of susceptibility to diphtheria. It is obtained by preparing a sterile filtrate from a culture on nutrient broth which, after being allowed to mature, is diluted so that 0·2 mil. contains the test dose.

Toxinum Diphthericum Calefactum. Schick Control.

Dose : 3 m. intradermally.

Is Schick Test Toxin which has been heated to a temperature of not less than 70° for not less than 5 minutes. It is prepared from the same batch of Test Toxin as that with which it is issued for use. A dose of the control is always given at the same time as the Test Toxin in order to exclude reactions due to non-specific substances.

Toxinum Diphthericum Detoxicatum. Diphtheria Prophylactic.

Dosage : By subcutaneous injection—the dose indicated on the label, on two or three occasions, at intervals of 2 to 4 weeks.

The sterile filtrate, or material derived from the filtrate, of a culture of *C. diphtheriæ*. The toxicity of the filtrate is reduced to a low value so that no reaction is observed after injection, but not so low that its immunizing powers are destroyed. This product is manufactured in at least six different forms, either clear liquids, or suspensions of floccules.

Granular Effervescent Salts (2)

Only two granular effervescent salts are official, but the method of preparation described below is suitable for all other preparations of a similar nature.

Such compounds consist essentially of (*a*) an active medicinal ingredient or ingredients ; (*b*) an alkaline carbonate or bicarbonate as the source of the gas, and (*c*) one or more vegetable acids to free the gas.

As the name suggests, these salts are in the form of irregular

grains or granules, and so long as they are kept perfectly dry, no reaction takes place between the acid and the carbonates. When added to water, however, solution with brisk effervescence occurs. These products require to be kept dry and airtight—if the cap or lid is left off the containing vessel, moisture in the atmosphere will cause the interaction to proceed slowly with consequent loss of gas. Similarly, a damp spoon introduced into the granules is sufficient to start the reaction.

Method of Preparation. The dry ingredients are reduced to a fine powder, and carefully triturated together to ensure even dispersion of the ingredients. The mixture of powders is placed in a large porcelain or metal dish, and heated on a water bath to between 95° and 105°. The powders should be pressed down hard in the vessel, and by the liberation of a little water of crystallization from the Citric acid, the mass soon becomes moist and coherent. Do not stir the mass during this process. When all the mass is moist, it is removed from the source of heat and is forced through the mesh of a wire sieve so that it is formed into particles of uniform size. Ungranulated powder is removed by gently shaking the granules on a sieve of finer mesh, after which the granules are dried in a hot-air oven at a temperature not above 55° and stored in well-closed containers.

Sodii Phosphas Effervescens. *Dose*, 60 to 240 grains.

Composition : Sodium phosphate, Sodium bicarbonate Citric acid, and Tartaric acid.

Action : Aperient and antacid.

Sodii Sulphas Effervescens. *Dose*, 60 to 240 grains.

Composition : Sodium sulphate, Sodium bicarbonate, Citric acid, and Tartaric acid.

Action : Aperient and antacid.

COMPOUNDS OF THE METALS AND AMMONIUM

As the majority of this large group of compounds are **salts** the term "**salt**" has been rather loosely used throughout the section. They may be divided into (*a*) Insoluble salts, and (*b*) Soluble salts.

The manufacturing processes by which these compounds are made are many and varied, and only a general outline of their preparation can be attempted here.

Insoluble Salts. These are chiefly made by mixing together solutions of two suitable soluble salts, whereby new compounds are formed, one of which is the insoluble salt required.

As an example, let us study the preparation of Magnesium

Carbonate. It will be necessary to bring together two solutions of soluble salts, one containing the Magnesium element and the other the Carbonate radical. This can be effected by making separate solutions of magnesium sulphate and sodium carbonate; these compounds are readily soluble, but when mixed together a precipitate of insoluble magnesium carbonate is thrown down.

Magnesium Sulphate→Sodium Sulphate (soluble).



Sodium **Carbonate→Magnesium Carbonate** (insoluble).

It will be noted that from the original compounds, by an interchange of radicals, two new compounds are formed—sodium sulphate which is soluble and therefore remains in solution, and magnesium carbonate which is insoluble, and is thrown out of solution as a fine, white deposit. The precipitate is collected by filtration, washed, dried, powdered, and is then ready for use.

Barium sulphate, Bismuth carbonate, and salicylate, and many other insoluble salts are made in a similar manner.

Soluble Salts. The example given above of the manufacture of the insoluble compound magnesium carbonate, might also serve as an example of how sodium sulphate—a soluble compound—may be obtained. The solution, after separation from the insoluble carbonate, only needs to be concentrated by evaporation for crystals of sodium sulphate to be formed. That it is not made in this way on a manufacturing scale is only because there are other and cheaper methods of making the compound.

Many soluble salts are obtained by neutralizing an alkaline compound of the metal with the acid corresponding to the salt it is required to make. Applying this process to the preparation of Calcium Chloride, it is at once seen that we must use some alkaline compound of the metal Calcium and Hydrochloric acid. Any alkaline salt of calcium will do equally well, but on account of its cheapness it is usual to employ Calcium carbonate (chalk), and to add this to Hydrochloric acid until the solution is neutral. At this stage there will be neither free acid not free alkaline carbonate present, and it only remains for the solution to be concentrated for the solid salt to be deposited in a crystalline state.

$CaCO_3$	$+2HCl$	$=CaCl_2$	$+H_2O$	$+CO_2$
Calcium	+Hydrochloric	=Calcium	+Water	+Carbon
Carbonate	acid	Chloride		Dioxide.

The carbon dioxide is evolved as a gas during the interaction.

A few soluble salts are formed by dissolving the metal itself in acid, the resulting solution being evaporated until the crystalline salt separates out. Thus ferrous sulphate is made by dissolving metallic iron in dilute sulphuric acid, and silver nitrate by dissolving silver in nitric acid.

Aluminium Salts

The two aluminium compounds are known as "Alum" and Kaolin, respectively. The former is a double salt of Aluminium sulphate with either Potassium or Ammonium sulphate, and the latter is a natural silicate of the metal, powdered, and freed from gritty particles by elutriation (continual washing).

Salt	Dose	Properties	Therapeutics	Solubility
Alumen ..	5–10 grs.	Colourless, transparent, crystalline masses. Taste sweetish and astringent.	Astringent and emetic.	Freely soluble.
Kaolinum	½–2 oz.	China Clay. A soft white, amorphous powder.	*Externally*— emollient. *Internally*— absorbent. Used in the treatment of gastric and duodenal ulcers.	Insoluble.

Ammonium Salts

Salt	Dose	Properties	Therapeutics	Solubility
Ammonii Bicarbonas.	5–10 grs.	White crystals, or fine, white, crystalline powder. Slight pungent odour of ammonia; pungent taste.	Expectorant.	1 in 5½.
Ammonii Carbonas.	5–10 grs.	Hard, crystalline masses. Strong odour of ammonia; pungent taste. When exposed to air it becomes coated with a white powder; this should be scraped off before the salt is used in medicine.	Expectorant. Emetic. Stimulant.	1 in 4.
Ammonii Chloridum.	5–60 grs.	White, granular, crystalline powder, with a cool saline taste.	Expectorant.	1 in 3.

Antimonium Salts

The Antimony salts are both double tartrate compounds. Antimony compounds administered by mouth act as diaphoretics, expectorants or emetics, according to dosage. The drug has, however, been largely superseded in these respects, but a far more important use for these preparations has been found in the treatment of Leishmaniasis (Kala-azar, Oriental sore) and Schistosomiasis, in which their action is little short of magical.

Solutions for injection may be sterilized by heating in an autoclave, by Tyndallization or filtration.

Salt	Dose	Properties	Therapeutics	Solubility
Antimonii et Potassii Tartras.	$\frac{1}{32}$–$\frac{1}{8}$ gr. and $\frac{1}{2}$–1 gr. emetic. $\frac{1}{2}$–2 grs. by intravenous injection.	Tartarated Antimony. Tartar Emetic. Colourless, transparent, crystals, or heavy, white, crystalline powder. Sweetish taste. Is depressant, and therefore not a suitable emetic for children.	Expectorant. Diaphoretic. Emetic. Used in treatment of Leishmaniasis and Schistosomiasis.	1 in 17.
Antimonii et Sodii Tartras.	Dosage as above.	Colourless crystals, whitish scales or powder. Hygroscopic. Sweetish taste.	Action as above, but is less toxic than the potassium compound.	1 in 1½.

Argentum Salts

It is a common error to speak of silver nitrate as occurring in sticks. The pure compound is crystalline, and only the toughened silver nitrate is cast into sticks. The sticks are frequently used as a local caustic application, particularly for reducing exuberant granulations.

Solutions of silver nitrate must be made with freshly distilled water, as the impurities in tap water would precipitate or even decompose the salt.

Salt	Dose	Properties	Therapeutics	Solubility
Argenti Nitras	$\frac{1}{8}$–$\frac{1}{4}$ gr.	Lunar Caustic. Colourless, flat crystals; bitter, metallic taste. Usually given internally in the form of a pill made with kaolin. The salt should be protected from light.	Caustic. Astringent. Antiseptic.	2 in 1.

Salt	Dose	Properties	Therapeutics	Solubility
Argenti Nitras Induratus.	No dose.	Toughened Caustic. Silver nitrate with 5 per cent. potassium nitrate added to harden it. In hard, opaque, greyish-white sticks, usually wrapped in black paper to protect from light.	Caustic. Astringent.	Freely soluble.
Argento-proteinum.	No dose.	Silver Protein. Protargol. An organic silver compound prepared by the action of a silver compound on gelatin in the presence of an alkali. It contains from 7½ per cent. to 8½ per cent. of silver. It occurs as a brown powder. Slowly soluble 1 in 2 of water, forming a dark brown solution. Aqueous solutions are best prepared by shaking the powder on to the surface of cold water and allowing to stand until solution is effected. Solutions should be freshly prepared. The compound should be kept in well-closed containers protected from light. Employed as a local antiseptic, particularly in conjunctivitis (2 per cent to 10 per cent.). Not such a powerful germicide as the nitrate but is less corrosive.	Antiseptic.	1 in 2.

Arsenium Salts

Compounds of this element have been included with the metallic salts, although Arsenium is usually regarded as being a metalloid and not a true metal. Arseni Trioxidum, the most important compound, has from time to time been variously known as Arsenious oxide, Arsenious anhydride, Acidum Arseniosum, White Arsenic, or simply Arsenic. It has no acid properties in the dry state, but when dissolved in water it yields a solution with faintly acid reaction.

The four organic Arsenics are described in a separate section on pp. 164–165.

Salt	Dose	Properties	Therapeutics	Solubility
Arseni Trioxidum.	$\frac{1}{60}$–$\frac{1}{12}$ gr.	Arsenious Anhydride. A heavy, white powder or in broken white lumps, having a glassy fracture. Given in pill or solution, always *after* meals.	Alterative, tonic, caustic.	1 in 65 slowly.
Arseni Triiodum.	$\frac{1}{16}$–$\frac{1}{4}$ gr.	Arsenious Iodide. Small, orange-red crystals.	Alterative, tonic.	1 in 18.

Barium Salts

The only Barium salt of the B.P. is the sulphate. No dose is prescribed for the compound, but it is given internally in the form of "barium meals" for radiographic diagnosis. For this purpose it must be in a very high state of purity, as contamination with soluble Barium compounds would render it poisonous.

Salt	Dose	Properties	Therapeutics	Solubility
Barii Sulphas	No dose.	A heavy, white, amorphous powder. No odour or taste.	Used in X-ray diagnosis of abnormalities of the stomach and intestines.	Totally insoluble.

Bismuthum Salts

The official Bismuth salts are markedly similar in appearance and properties; all except the double Tartrate salt are insoluble white powders. It used to be a fixed rule to use suspending agents in making Bismuth mixtures, but these salts are now so readily diffusible that it is not necessary to do so. Occasionally, for some specific purpose, the prescriber may order a mucilage as a suspending agent. When such is the case, the dispenser has no option but to dispense the mixture as written, but it should be noted that freshly made Mucilage of Tragacanth is the best agent; avoid the use of Acacia as this forms a compact mass which does not diffuse with shaking.

The Salicylate undergoes slight decomposition with development of free acid on mixing with water ; this should be borne in mind when compounding the salt with alkaline carbonates and bicarbonates, or with iodides.

Bismuth salts in general are gastric sedatives, intestinal antiseptics, and astringents. More recently Bismuth compounds have been injected intramuscularly in the treatment of syphilis.

Salt	Dose	Properties	Therapeutics	Solubility
Bismuth Carbonas.	10–30 grs.	Bismuth Subcarbonate or Oxycarbonate. A white or creamy-white powder ; odourless and tasteless.	Gastric sedative.	Insoluble.
Bismuthi Salicylas.	10–30 grs. 1–2 grs. by intramuscular injection.	A whitish, amorphous powder ; odourless and tasteless. Suspensions for injection are sterilized by heating in an autoclave, or by Tyndallization.	Gastric sedative. Intestinal antiseptic. Antisyphilitic.	Insoluble.
Bismuthi Oxychloridum.	10–30 grs. 1½–3 grs. by intramuscular injection.	Bismuth Subchloride or Oxychloride. A fine, white amorphous or minutely crystalline powder. No odour or taste. Administered by mouth it has the general action of Bismuth salts. In the form of an ointment or suppository it is used in hæmorrhoids. The official injection is employed in the treatment syphilis.		Insoluble.
Bismuthi et Sodii Tartras.	1–3 grs. by intramuscular injection.	Bismuth Sodium Tartrate. A white powder or slightly yellow scales. Solutions for injection may be sterilized by heating in an autoclave, by Tyndallization or filtration.	Used in the treatment of syphilis.	1 in 1.

Calcium Salts

In addition to the several normal Calcium salts there is a Lime compound—**Calx Chlorinata.** This is frequently called "**Chloride of Lime**" but it must not be confused with Chloride of Calcium (Calcii Chloridum), which is a totally different compound. Two forms of Chalk are official—**Creta**

(Prepared Chalk) and **Calcii Carbonas** (Precipitated Chalk). These are different forms of the same compound, Calcium Carbonate, the former being a purified native mineral and the latter a manufactured compound.

Salt	Dose	Properties.	Therapeutics	Solubility
Calx Chlorinata	No dose.	Chlorinated Lime, Chloride of Lime or Bleaching Powder. Contains not less than 30 per cent. chlorine. A dull whitish powder, with the pungent, odour of chlorine. Rapidly becomes damp and decomposes on exposure to air. Largely used as an antiseptic in the form of **Eusol** solution. Made into a paste with water, or employed as an ointment, it is used in the first-aid treatment of mustard gas burns.	Powerful Antiseptic. Deodorant. Disinfectant.	Partially soluble.
Calcii Hydroxidum.	5–15 grs.	Calcii Hydras. Slaked Lime. A soft, white amorphous powder. Alkaline and slightly bitter taste.	Antacid (in the form of Lime water).	Very sparingly soluble.
Calcii Chloridum Hydratum.	1–3 grs. intramuscularly 10–30 grs. intravenously.	Hydrated Calcium Chloride. Colourless crystals; taste slightly bitter. Very deliquescent. Solutions for injection may be sterilized by heating in an autoclave or by Tyndallization.	Action same as chloride.	4 in 1.
Calcii Chloridum.	10–30 grs. also ½–1½ grs. intramuscularly and 5–15 grs. intravenously.	White granules, or irregular, white, porous masses. Very deliquescent. Taste warm and slightly bitter. When prescribed by injection twice the amount of the hydrated compound shall be dispensed.	Increases the coagulability of the blood in hæmorrhages.	1 in 1½.
Calcii Phosphas	10–30 grs.	A light, white, amorphous powder. No odour; little taste.	Promotes bone growth and aids the union of fractures.	Insoluble.
Calcii Lactas	15–60 grs.	A white powder or granules. Little odour or taste.	Action same as the chloride.	1 in 18½ slowly.

Salt	Dose	Properties	Therapeutics	Solubility
Calcii Carbonas	15–60 grs.	Precipitated Chalk. White, minutely crystalline powder ; no odour or taste.	Antacid. Astringent.	Insoluble.
Creta.	15–60 grs.	Prepared Chalk. Greyish-white powder, or irregular, crumbly masses. No odour or taste.	Antacid. Astringent.	Insoluble.
Calcii Gluconas	30–60 grs.	Calcium Gluconate. A white crystalline or granular powder ; no odour or taste.	Administered in all forms of calcium deficiency.	1 in 30.

The Chromium Salt

The only representative of the metal Chromium in the B.P. is the Trioxide, formerly known as Acidum Chromicum. The trioxide is the anhydride of Chromic acid.

Salt	Dose	Properties	Therapeutics	Solubility
Chromii Trioxidum.	No dose.	Chromic anhydride. Chromic Acid. Dark red, needle crystals, or dark-brown masses. Very deliquescent and corrosive. Liable to explode in contact with glycerin, and certain other organic compounds.	Antiseptic. Deodorant. Powerful caustic.	Very soluble.

The Cuprum Salt

Salt	Dose	Properties	Therapeutics	Solubility
Cupri Sulphas	¼–2 grs. and 5–10 grs. (emetic).	Bluestone or Blue Vitriol. Brilliant blue crystals or crystalline masses. The aqueous solution is acid.	Externally— caustic. Internally— astringent and emetic.	1 in 3.

Ferrum Salts

The two substances known as the " Scale " preparations are amongst the most important of the iron compounds. They are **Ferri et Ammonii Citras** and **Ferri et Quininæ Citras.**

Ferri et Ammonii Citras. Freshly precipitated Ferric hydroxide is dissolved in a warm aqueous solution of Citric acid, and a slight excess of solution of Ammonia added. The liquid is then evaporated to a syrupy consistence, painted on to porcelain or glass plates, dried at a temperature not above 40° in dust-free rooms, and scraped off in the form of thin, flat, irregular flakes.

Ferri et Quininæ Citras. Made in a similar manner to the above, but freshly precipitated Quinine is also dissolved in the hot Citric Acid solution before evaporating.

The Saccharated compound—**Ferri Carbonas Saccharatus**—is made by precipitating Ferrous carbonate from a solution to which Liquid Glucose has been added. The Glucose acts as a preservative, and to some extent retards oxidation.

Salt	Dose	Properties	Therapeutics	Solubility
Ferri Sulphas Exsiccatus.	½–3 grs.	A greyish-white powder made by drying the crystalline salt at 40° until part of the water of crystallization is driven off. Used for making iron sulphate pills.	Tonic and astringent.	Slowly soluble.
Ferri Sulphas	1–5 grs.	Ferrous Sulphate. Green Vitriol. Transparent, pale green or greenish-blue crystals. Astringent taste.	Tonic and astringent.	1 in 1½.
Ferri Subchloridum Citratum.	3–5 grs.	Citrated Ferrous Chloride. A buff-coloured powder; taste acid, metallic and astringent. Should be kept in well-closed containers, protected from light.	Tonic and hæmatinic.	1 in 1.
Ferri et Quininæ Citras.	5–15 grs.	Thin, greenish-yellow scales. Deliquescent. Very bitter taste.	Tonic and hæmatinic.	2 in 1.
Ferri et Ammonii Citras.	20–40 grs.	Thin, dark red, transparent scales. Deliquescent. Taste sweetish and astringent.	Tonic and hæmatinic.	2 in 1.
Ferri Carbonas Saccharatus.	10–30 grs.	Saccharated Iron Carbonate. Made from Ferrous Sulphate, Sodium Carbonate, Liquid Glucose and Distilled water. Dull, greenish-brown, amorphous powder. Contains not less than 50 per cent. ferrous carbonate.	Tonic and hæmatinic.	Partially soluble.

Hydrargyrum Salts

Particular note should be made of the synonyms of the Mercury compounds, as they are frequently prescribed by synonym. The two salts most likely to be confused are **Hydrargyri Perchloridum** (Mercuric Chloride or **Corrosive Sublimate**) and **Hydrargyri Subchloridum** (Mercurous Chloride or **Calomel**). The dose of the former is only $\frac{1}{32}$ to $\frac{1}{16}$ grain, and of the latter $\frac{1}{2}$ to 3 grains. The perchloride is the only one likely to be given in mixture form, usually along with potassium iodide, but either salt may be given in pills. If there is the slightest doubt as to which compound is intended always refer the matter to the prescriber or to some authorized person for confirmation.

Mersalylum, an organic mercury compound, suitable for injection as a diuretic, was added to the official list of Mercury salts by the Addendum of 1936.

Salt	Dose	Properties	Therapeutics	Solubility
Hydrargyri Iodidum Rubrum.	$\frac{1}{32}$–$\frac{1}{16}$ gr.	Red Iodide of Mercury. Biniodide of Mercury. A scarlet-red, crystalline powder. Freely soluble in pot. iodide solutions.	Antiseptic. Antisyphilitic.	Insoluble.
Hydrargyri Perchloridum	$\frac{1}{32}$–$\frac{1}{16}$ gr.	Mercuric Chloride or Corrosive Sublimate. Heavy, colourless or white crystalline masses; also heavy white powder. Acrid, metallic taste.	Powerful antiseptic and germicide. Antisyphilitic.	1 in 18.
Hydrargyri Oxycyanidum	$\frac{1}{12}$–$\frac{1}{8}$ gr. intramuscularly and $\frac{1}{6}$ gr. by intravenous injection.	Mercuric Oxycanide. A white crystalline powder. The aqueous solution is alkaline.	Antiseptic. Antisyphilitic.	1 in 18.
Hydrargyri Subchloridum.	$\frac{1}{2}$–3 grs. and $\frac{1}{2}$–1 gr. by intramuscular injection.	Calomel or Mercurous Chloride. Heavy, dull white powder. No odour or taste. Leaves a yellow streak when rubbed on white paper.	Purgative. Intestinal antiseptic.	Insoluble.
Mersalylum.	No dose.	Mersalyl. Salyrgan. A deliquescent white powder; no odour, bitter taste. Contains 38·5 per cent. to 40·5 per cent. of mercury in organic combination. Administered by intravenous or intramuscular injection as a diuretic in cardiac and renal œdema.	Diuretic.	1 in 1.

Hydrargyrum Salts—*continued*

Salt	Dose	Properties	Therapeutics	Solubility
Hydrargyri Oxidum Flavum.	No dose.	A heavy, orange-yellow, amorphous powder. Chiefly used as an ointment in eye cases.	Absorbent.	Insoluble.
Hydrargyrum Ammoniatum.	No dose.	Ammoniated Mercury. White Precipitate. A heavy white powder. Slowly decomposed by by water.	Antiparasitic.	Insoluble.
Hydrargyrum Oleatum.	No dose.	Oleated Mercury. A greyish-yellow, greasy semi-solid, prepared from yellow Mercuric oxide, Oleic acid and Liquid Paraffin.	Employed to introduce mercury into the system by inunction.	Insoluble.

Magnesium Salts

The Heavy and Light Oxides of Magnesium are prepared from the corresponding Carbonates by heating until all volatile constituents are given off. This operation of Pharmacy is called **calcination,** and these compounds are often known as Heavy or Light Calcined Magnesia.

Magnesium Sulphate (Epsom salts), the only soluble official salt of magnesium, is somewhat similar in appearance to both Zinc sulphate and Oxalic acid. Distinguishing features are: Zinc sulphate is heavier and has an astringent, metallic taste, whilst Oxalic acid is in larger crystals and has a sour taste. Epsom salt has a bitter, saline taste.

Salt	Dose	Properties	Therapeutics	Solubility
Magnesii Carbonas Ponderosus.	10 to 60 grs.	White granular powder.	Antacid and laxative.	Insoluble.
Magnesii Carbonas Levis.		Very light, white powder.		Insoluble.
Magnesii Oxidum Ponderosum.		Heavy Magnesia. A dull white, heavy powder.		Insoluble.
Magnesii Oxidum Leve.		Light Magnesia. A very light, bulky, white powder.		Insoluble.
Magnesii Sulphas.	30–240 grs.	Epsom Salts. Small, colourless, transparent crystals. The crystals gradually effloresce. Bitter, saline taste. Much used in the form of the popular Mistura Alba.	Saline purgative.	1 in 1½.

Plumbum Salts

Solutions of Lead Acetate made with tap water are always turbid owing to the formation of insoluble Carbonate of Lead. Solutions in freshly distilled water are clear, but on standing absorb carbon dioxide from the air and become cloudy.

Salt	Dose	Properties	Therapeutics	Solubility
Plumbi Acetas	½–2 grs.	Sugar of Lead. White crystalline powder, or heavy crystalline masses. Vinegar odour; taste sweetish and astringent. Administered internally in simple solution or pill form.	Astringent and hæmostatic.	1 in 2½.
Plumbi Monoxidum.	No dose.	Lead Oxide. Litharge. Heavy, reddish-yellow powder or scales. Used in the preparation of Lead Plaster and Strong Solution of Lead Acetate.	—	Insoluble.

Potassium Salts

Salt	Dose	Properties	Therapeutics	Solubility
Potassii Permanganas.	1–3 grs.	Sometimes (erroneously) known as Condy's crystals. Slender, shining, needle crystals, of a deep purple colour. No odour; sweetish, astringent taste. Internally administered in simple solution, or in pills made with kaolin.	Antiseptic. Disinfectant. Deodorant.	1 in 20.
Potassii Carbonas	2–5 grs.	Salt of Tartar. Small crystalline grains or white powder. Very deliquescent. Taste strongly alkaline and caustic.	Antacid, like the bicarbonate, but is rather irritant.	1 in 1.
Potassii Chloras.	5–10 grs.	Chlorate of Potash. Colourless, glistening crystals, or white powder. Cool, saline taste. Liable to explode if heated or triturated with readily oxidizable substances like sulphur, sugar, etc.	Alterative to mucous surfaces.	1 in 16.

Potassium Salts—*continued*

Salt	Dose	Properties	Therapeutics	Solubility
Potassii Nitras	5–15 grs.	Nitre. Saltpetre. White crystalline powder, or colourless, striated crystals. Cool, saline taste.	Diaphoretic. Diuretic.	1 in 4.
Potassii Iodidum.	5–30 grs.	Colourless, cubical crystals. Crystals are usually broken but corner pieces with their right angles may be distinguished. Saline and slightly bitter taste. Added to most iodine solutions to assist solubility.	Alterative. Diuretic. Resolvent. Expectorant.	1 in 1.
Potassii Bromidum.	5–30 grs.	Small, colourless, cubical crystals, or granular white powder. Saline, somewhat pungent taste.	Hypnotic and sedative.	1 in 2.
Potassii Acetas	15–60 grs.	White, flaky, satiny masses or granules. Very deliquescent. Faint, acetic odour; taste sharp and saline.	Diaphoretic. Diuretic. Renders the urine alkaline.	2 in 1.
Potassii Bicarbonas.	15–60 grs.	Colourless, transparent crystals, or white granular powder. Taste saline and feebly alkaline.	Antacid. Diuretic.	1 in 4.
Potassii Citras.	15–60 grs.	White granular crystals, or crystalline powder. Deliquescent. Taste saline and feebly acid.	Diaphoretic. Diuretic, renders the urine alkaline.	1 in 1.
Potassii Tartras Acidus.	15–60 grs.	Cream of Tartar. Gritty, white, crystalline powder. Pleasant, acid taste.	Diaphoretic. Diuretic. Purgative.	1 in 220.
Potassii Hydroxidum.	No dose.	Caustic Potash. Hard, white sticks or cakes, or fused masses. Very deliquescent and corrosive. Used in the preparation of Liquor Arsenicalis and Lysol.	Powerful Caustic.	1 in 1.
Potassa Sulphurata.	No dose.	Liver of Sulphur or Sulphurated Potash. Greenish-yellow, irregular pieces. Disagreeable odour and taste. Used as a bath (4 oz. to 30 gallons) in chronic skin affections. Not used internally.	Antiparasitic.	Freely soluble.

Sodium Salts

There are sixteen official Sodium salts, excluding the two effervescent compounds, but including Sodium Biborate which is known in the B.P. as Borax.

The only salts for which no special dosage is recommended are the Chloride and Hydroxide ; the former, however, is of considerable value in medicine for the preparation of the various Saline solutions. Three types of saline solutions used in medicine are called **hypertonic** (stronger), **isotonic** (normal), and **hypotonic** (weaker), according as they compare with the normal blood serum. Red blood corpuscles become shrivelled in the stronger, and swell out in the weaker solutions, but undergo no change in Isotonic or Normal Saline.

Two isotonic salt solutions are official—Liquor Sodii Chloridi Physiologicus (Normal Saline Solution) and Injectio Sodii Chloridi et Acaciæ ; they both contain 0·9 per cent. of Sodium Chloride.

Normal Saline is employed to counteract post-operative shock, and as a temporary measure, to replace blood lost after extensive operations or severe hæmorrhages. It may be administered by subcutaneous, intravenous or rectal injection. The Salt and Acacia solution is intended for intravenous injection, the Acacia being added to produce a fluid more closely resembling the viscosity of normal blood, it also retards the excretion of the salt.

Salt	Dose	Properties	Therapeutics	Solubility
Sodii Nitris.	½–2 grs.	Deliquescent crystals or granular powder, either colourless or yellowish. Saline taste.	Vaso-dilator, like other nitrites.	1 in 1½.
Sodii Carbonas Exsiccatus.	2–5 grs.	A white, odourless powder, obtained by heating the crystalline salt.	Used in Pil. Ferri. Carb.	Freely soluble.
Sodii Carbonas	5–15 grs.	Washing Soda. Transparent, colourless crystals. Effloresecent. Strongly alkaline taste.	Antacid.	1 in 2.
Borax.	5–15 grs.	Sodium Biborate. Transparent, colourless crystals, or white powder.	Antiseptic. Astringent.	1 in 25.
Sodii Benzoas.	5–30 grs.	A white, amorphous or granular powder. Odourless, or with a faint odour of Benzoin. Sweetish, unpleasant taste.	Diuretic.	1 in 2.

Sodium Salts—*continued*

Salt	Dose	Properties	Therapeutics	Solubility
Sodii Bromidum	5–30 grs.	Small, colourless, cubical crystals, or white, deliquescent, granular powder. Taste saline rather bitter.	Sedative.	1 in 1½.
Sodii Iodidum	5–30 grs.	A white crystalline, deliquescent powder. Taste saline and rather bitter.	Alterative. Diuretic. Resolvent.	1 in 1.
Sodii Salicylas	10–30 grs.	Small colourless crystals, pearly crystalline flakes, or whitish powder. Taste sweetish, saline, and unpleasant. Solutions for injection are sterilized by Tyndallization of filtration.	Antipyretic. Antirheumatic.	1 in 1.
Sodii Bicarbonas.	15–60 grs.	Small opaque crystals, or white, minutely crystalline powder. Saline, alkaline taste. Solutions for injection are sterilized by Tyndallization or filtration.	Antacid. Diuretic.	1 in 11.
Sodii Citras.	15–60 grs.	White, granular crystals, or crystalline powder. Saline taste. Added to milk it lessens curdling, and is used for this purpose in infant and invalid milk foods. A 2 per cent. solution added to blood delays clotting and use is made of this property in collecting blood for transfusion. Solutions for injection may be sterilized by heating in an autoclave, by Tyndallization or filtration.	Antacid.	1 in 2.
Sodii Thiosulphas.	5–15 grs. by subcutaneous, intramuscular, or intravenous injection.	"Hypo." Colourless, transparent crystals; saline taste. Principally used as an antidote in overdosage of organic arsenic compounds, also salts of bismuth and mercury. When such compounds are administered intravenously there may be a leakage of the solution into the surrounding		2 in 1.

Salt	Dose	Properties	Therapeutics	Solubility
		tissue owing to faulty technique; in such cases the area is infiltrated with a sterile solution of the thiosulphate as an antidote. Solutions may be sterilized by heating in an autoclave, by Tyndallization, or filtration.		
Sodii Phosphas Acidus.	30–60 grs.	Sodium Acid Phosphate or Sodium Di-hydrogen Phosphate. Large, transparent crystals, or crystalline powder. Taste saline and acid.	Diuretic—renders the urine acid.	1 in 1.
Sodii Phosphas	30–240 grs.	Di-sodium Hydrogen Phosphate. Large, transparent, colourless crystals. Saline taste.	Saline purgative.	1 in 7.
Sodii Sulphas	30–240 grs.	Glauber's Salt. Large, colourless, efflorescent crystals. Bitter, saline taste.	Saline purgative.	1 in 3.
Sodii et Potassii Tartras.	120–240 grs.	Rochelle Salt. Soda Tartarata. White, crystalline powder. Taste saline and cooling. Used chiefly in the form of Seidlitz Powder.	Saline purgative.	1 in 1½.
Sodii Chloridum	No dose.	Common Salt. Colourless, crystalline grains, or white crystalline powder. No odour; taste strongly saline. As an enema is anthelmintic for threadworm. Solutions for injection may be sterilized by heating in an autoclave, by Tyndallization or filtration.	Small doses—tonic and restorative. Large doses—emetic.	1 in 3.
Sodii Hydroxidum	No dose.	Caustic Soda. Hard, white, brittle sticks, fused masses, or scales. Very deliquescent. Strongly alkaline and corrosive.	Powerful caustic	1 in 1.

Zincum Salts

Salt	Dose	Properties	Therapeutics	Solubility
Zinci Sulphas	1–3 grs. and 10–30 grs. emetic.	White Vitriol. Colourless, transparent needle crystals, similar in appearance to Epsom Salts, but is heavier, and has a metallic, astringent taste.	Astringent. Hæmostatic. Emetic in large doses.	1 in 1.
Zinci Oxidum	5–10 grs.	A soft, white amorphous powder, free from grittiness. No odour or taste. A mild astringent internally. Externally—a soothing astringent and absorbent, largely used as such for weeping skin diseases.	Astringent. Absorbent.	Insoluble.
Zinci Stearas	No dose.	A light, white, amorphous powder.	Emollient.	Insoluble.
Zinci Chloridum	No dose.	White, granular powder, or more commonly in hard, white opaque sticks and masses. Very deliquescent and caustic.	Powerful caustic and antiseptic.	1 in 1 or less.

PRACTICAL DISPENSING AND PHARMACY

The Action of Drugs and Dosage.

The object of using or of administering drugs is to produce either (*a*) a local action on the tissues, or (*b*) a more general effect after absorption into the blood stream. Drugs employed for local effect include astringents and antiseptics, which exert their influence at the site of application. In a larger sense they embrace preparations which are brought into contact with mucous surfaces to produce a local action, such as nasal and other douches, gargles, etc. Apart from this group it may be said that the vast majority of drugs are administered to produce a sufficient concentration in the blood stream to cause the desired reaction in some particular organ or piece of tissue. Even though a drug may pass, in the blood stream, through all the organs and cell tissues of the body, it will react only with some specialized form of tissue. In other words, all drugs have a selective action, although this property is more marked in some drugs than in others. It is well indeed that drugs do possess this selective power, for on it is

based the whole science of therapeutics and administration of drugs in disease. Chloral hydrate, for example, depresses the central nervous system, while strychnine stimulates the same centres, but neither drug has any important action on other forms of tissue.

It is thought likely that the selectivity of drugs is brought about by reason of changes in the cell constituents induced by chemical action between the drug and the complex compounds present in solution in the cells. Little is known about these delicate and transient reactions, but a pointer to their existence is that it has been noticed that similarity in chemical constitution of drugs is often accompanied by a similarity in therapeutic action.

Drugs cannot change the normal function of an organ or piece of tissue, their action is directed towards stimulating or inhibiting the normal function. Experience has shown that a certain concentration of the drug in the blood stream is necessary to produce a desired effect, and this is obtained by regulation of the dosage.

Dosage. The British Pharmacopœia indicates a minimum and a maximum dose for all drugs and preparations intended for internal use. The former is the smallest dose likely to give a sufficient degree of concentration in the tissues to exhibit the therapeutic action of the drug, and the latter is considered to be the largest quantity that can be given with safety. Note that the maximum is regarded as a **safe** dose, but a dose in excess of the maximum **may** be dangerous. In the case of poisonous drugs it is reckoned that three times the maximum dose may be fatal.

The medical practitioner is not bound to keep within the limits of B.P. dosage, and may diminish or increase doses on his own responsibility, having due regard to the special requirements of his patient. Notwithstanding the responsibility of the doctor with regard to dosage, the dispenser is expected to keep a check on doses, and will not dispense any prescription containing an overdose without obtaining the confirmation of the prescriber. With some medical men it is customary, when prescribing more than the B.P. maximum dose, to draw the dispenser's attention to the fact and at the same time to signify assent, by underlining the dose or inscribing his initials by the side of the drug concerned. A prescription in which the overdose has been emphasized in this way may be dispensed safely.

There are a number of conditions which influence the dosage of a drug such as age, bodyweight, method of administration, cumulative action, habit, sex, idiosyncrasy, tolerance, etc.

Age and Bodyweight. The specific therapeutic action of a drug is regulated by the degree of concentration attained in the blood. Thus, if a dose of an active drug be given to a man, and also to a youth of only half his weight, it will be distributed through twice as much blood and tissue in the man, and the concentration will be only half as great. Therefore, if a dose of 20 grains of a drug will produce a desired effect in the man, a similar action can be induced in the youth by giving a dose of 10 grains. Dosage must therefore be regulated according to the mass of tissue it is required to act upon.

Children's Doses. It is not always convenient to weigh children for the estimation of dosage, and age is now accepted as the basis of dose calculation. The dispenser should be able to check the dose of remedies for children in prescriptions he is called upon to compound.

Of the many rules for calculating children's doses, the one most commonly used is **Young's method,** which is expressed as the following fraction :

$$\frac{\text{Age (in years)}}{\text{Age} + 12.}$$

This gives a fraction which, when taken of the adult maximum dose, represents the average dose for a child of that age.

Examples. The maximum dose of Aspirin is 15 grains. What dose can be given to a child aged 4 years ?

$$\frac{\text{Age}}{\text{Age}+12} = \frac{4}{4+12} = \frac{4}{16} = \frac{1}{4} \text{ of } 15 \text{ grs.} = 3\tfrac{3}{4} \text{ grs.}$$

The maximum dose of Tincture of Ipecacuanha is 30 m. ; what is the dose for a child aged 9 months ?

$$\frac{\text{Age (in years)}}{\text{Age}+12} = \frac{\frac{9}{12}}{\frac{9}{12}+12} = \frac{\frac{9}{12}}{\frac{153}{12}} = \frac{9}{153} = \frac{1}{17} \text{ of } 30 \text{ m.}$$

that is, 2 m. (approximately).

Children have special peculiarities with regard to their tolerance for certain drugs, and can bear nearly as full doses as adults of **arsenic, squills, belladonna, ipecacuanha,** and purgatives like **calomel, rhubarb,** and **jalap.** On the other hand narcotics, particularly **opium** and **cannabis indica** are very badly tolerated by young children, and it is not safe to rely upon doses calculated by Young's or any other method for such drugs.

Methods of Administration. The most common method of drug administration is by the mouth. The drug passes

into the stomach, where it may be modified or inactivated altogether by the action of the gastric juices and, after passing into the small intestine, begins to be absorbed into the blood stream. In the blood it passes through all the organs of the body, neglecting some, stimulating or depressing others, and finally passes out of the body in one or more of the waste products. This cycle of events may take hours or even days for its completion, and the concentration of drug in the blood is low in comparison with the bulk of drug taken.

A more rapid action is afforded, and a higher concentration obtained, by injecting a solution of the drug beneath the skin (subcutaneous injection). The drug becomes active at once and reaches its maximum concentration in a short time, thus permitting of careful observation of the reaction shown. Some drugs cause pain and discomfort when injected in this way, and in these cases it is more convenient to make the injection directly into the muscular tissue (intramuscular injection), whence absorption is even more rapid.

The speediest of all methods is to introduce a solution of the drug directly into a vein (intravenous injection). By this means the whole of the drug is obtained, unaltered, in the blood in the minimum of time and without wastage.

It is obvious that a smaller dose of the drug will be required by any of the injection routes, than when given by mouth.

Volatile substances may be administered by inhalation, absorption taking place very rapidly from the lung alveoli.

Drugs may also be introduced per rectum, either for some local action in the lower bowel, or to produce a more general action after absorption.

Cumulative Action. When certain drugs, such as **digitalis, potassium iodide, arsenic, antimony, lead, mercury,** and many others, have been given medicinally for a lengthy period, severe poisonous symptoms of a chronic nature have been noticed. The condition has, in many cases, been caused by some interference with the natural excretion of the drug from the system. In the case of digitalis, the drug itself contracts the renal vessels and retards excretion ; with other drugs accumulation of poisonous compounds takes place in the liver, spleen, and other organs. Under suitable conditions a fresh supply of the poison is put into circulation from one of these natural storehouses, and poisoning occurs. It follows then, that if any drug is being taken into the system at a quicker rate than it can be excreted, it must accumulate somewhere in the tissues until sufficient is present, or conditions favourable, for unusual or poisonous symptoms to develop. In such cases administration of the

drug is greatly reduced, suspended altogether or, where possible, treatment by some other drug substituted.

Many occupational diseases also come under the heading of cumulative poisoning. The gradual absorption of minute amounts of toxic substances through skin and mucous surfaces, and the inhalation of dust laden with particles of the poison, has given rise to chronic poisoning. Instances of such are more fully described in the poisons section of this work.

Time of Administration. The presence of food in the stomach greatly retards the rate of absorption, and many medicines are specifically directed to be taken either before or after food in order to produce some special action. Drugs administered for their local action on the stomach are administered before food so that they may come into direct contact with the stomach wall. Arsenic is intensely irritant when given on an empty stomach and is, therefore, always administered after meals. Iron preparations, on account of their astringency, are likewise given after food.

A suitable time for the administration of drugs for the treatment of insomnia, is at bedtime, when the activity of the brain cells has been lessened by fatigue.

Habit. The tissues seem to have the power of accommodating themselves to gradual changes of conditions. With some drugs at least, individuals acquire the habit of taking a certain dose at regular intervals and, after a time, the dose ceases to have the effect for which it is taken, and is accordingly increased. This seems to be evidence that the tissues have become so accustomed to dealing with a particular quantity of the drug that they no longer react to it, and a higher concentration is needed to produce the desired effect. By a gradual increase in dosage, amounts can be tolerated that would be fatal to a person unaccustomed to the use of the drug.

Narcotic and sedative drugs like morphine, cocaine, heroin, chloral hydrate, veronal, etc., given to induce sleep or to relieve pain, are habit-forming drugs.

In contra-distinction to habit formation we have the condition known as **idiosyncrasy,** which is an unusual intolerance to the action of certain drugs. This condition is closely related to **food allergy** referred to under the heading of food poisoning. In some patients, quite small doses of ordinary drugs will cause alarming symptoms.

Diseased or Abnormal Conditions. Such conditions of the patient may have to be taken into account by the physician when estimating dosage. It is well known that, in syphilis, patients can tolerate large doses of mercurial preparations,

whereas the same drugs are very badly tolerated in albuminaria. Again, patients suffering from severe mental disorders often require very large doses of hypnotics before they can be quietened. During lactation, many drugs are partially excreted in the milk, and so may be given in turn to the child. Poisoning has been caused in this way.

The foregoing conditions modifying dosage are more important to the physician than to the dispenser, but the work of the latter becomes so much more interesting when he is able to follow, to some extent at least, the principles of drug administration. In any case it has the tendency of making the dispenser more careful in checking doses in the various preparations which he is called upon to compound.

Weighing and Measuring

Before proceeding to a study of the following chapters the student should again read very carefully the section devoted to Weights and Measures, and the examples of the various calculations employed in practical dispensing.

Compounding is the term applied to the expert mixing together of the various ingredients to produce a mixture, plaster, etc., as ordered by the physician.

Dispensing is the term which describes the labelling, packing, and finishing off the preparation which has been compounded.

The terms "Compounding" and "Dispensing" are now regarded as synonymous, and the former term has fallen into disuse.

Weighing

In practical dispensing, small quantities of potent drugs have to be weighed, and accuracy and cleanliness are of the utmost importance. Weighing should never be performed in a careless manner and, in theory at any rate, 1 drachm of sodium bicarbonate should be weighed with the same scrupulous care as 1 grain of arsenic.

The usual type of dispensing scale is provided with two scale-pans; the left hand one is of brass and the right-hand one of glass. The weights should be placed on the brass pan and the drug on the glass one. For ordinary solid drugs it is not necessary to counterbalance pieces of paper on the scale-pans, the drug may be weighed directly on to the glass pan. Only in the case of soft solids or greasy substances is such a procedure advisable.

Accurate weighing is chiefly a matter of practice, but the following points are worthy of note:

(1) When weighing 1 grain or less, use the more accurate and sensitive chemical balance.

(2) Watch the pointer to judge when correct weight has been obtained, and not the scale pans.

(3) Never remove excess of the drug from the pan with the beam raised ; the practice tends to damage the knife edges which support the beam.

(4) Remove the last traces of drug from the scale pan by means of a spatula and not by tapping the glass pan against the edges of mortars and measures. A splinter of glass broken off the pan will throw the balance out of true.

(5) After use, wipe scales and dispensing counter at once, and replace weights in the drawer provided for them.

The Weighing of Fractional Quantities.

(1) ℞

Bismuth. carb.	gr. iv
Kaolin	gr. xx
Morphin. hyd.	gr. $\frac{1}{20}$
Mt. ft. pulv.	mitte tales vi.

The six powders only require $\frac{6}{20}$ grain of morphine hyd. altogether, and this quantity cannot be weighed on an ordinary balance, neither are weights obtainable for such amounts.

It is usual to fix upon some small weight of drug as being the smallest quantity that ought to be weighed on the dispensing balance ; 1 grain has been adopted as this minimum amount. One grain of the morphine salt is weighed and placed in a small glass mortar. Then 19 grains of some inert powder such as **lactosum** (Milk Sugar) is added and mixed with careful trituration. This gives 20 grains of a mixture containing 1 grain of morphine hydrochloride, and, therefore, each grain of this mixture must contain $\frac{1}{20}$ grain of the morphine compound. Six grains of the mixture will contain the required amount of $\frac{6}{20}$ grain.

Morphine hydrochloride	1 grain.
Lactosum	19 grains.
Total ..	20 grains.

20 grains of the mixture contain 1 grain of morphine hyd.
1 grain ,, ,, contains $\frac{1}{20}$ grain of morphin hyd.
6 grains ,, ,, contains $\frac{6}{20}$ grain of morphin. hyd.

By this method the $\frac{1}{20}$ grain of alkaloidal salt in each powder is represented by 1 grain of the mixture, and the powders will now weigh exactly 25 grains each.

The original fractional quantity of $\frac{6}{20}$ grain should not be reduced to $\frac{3}{10}$ grain as this will only lead to fractional amounts again when weighing out the powders.

(2) ℞

Arsenii triiodid.	..	G. 0·003
Ft. pulv.	..	mitte x.

The smallest metric quantity of a potent drug that should be weighed on the dispensing scales is 0·1 gramme.

In the above example the total quantity required is 0·003 × 10 gramme or 0·03 gramme.

Calculation :

Arsen. triiodid. ..	..	0·1 gramme
Lactose	..	0·9 gramme
Total	..	1·0 gramme

Of this mixture weigh 0·3 gramme which contains the required amount of 0·03 gramme of the arsenic compound.

This is still too small to be divided into ten powders, so a further 0·7 gramme of lactose is added, thus :

Arsenic mixture ..	..	0·3 gramme
Lactose	..	0·7 gramme
Total	..	1·0 gramme

This is then divided, by weighing, into ten powders, each weighing 0·1 gramme, and each containing exactly 0·003 gramme of arsenic compound.

(3) ℞

Arseni trioxid. ..	..	gr. $\frac{1}{30}$
Strychnin. hyd. ..	..	gr. $\frac{1}{50}$
Ft. pil.	..	mitte tales xxiv.

Following the same procedure as before, and taking each ingredient separately, the calculations are :

(*a*)

Arseni trioxid.	..	1 grain
Lactose	..	29 grains
Total	..	30 grains of mixture.

Weigh out 24 grains of this mixture.

(*b*)

Strychnin. hyd.	..	1 grain
Lactose	..	49 grains
Total	..	50 grains of mixture.

Weigh out 24 grains of this mixture.

The pills will now contain 2 grains of solid ingredients in each. This is not an unreasonable weight, but they could have been made smaller by reducing the original fractional amounts; thus $\frac{24}{30}$ grain arsen. triox. would become $\frac{4}{5}$ grain, and $\frac{24}{50}$ grain strychnin. hyd. become $\frac{12}{25}$ grain. The calculations would then be:

(*a*)	Arsen. trioxid.	1 grain
	Lactose	4 grains
	Total ..	5 grains

Weigh 4 grains of the mixture.

(*b*)	Strychnin. hyd.	1 grain
	Lactose	24 grains
	Total ..	25 grains

Weigh 12 grains of this mixture.

The weight of solid ingredients for the 24 pills is now 16 grains, and this, together with some added binding agent, will give approximately 1 grain pills.

When prescriptions for fractional quantities are frequently dispensed, it is a time-saving device for the dispenser to have a series of admixtures of various strengths all ready prepared. These are known as **triturates,** and may be 1 in 5, 1 in 10, 1 in 50, or any other convenient strength. They may be stored in wide-mouthed bottles, the labels bearing in bold figures and letters, the strength and composition of the triturate. The $\frac{4}{5}$ grain of arsenic required in the above example would be obtained by weighing 8 grains of a 1 in 10 triturate, 16 grains of a 1 in 20 triturate, or 4 grains of a 1 in 5 triturate.

Measuring

Measures up to a capacity of 4 fluid ounces are usually conical in shape, those of a larger capacity are generally round. Dispensing measures are suitably graduated, and have the markings on the front and rear surfaces. The base of the measure should be held between the first and second fingers of the left hand, and steadied by means of the thumb in front, in such a manner that the graduations are not obscured, and held up on a level with the eyes. The surface of the liquid will then coincide both with the front and rear graduations, thus proving that the measure is being held perfectly level.

The surface of liquids is concave, partly due to capillary attraction and partly to the elasticity of the liquid. This phenomenon is more apparent in clear, transparent liquids than in muddy or opaque ones. Thus the surface level of the

liquid appears to have two lines ; this double line is called the **meniscus.** In wide measures the meniscus is not very noticeable, but in narrow, conical measures in which the meniscus is more pronounced, correct measure is taken as lying midway between the upper and lower lines.

For measuring very small quantities of fluid, a small graduated pipette or syringe may be used.

Rules of Measuring.

(1) Choose a measure nearest to the amount required. Measure small amounts in the 2 drachm conical glass, 4 to 6 drachms in the ounce measure, and so on. Never attempt to estimate a small quantity in a 2 or 4 ounce glass.

(2) When two or more liquids, for the same medicine, require to be measured, the same glass may be used throughout, always providing that Rule (1) is strictly observed and that the liquids are measured in correct order—thin, mobile liquids before thicker liquids.

(3) Keep the label of the containing bottle facing upwards ; this prevents drops of the liquid from running down the side of the bottle and defacing the label.

(4) Catch the drop on the lip of the bottle with the stopper before replacing the latter.

(5) If excess of the fluid has been poured into the measure glass it may be returned to the stock bottle, unless the glass has been used previously for some other fluid, in which case the excess must be poured down the sink.

Dropping.

This procedure may only be used for amounts up to 5 m. At the best it is a rough and unreliable method of measuring and is not to be recommended, as the weight and volume of a drop depends upon such conditions as the viscosity of the fluid, size and shape of the bottle neck, amount of moisture in the atmosphere, etc. Dropping can always be avoided by using a graduated syringe or pipette, or by the method of dilution described below.

For purposes other than the compounding of medicines, a standard size of dropping tube has been agreed upon. The tube is of such a bore that 20 drops are equal to 1 gramme of distilled water.

Fractional Quantities in Liquids.

(1) ℞

Tinct. Strophanthi	..	ℿ $\frac{1}{5}$
Aq. Camphor. ..	..	ad ℥ij

Ft. haustus. To be taken at once.

Measure a fixed minimum quantity of the tincture (10 minims is suggested) and dilute to 500 minims with the vehicle. Then, 10 minims of this dilution will contain $\frac{1}{5}$ m. of the tincture.

Always dilute the active fluid to 100 times the denominator of the fraction, otherwise an amount smaller than 10 minims of the dilution will need to be measured.

(2) Required—$\frac{1}{10}$ minim of Liq. Adrenalin. Hydrochlor.

Liquor Adrenalin	..	10 m.
Distilled water	..	990 m.
Total	..	1,000 m. of dilution.

Then, 1,000 minims contain 10 minims of the Liquor.
100 ,, ,, 1 minim ,, ,,
and 10 ,, ,, $\frac{1}{10}$ minim ,, ,,

Specific Gravity

The Specific Gravity (Sp. Gr.) of a liquid is defined as being the weight of a known volume of that liquid compared with the weight of the same volume of distilled water under the same conditions of temperature and atmospheric pressure.

Some B.P. preparations are tested as to strength by taking the specific gravity and comparing with the B.P. standard. Most of the dilute acids are tested in this way, and the process is easily carried out by means of the specific gravity bottle.

An example of the calculations involved is given herewith :

Weight of specific gravity bottle filled with distilled water	106·417 grammes.
Weight of specific gravity bottle empty	50·0 grammes.
Weight of water	56·417 grammes.
Weight of specific gravity bottle filled with liquid	101·938 grammes.
Weight of specific gravity bottle empty	50·0 grammes.
Weight of liquid	51·938 grammes.

$$\text{Specific Gravity} = \frac{\text{Weight of Liquid}}{\text{Weight of Water}} = \frac{51{\cdot}938}{56{\cdot}417} = 0{\cdot}9207.$$

Practical Example.—Suppose we wish to obtain 4 fluid ounces of castor oil by weighing instead of measuring ; this

can be done by taking the specific gravity of the oil into account.

The Sp. Gr. of castor oil is 0·970, which means that 1,000 grains of pure distilled water and 970 grains of castor oil have the same volume.

4 fluid ounces of water weigh $4 \times 437{\cdot}5 = 1{,}750$ grains.

4 fluid ounces of castor oil weigh $1{,}750 \times 0{\cdot}970 = 1697{\cdot}5$ grains.

THE COMPOUNDING OF MIXTURES

General Hints.

(1) Read the prescription right through from start to finish and be certain you can translate and understand it.

(2) Write all labels before beginning to compound.

(3) Obtain the correct size and type of bottle, and however clean and bright it may appear, wash it out thoroughly.

(4) The dosage stated on the label must agree with the graduations (if any) on the bottle; use an ungraduated bottle rather than a wrongly graduated one.

(5) Cultivate the habit of inspecting the label on the stock bottle, both on taking it from the shelf and on returning it thereto.

(6) When weighing or measuring a poisonous or potent drug, always get a second person to check the correctness of the amount whilst it is still on the scale pan or in the measure.

(7) Unless there is any special reason to the contrary, add small quantities of poisonous liquids to the mixture in the bottle the last thing before corking.

(8) It is a good practice to put a " Shake the Bottle " label on all mixtures sent out. However clear a medicine may be at the time of dispensing, it may deposit on standing.

(9) When in doubt, do not be afraid to ask advice.

(10) Work neatly and quickly; hesitation indicates doubt, and in many cases, lack of ability.

Simple Mixtures.

The simplest type of mixture to compound is that containing only liquid ingredients which dissolve in or are miscible with an aqueous vehicle.

℞

Liquor Ferri Perchlor. ..	ℿ v
Glycerin	ℿ xxx
Aq.	ad ℥ j
Ft. mist.	mitte ℥ vj

The compounding of this mixture involves only the accurate measurement of the liquid ingredients, making up to volume, and labelling.

Note that the ingredients are for 1 fluid ounce of mixture, and that 6 fluid ounces are to be sent. Quantities required will be :

Liquor Ferri Perchlor ..	$6 \times 5 = 30$ minims.
Glycerin	$6 \times 30 = 180$ minims or 3 fluid drachms.

Measure the liquor in the smallest sized conical measure, transfer it to another glass capable of holding at least 6 fluid ounces, and rinse the measure with several portions of the vehicle. Measure 3 drachms of glycerin and add some of the vehicle to it in the measure glass. Stir the two liquids together with a glass rod taking care to detach the viscous glycerin from the sides of the glass, and note that it forms a clear solution with the water. Transfer to the larger measure containing the liquor, and rinse the glass with more of the vehicle. Now make the volume of fluid in the measure up to 6 fluid ounces, pour into a white glass dispensing bottle and affix the label.

Immediately wash the measures, glass rod, etc., and leave everything clean and tidy for the next operation.

Distilled water should be used for all mixtures, unless Aqua Fontana (tap water) is specified. In many cases there is no difference in the finished product whether tap water or distilled water be used, but excessive hardness of the tap water may cause sedimentation where distilled water would yield a perfectly clear and bright mixture. Distilled water is cheap and should always be employed so as to ensure uniform results. The presence of carbonates or bicarbonates in the vehicle used for the above mixture would cause turbidity on standing due to the formation of a small amount of insoluble carbonate of iron.

℞

Tr. Card. Comp.	$\bar{3}$ij
Spt. Ammon. Aromat. ..	$\bar{3}$iij
Tr. Gentian. Comp.	$\bar{3}$iv
Aq. Menth. Pip. ..	ad $\bar{3}$viij. Ft. Mist.

This may be compounded as described for the previous example, but note that the vehicle is a medicated water. The tinctures and spirits are all mobile liquids, and the same glass may be used throughout for their measurement. As the prescriber does not specify any particular kind of Pepper-

mint Water, the dispenser may use either the distilled preparation, that made by diluting the concentrated water, or a water made by the alternate process. Had Aqua Menth. Pip. Dest. been prescribed it would be necessary to use the distilled preparation.

Note that the finished product is turbid ; this is due to the volatile oils in the Tinct. Card. Co. and Spts. Ammon. Aromat., which are freely soluble in alcohol, being precipitated as a fine deposit on addition of water. It is only necessary to put a " Shake the Bottle " label on the container, and in no case should straining or filtering be resorted to as a means of clearing the mixture.

Soluble Salt Mixtures.

The general rule is to dissolve soluble salts in a portion of the aqueous vehicle before adding any other ingredient. Freely soluble salts, such as **potassium iodide** and **ammonium chloride,** may be dissolved by placing them directly into the bottle with an ounce or two of the vehicle and shaking until solution is effected. Less soluble salts, and hard crystalline masses, like **ammonium carbonate** and **perchloride of mercury,** require to be powdered and dissolved in a mortar before pouring into the bottle. **Scale preparations of iron**—Ferri et Ammonii Citras and Ferri et Quininæ Citras—should not be dissolved in the bottle by shaking as, although freely soluble, a copious froth is formed which takes a long time to subside. The best method of effecting solution is to have several ounces of the vehicle in a wide measure, pour the scales on the surface of the liquid, allow them to slowly sink to the bottom of the glass, and then dissolve by stirring with a glass rod.

Many students have a rooted idea that because a salt is soluble in water, it will be even more soluble in alcohol and spiritous solutions. This is not so ; indeed, the addition of alcohol to a concentrated aqueous solution of a salt will almost certainly result in the precipitation of the salt from solution.

The following is an example of a simple soluble salt mixture :

℞

Ferri Sulph.	gr. xxiv
Mag. Sulph.	℥iv
Spt. Menth. Pip.	℥j
Tr. Calumbæ	℥iij
Aq.	ad ℨvj. Ft. Mist.

Method of Compounding. Weigh out the solids, reduce them to a coarse powder in a stone mortar. Add a portion

of the vehicle and stir until the powder has completely dissolved ; strain if necessary and pour into the bottle. Add the Spirits and Tincture, and make up to the required volume with water.

℞

Sod. Bicarb.	℥vj
Sod. Citras	℥iv
Tr. Hyoscyami	℥vj
Spt. Chlorof.	℥ij
Aq.	ad ℨviij. Ft. Mist.

Method of Compounding. This again is a soluble salt mixture, but with the difference that the salts are present in such quantity that they will not all dissolve in the vehicle. Sodium Bicarbonate is only soluble 1 in 11, and therefore 6 drachms will require a minimum of $6 \times 11 = 66$ fluid drachms of water for its solution. The whole mixture only measures $8 \times 8 = 64$ fluid drachms, and of this 8 fluid drachms are occupied by spiritous fluids in which the bicarbonate is even less soluble. It is evident then, that a large proportion of the salts must remain undissolved, and the mixture is compounded by placing the salts in a mortar and reducing them to as fine a powder as possible. Stir the powder with some of the vehicle, transfer to the bottle, and rinse out the mortar with more of the vehicle. Add the liquid ingredients and make up to the required volume. Some of the soluble solid will enter into solution, and the rest will remain in the bottle as a fine sediment. Put a " shake " label on such mixtures. Do not fall into the error of using hot water to effect solution as, on cooling, the excess of solid will separate out as **crystals,** and the patient will hesitate to take the mixture.

Simple Insoluble Salt Mixtures.

A mixture containing an insoluble salt is really an example of physical incompatibility, but such preparations are frequently compounded.

℞

Rhei Pulv.	gr. xxxvj
Bism. Carb.	℥ij
Calc. Carb.	℥ij
Tr. Card. Co.	℥iij
Spts. Ammon. Aromat. ..	℥iss
Aq. Chlorof. ..	ad ℨvj. Ft. Mist.

Method of Compounding. The three solid ingredients are insoluble, and should be thoroughly triturated together in a

stone mortar. Then add a small amount of the vehicle, and with the aid of the pestle, rub into a smooth creamy mixture. It is in this concentrated state that coarse particles can best be rubbed smooth. Gradually incorporate more of the chloroform water whilst continuing to stir, transfer the mixture to the bottle, rinse the mortar, add the liquid ingredients, and make up to volume with more of the vehicle.

When mixtures contain both soluble and insoluble salts, it is best to regard them as being all **insoluble** and treat as above. An exception to this rule is made when the soluble salt is ammonium carbonate. In this case the ammonium salt should be dissolved in a separate portion of the vehicle and poured into the bottle, as trituration in an open mortar would result in a loss of the volatile ammonia.

℞

Magnes. Sulph.	℥ij
Magnes. Carb. Pond. ..	gr. xx
Ol. Menth. Pip.	♏ ½
Aq.	ad ℥i
Ft. mist.	mitte Ci.

This preparation, known as Mistura Alba, is a favourite purgative, and is frequently compounded in large quantities.

Method of Compounding. The quantities required for 1 gallon are :

Magnesium Sulphate ..	19,200 grs. (soluble).
Magnesium Carbonate ..	3,200 grs. (insoluble).
Oil of Peppermint	80 m.
Water .. .. up to	1 gallon.

It will be necessary to employ both Imperial and Apothecaries' weights in dealing with these large amounts.

(1) 19,200 grains is just 50 grains short of 2¾ lb. imperial, and it will be an advantage to weigh the latter amount of the sulphate and discard 50 grains. Place the crystals in a large stone mortar or large enamel jug, and pour over it about 2 pints of hot water, stir until solution is complete. It will be necessary to strain this solution as most commercial samples of magnesium sulphate become contaminated with particles of dust, etc., which rise to the surface of the solution as a scum.

(2) Weigh out 7 oz. (Imperial) and 137½ grains of the heavy magnesium carbonate and place a little of it in another large mortar. Add the peppermint oil to the carbonate in the mortar and triturate thoroughly to disperse the oil evenly throughout the bulk of the powder. Gradually add more of the carbonate with continual trituration until all has been used.

(3) Now begin to add the solution of magnesium sulphate, which by this time has cooled, with thorough trituration, to form a smooth, thickish cream. The first addition of the solution should not be too small or difficulty will be experienced in stirring, and lumps may be formed; sufficient solution should be added at one time to produce a creamy mixture after stirring. Add the remainder of the sulphate solution and gradually make up to volume with water. Oil of peppermint is used in this preparation rather than the spirit or aqua, on the grounds of cheapness.

Suspending Agents.

For certain insoluble drugs it is necessary to thicken the vehicle so that the insoluble particles do not separate out too rapidly.

It has always been a matter for discussion whether the dispenser has the right to add or omit suspending agents if he thinks fit. It is now generally accepted that if the prescriber orders a suspending agent, the dispenser must put it in, and has no right whatever to omit it. On the other hand, if the dispenser is of the opinion that a reasonably accurate proportion of an insoluble ingredient **cannot** be obtained by the simple expedient of shaking the bottle and pouring out a dose at once, he is justified in adding the necessary suspending agent.

Certain drugs which at one time needed the addition of suspending agents, are now manufactured in such a light and readily diffusible form that these agents can be dispensed with. Bismuth carbonate is an example of such a compound.

Suspending agents are of two kinds, **natural** and **artificial.** Natural suspending agents are thick liquids, such as glycerin and syrup which are used for their medicinal or flavouring properties, and by reason of their viscosity, also assist in the suspension of insoluble particles.

℞

Bismuth Subnit.	.. ..	℥ij
Tr. Rhei Co. ..	.. ..	℥ss
Spt. Chlorof. ..	.. ..	℥j
Syrup. Aurantii	.. ..	℥iss
Aq.	..	ad ℥vj. Ft. mist.

Method of Compounding. The subnitrate of bismuth is not an official B.P. salt, but it is still occasionally used in mixtures. It should be triturated in a mortar with the previously diluted Orange syrup before transferring to the bottle and adding the other ingredients. The thickness of the syrup aids in keeping the dense particles of the subnitrate in suspension for sufficient

time for a dose to be poured out. Natural suspending agents do not thicken the mixture sufficiently for some drugs, and for these the more powerful artificial agents are required. Such agents should be ordered in the prescription by the physician, but should he omit to do so the dispenser may, if he thinks it essential, make the necessary addition. The artificial suspending agents in common use are **acacia** and **tragacanth** gums, either in powder or mucilage.

℞

Aspirin	℥iss
Caffein. Citras	gr. xxiv
Phenacetin	℥j
Tr. Cocci	♏xx
P. Tragacanth. Co.	q.s
Aq.	ad ℨvi. Ft. mist.

Compound Tragacanth Powder is a most useful suspending agent for general use, although some dispensers have objected to it on the grounds that it unnecessarily introduces other ingredients (starch and sugar) into the preparation. From 2 to 10 grains, according to the nature of the drug or drugs to be suspended, will be required for each ounce of mixture to be made. In the above example, 30 grains in the 6-oz. mixture will be ample.

Method of Compounding. Carefully reduce the crystalline substances to the finest powder, add 30 grains of Pulv. Tragac. Comp. and lightly stir the powders to an intimate mixture. On adding a little of the vehicle and stirring with the pestle, the gums commence to dissolve and form a thick liquid in which the insoluble particles are perfectly suspended. Continue the stirring for a minute or two to ensure perfect smoothness, and then commence to add further quantities of the vehicle in small successive portions, continuing to stir throughout the operation. When sufficiently fluid, transfer to the bottle, rinse the mortar, add the tincture, make up to volume, and give the finished product a thorough shaking. The mixture will be a fairly thick liquid and if the bottle be well shaken before a dose is poured, the insoluble solids will diffuse throughout the fluid medium, and each dose will contain its correct proportion of solid matter. The particles will certainly separate out on standing, but readily diffuse again when shaken.

When **mucilage of acacia** or **tragacanth** is ordered as a suspending agent, it is to be added in the same way as a natural suspending agent. One fluid drachm of either mucilage will usually be required to each ounce of mixture.

The best suspending agent to employ with **bismuth** salts is tragacanth powder or mucilage. Acacia tends to form a cement-like mass with bismuth compounds which does not diffuse on shaking. It has been held that even should the prescriber order the use of acacia, the dispenser would be justified in substituting an equal amount of the tragacanth preparation.

Simple tragacanth powder is a powerful suspending agent, although somewhat difficult to handle.

℞

Bismuth. Salicylas	℥iv
Salol.	℥j
Spts. Chlorof.	℥iij
Tragac. Pulv.	gr. xx
Aq.	ad ℥viij. Ft. mist.

Method of Compounding. Three methods of compounding this mixture are available.

(1) Triturate the Bismuth salt, Salol, and Tragacanth together, taking care to reduce the Salol to as fine a powder as possible. Now add sufficient of the vehicle, all at once, to make a cream on trituration. Continue the trituration of this creamy mixture until perfectly smooth, and gradually dilute with further portions of vehicle until sufficiently fluid to transfer to the bottle. Rinse the mortar, add the spirit, make up to volume and give the finished mixture a thorough shaking.

(2) Mix all the powders as before, add the undiluted Spirit of Chloroform, and stir. Then begin to add, with constant stirring, successive portions of the vehicle until a thick creamy mixture results. Finish off in the manner previously described. The addition of the spirit helps to break down the gum ; water added directly to this gum forms gelatinous lumps which are almost impossible to rub smooth.

(3) Triturate the Bismuth and Salol together in a mortar. Pour the spirit into a bottle, run the spirit round the walls and neck of the bottle (this prevents the powdered gum from sticking to the bottle), and drop in the powdered Tragacanth. The gum readily diffuses in the spirit without dissolving and without thickening. Now add, all at once, about 4 oz. of water and shake vigorously. The result is a thick mucilage, which is now added to the mixture of powders in the mortar, and the mixture completed in the usual manner.

Extracts in Mixtures.

Fluid extracts, unless of a resinous nature, do not present any difficulty in compounding.

The best way of adding dry or soft extracts is to rub them down in a mortar with a little warm water ; in other words, to convert them into liquid extracts before adding to the remainder of the ingredients.

Resinous extracts will need the addition of mucilage to suspend the insoluble resin particles.

A difficult extract to compound is that of Male Fern (Extractum Filicis), which contains both oils and resins. The compounding of this preparation is dealt with under the heading of Emulsions.

Infusions in Mixtures.

For a number of reasons, fresh infusions are rarely used in army dispensaries, the concentrated products being invariably provided. The B.P. has now recognized the use of concentrated infusions, and gives directions for their preparation.

It can be said at once that the infusion made by diluting the concentrated product is never the equal in medicinal activity or flavour of the freshly made preparation, but the concentrated infusion has the advantage of good-keeping properties. Fresh infusions soon develop vegetable growths, and should be used within 12 hours of preparation. Concentrated infusions more closely resemble tinctures or liquid extracts than infusions as they contain 20 to 25 per cent. alcohol as a preservative.

If the prescription specifies a " Recens " (fresh) infusion, then a freshly made preparation must be dispensed. If, however, as is usual, no special instructions as to the type of infusion to be employed are given, then it is optional whether the fresh or concentrated preparation be dispensed, **except that the infusion of digitalis must always be freshly prepared.**

Preparation of a Fresh Infusion.

This is a simple operation which can be likened to making a pot of tea. Warm the infusion pot by pouring some hot water into it. Slice, bruise, or powder the drug as required, and weigh out the required amount. Empty the infusion pot, dry it quickly, place the drug in it, and counterbalance on the scales. Have some boiling distilled water at hand and weigh it into the pot—remember 1 oz. weight (Imperial) is equal to 1 fluid ounce. Allow to stand for the prescribed length of time, pour off the infusion, and strain if necessary. Note that infusions are not made up to any definite volume. Be careful to allow the infusion to cool to room temperature before using it in a mixture, otherwise volatile ingredients may be driven off.

Use of Concentrated Infusion.

B.P. concentrated infusions are so made that 1 fluid drachm diluted and made up to 1 fluid oz. with distilled water gives a preparation of similar appearance and strength to the fresh infusion. Infusions other than those described in the B.P. are also concentrated 1=8 unless otherwise stated on the label.

℞

Tr. Card. Co.	℥j
Tr. Rhei Co.	℥iij
Syrup. Zingib.	℥ss
Infus. Aurantii ..	ad ℥viij. Ft. mist.

The volume of ingredients other than the vehicle in this example is 8 fluid drachms, therefore, the amount of infusion needed is 7 fl. oz. If a fresh infusion is employed, no mistake can be made as only 7 fl. oz. of infusion can be got into the bottle when the other ingredients have been added. In using the concentrated preparation care must be taken to see that no more than the equivalent of 7 fl. oz. is used, that is, 7 fl. drs. of concentrated.

℞

Sodii Bicarb.	℥iv
Bism. Carb.	℥ij
Tr. Gent. Co.	℥ss
Spt. Ammon. Aromat. ..	℥ij
Syrup. Aurant.	℥vj
Inf. Caryophylli ..	ad ℥xij. Ft. mist.

In this prescription allowance has to be made for the volume occupied by solid as well as liquid ingredients other than the vehicle of infusion. It is usual to reckon that the volume occupied by a soluble salt is equal to half its weight, and for insoluble salts to allow the same volume as weight. Of course, this is not exactly correct, but is near enough for all practical purposes. The total volume to be allowed, therefore, for other ingredients, is :

Sod. Bicarb.—a soluble salt ..	2 drachms.
Bismuth Carb.—an insoluble salt	2 ,,
Liquid ingredients	12 ,,
Total ..	16

The remainder of the volume (12−2=10 fl. oz.), represents the infusion, and the corresponding quantity of concentrated infusion needed for the mixture is 10 fl. drs.

Another method of working which affords greater accuracy, but which entails a waste of infusion, is to measure out the full 12 fl. drs. of concentrated infusion, dilute it to 12 fl. oz. with distilled water, use as much of this as is required, and discard the unused portion. The disadvantage of this method is that too great a wastage would occur when the volume of other ingredients in the mixture is large.

Resinous Tinctures in Mixtures.

Among the more important resinous solutions which require to be suspended when compounded in mixture form, are the tinctures of **asafetida, catechu, myrrh, tolu,** and **benzoin comp.** On rare occasions the suspending agent to be employed is named in the prescription, more often the choice is left to the dispenser. The agents commonly used are the mucilages of acacia and tragacanth. Either of these mucilages, or a mixture of equal parts of each, may be employed, and from $\frac{1}{2}$ to 2 drachms to each ounce of mixture will suffice.

Method of Compounding. Measure the mucilage into the bottle and dilute it with about an equal volume of the aqueous vehicle. Pour the resinous tincture, in a thin stream, into the centre of the diluted mucilage, gently agitating the while. Care should be taken not to allow the tincture to come into contact with the wet sides of the bottle, otherwise resin particles will be precipitated which cannot afterwards be suspended. Until he has gained experience of the method, the student may find it better to compound the mixture in a mortar or to pour the tincture into the mucilage in the bottle through a small glass funnel. Whichever method is adopted the resin particles become coated with mucilage immediately they are precipitated from solution and do not readily cohere again. Salts and acid preparations should be added after the resinous preparation has been suspended and should never be added to the dilute mucilage beforehand, as this will interfere with suspension of the resinous tincture.

Quinine Mixtures.

There are six official Quinine salts :

Quinine Sulphate	Soluble 1 in 800.
,, Bisulphate	,, 1 in 10.
,, Hydrochloride ..	,, 1 in 32.
,, Dihydrochloride ..	Soluble in less than its own weight of water.
,, Tannate	Very sparingly soluble.
,, and Ethyl Carbonate	Insoluble.

The last two salts are frequently administered in powder or cachet form as, owing to their insolubility, they are practically

tasteless. Although the hydrochlorides and the bisulphate are so much more soluble, quinine sulphate remains the first choice with many prescribers when quinine is to be administered in mixture form.

Quinine Sulphate with Acids.

Most quinine sulphate mixtures also contain dilute sulphuric acid to aid the solution of the alkaloidal salt, 1 minim of the dilute acid being sufficient to dissolve 1 grain of the salt. Other dilute mineral acids, hydrobromic, hydrochloric, and phosphoric acids, are also employed for this purpose.

℞

Quinin. Sulph.	.. ..	gr. iv
Acid. Sulph. Dil.	.. ..	♏iv
Tr. Nucis Vom.	.. ..	♏v
Syr. Aurant. ..	.. ..	℥ss
Aq.	..	ad ℨss. Ft. mist mitte ℨvj

Method of Compounding. There is no need to powder the crystals of quinine sulphate, simply dilute the acid with about half the available quantity of the aqueous vehicle, add the crystals, and stir. The salt dissolves almost at once. Add the tincture and then the syrup and make up to volume.

The important point is to **freely dilute the acid before attempting to dissolve the Quinine compound.** The stronger the acid solution the more difficult it is to get the quinine to dissolve.

In addition to the dilute mineral acids, other acid preparations like Liquor Ferri Perchlorid, and Syrup Limonis, are used in conjunction with this quinine salt.

℞

Quinin. Sulph.	.. ..	gr. xxiv
Liq. Arsen. ..	.. ..	♏xxxvj
Liq. Ferri Perch.	.. ..	℥iij
Aq.	..	ad ℨvj. Ft. mist.

Freely dilute the Iron liquor and in this dissolve the crystals of quinine sulphate. Complete the mixture in the usual manner.

Quinine Sulphate without Acid.

Physicians sometimes prescribe the sulphate in neutral or even alkaline mixture. Some dispensers have become so accustomed to adding a dilute acid for the purpose of dissolving the salt, that they do so when such is not ordered in the prescription. This is a grave error which cannot be justified

on any grounds; if the dispenser is of opinion that the mixture needs the addition of acid he must obtain the authority of the prescriber for the addition.

℞

Quinin. Sulph.	.. ..	℈ij
Potass. Bicarb.	.. ..	ʒij
Tr. Hyoscyami	.. ..	ʒss
Syrup	.. ..	ʒi
Aq.	..	ad ℥viij. Ft. mist.

Method of Compounding. It is obvious that if the quinine salt were to be dissolved with the aid of an acid, that such acid would interact chemically with the bicarbonate, causing effervescence and totally altering the character of the mixture. The best way to compound this mixture is to triturate the solid ingredients to a very fine powder and compound as an ordinary insoluble salt mixture, using the syrup as a natural suspending agent.

Quinine Tannate.

Quinine tannate is not often prescribed in mixtures, but it may be formed as a product of chemical interaction. Any soluble quinine salt prescribed with an infusion or liquid extract containing tannin or similar astringent, will precipitate the insoluble tannate on standing.

℞

Quinin. Dihydrochlor.	..	ʒss
Liquor Arsenicalis ..	..	♏xl
Spt. Chlorof. ..	.. ..	ʒij
Infus. Gentian. Comp.		ad ℥viij. Ft. mist.

The quinine compound readily dissolves and the mixture presents no difficulty in compounding, but after standing for a time a light precipitate of quinine tannate may be noticed. This mild degree of incompatibility is not dangerous and the precipitate must not be removed by straining or filtration. Put a " Shake " label on the bottle.

Hydrocyanic Acid in Mixtures.

The B.P. Acidum Hydrocyanicum Dilutum is a 2 per cent. solution of HCN gas in distilled water. It is stored in quantities of 1 or 2 fl. oz., in glass-stoppered poison bottles, and is kept inverted in a cool place. Even when such precautions are taken HCN gas is evolved and collects in the bottle, and will escape when the stopper is withdrawn. When using this acid always shake the bottle to redissolve the gas **before loosening the stopper.**

Diluted Prussic Acid should always be added to the mixture in the bottle the last thing before corking, so as to minimize loss of strength. Mixtures containing this preparation must always have a " Shake " label on the bottle, so that any gas which is liberated in the bottle may be redissolved.

Iodide Mixtures.

℞

Potass. Iodid.	.. ..	℥ij
Spts. Ether Nit.	.. ..	℥ss
Aq. Chlorof.		ad ℥iv. Ft. mist.

Iodine is liberated from solutions of soluble iodides by the action of oxidizing agents, and this is likely to be dangerous as free iodine is an irritant poison.

Spirit of Nitrous Ether, when perfectly fresh and at full strength, has little or no action on iodide solutions, but after being stored for only a short time it undergoes gradual decomposition. As a result of dissociation Nitrous Acid and Nitrous Oxide are formed, both of which are strong oxidizing agents. If the above mixture is dispensed without taking certain precautions, a dark brown solution is obtained which contains an appreciable quantity of iodine in the uncombined state ; the darkening will be observed immediately the spirit is added.

A safe mixture is obtained by neutralizing the spirit before adding it to the iodide solution, as follows : Measure out about 6 fl. drs. of the spirit and add about 30 grains of sodium bicarbonate to it in the measure. The bicarbonate does not dissolve, but after remaining in contact with the spirit for a few minutes it will have combined with any free acid present. Test for absence of acidity with blue litmus paper, and measure out 4 fl. drs. of the neutralized spirit. On adding this to the solution of the potassium iodide, no discoloration occurs.

Some dispensers keep a layer of bicarbonate at the bottom of the Spirits Ether Nit. bottle, so that they always have a supply of acid-free spirit available. This is a needless precaution as the acidity of the spirit is of no particular account in the majority of mixtures ; it is only in iodide medicines that the spirit must be neutral.

℞

Hydrarg. Iodid. Rub.	..	gr. iv
Potass. Iodid.	.. ..	gr. vj
Aq.		ad ℥xvj. Ft. mist.

The red iodide of mercury is occasionally prescribed in mixture form. This mercury compound is insoluble in

water, but is very soluble in aqueous solutions of potassium iodide, due to the formation of a soluble double salt—mercuric potassium iodide. The small amount of potassium iodide in this mixture is of no therapeutic value, but is present for the express purpose of dissolving the mercury salt. The two salts should be added to about 2 fl. drs. of water in a measure and stirred until a clear, water-white solution is obtained, which may then be diluted to the full volume of the mixture without fear of precipitation.

Should the prescriber omit to include potassium iodide in such a mixture, the dispenser should rectify the omission as the dose of the mercury salt is so small ($\frac{1}{32}$—$\frac{1}{16}$ gr.) that it is dangerous to send it out as a precipitate.

Other iodide mixtures are discussed under the heading of Incompatibility.

Bismuth Subnitrate in Mixtures.

Bismuth Subnitrate or Oxynitrate is not now a B.P. compound, but it is still occasionally prescribed in mixtures.

℞

Bismuth. Subnit.	.. ..	℥iij
Sodii Bicarb. ..	.. ..	℥iij
Tinct. Rhei Comp.	.. ..	℥iv
Glycerini ..	.. ..	℥vj
Aq.	..	ad ℥vj. Ft. mist.

Bismuth Subnitrate always undergoes slight decomposition when added to water, a little nitric acid being produced. The acid in turn interacts with bicarbonates to form Bismuth Subcarbonate, half of the carbon dioxide of the bicarbonate being liberated as a gas. The reaction proceeds slowly, and if compounded in the usual manner the carbon dioxide will accumulate and may burst the bottle. The best way of treating the preparation is to compound it in such a way that all the reaction is complete before bottling.

Method of Compounding. Place the subnitrate and bicarbonate together in a mortar, add a little hot water and stir. Effervescence takes place at once, and as soon as this has died down, the mixture may be completed in the usual manner without risk of further action. It must be fully understood that the hot water merely hastens an inevitable change, and is strictly in accordance with the prescriber's intention.

The Use of Heat.

By using hot water instead of cold, more of a soluble salt can be obtained in solution for the time being. The use of

heat in mixture making is, however, strictly limited, as in some cases its use is attended by chemical change, and in others the excess of salts dissolved will separate out on cooling in the form of crystals.

℞

Sodii Bicarb.	℥vj
Tinct. Gentian. Comp. ..	℥ss
Spts. Menth. Pip.	℥ij
Aq.	ad ℥vj. Ft. mist.

The maximum solubility of sodium bicarbonate in cold water is 1 in 11, and therefore 6 drachms of the salt will not dissolve in the amount of water available. If the bicarbonate be added to 2 or 3 fl. oz. of water and heated, carbon dioxide is liberated; the bicarbonate is converted into sodium carbonate which is soluble 1 in 2 and which dissolves to give a clear solution. Such a procedure is entirely contrary to the prescriber's intentions and must not be attempted. In compounding such a mixture the excess of bicarbonate must be permitted to remain in the bottle as a finely powdered deposit, and the mixture directed to be shaken.

A solution of a bicarbonate or carbonate should never be heated and in the case of ammonium carbonate the use even of warm water is prohibited as ammonia gas as well as carbon dioxide is given off, and the resulting mixture will be deficient in ammonia content.

℞

Acid Boric	℥iii
Sodii Chlorid.	gr. xxx
Zinci Sulphas.	gr. iv
Aq. Rosæ	ad ℥vj. Ft. lotio.

Acid boric is soluble 1 in 25 of cold water, and if heat be employed to dissolve it for the above lotion, the excess will, on cooling, be deposited as crystals. If the amount of boric acid had been only 1 drachm, then hot water could have been used to dissolve it as in that case the limit of solubility would not be reached.

Emulsions

An emulsion is really an example of physical incompatibility which has been overcome by skilful manipulation of the ingredients.

Emulsions are a special class of mixture containing oils, fats, resins, oleo-resins, balsams, etc., intimately mixed with an aqueous vehicle. A third substance, called the **emulsifying agent,** is always required to make the mixture stable.

Theory of Emulsification.

When oil and water are vigorously shaken together, the liquids become divided into rounded drops or globules of various sizes, the globules intermingling and forming a sort of unstable emulsion. As soon as shaking is stopped the liquids tend to separate again. First of all the larger globules coalesce (run together) and within a few seconds of ceasing to shake there will be a definite lower aqueous layer and an upper oily layer. Between these two layers is a portion of liquid consisting of various sized globules of both oil and water. This portion exhibits two phases: (1) a phase containing globules of oil suspended in an aqueous medium, and (2) a phase consisting of aqueous globules in a medium of oil. If the fluid is allowed to remain at rest the difference in specific gravity of the two liquids takes effect, and more of the globules either rise or fall to coalesce with the parent liquid. It may take as long as one or two days before the finest globules have separated out, but ultimately separation is complete and the dividing line between the liquids becomes sharply defined.

When suspended globules come into contact they do not coalesce until the film surrounding them is broken and they run together to form a larger globule.

Two conditions are necessary for the formation of a stable emulsion:

(1) The suspended substance must be in a very fine state of subdivision; the smaller the globules, the more stable will be the product.

(2) The medium in which the substance is suspended must be of such a nature that the globules are coated over with a film which is not easily ruptured.

Two types of emulsions are met with in Pharmacy:

(*a*) Oil in water emulsions. In these the oil is the substance suspended, and is said to constitute the disperse phase, while the aqueous medium is called the continuous phase. Cod Liver Oil emulsion is an example of this type.

(*b*) Water in oil emulsions. Here the aqueous globules form the disperse phase, and the oil or fat the continuous phase. Wool Fat is an example of this type of preparation.

Emulsifying Agents.

The continuous phase of an emulsion is made suitable for keeping the disperse phase in suspension by the addition of

emulsifying agents or **emulgents.** The agents in common use are **acacia** and **tragacanth gums** in powder or mucilage, **yolk of egg, mucilage of Irish moss,** and **casein.**

The Compounding of a Simple Emulsion.

℞

Olei Ricini	.. .. ..	℥j
Pulv. Acacia	.. .. ..	ʒij
Aq.	.. ..	ad ℥iv. Ft. emulsio.

In practice it will be found that powdered Gum Acacia is easier to handle and gives a more stable emulsion than other emulsifying agents, although a small amount of Tragacanth is often added to increase the viscosity of the continuous phase.

Method of Compounding. The method to be described is known as the **dry gum method,** and if the directions are accurately followed it is almost impossible to fail to produce an emulsion of good quality.

Weigh out the powdered gum, place it in a large-sized **perfectly dry** mortar, and add the prescribed amount of Castor Oil. Using a flat-headed pestle, stir these ingredients thoroughly together ; the gum does not dissolve but, being in very fine powder, remains suspended and evenly diffused through the bulk of the oil. Now take a second measure, and measure a quantity of **water equivalent to half the volume of oil used,** that is, 4 fl. drs. Continue to stir the mixture of oil and gum and pour the **4 fl. drs. of water into the mortar all at once.** Triturate this mixture of essential ingredients with a light rotary motion of the pestle, and notice the gradual change in the nature of the mixture from a liquid to a thick white cream. A distinct crackling sound should be heard as the pestle is rotated. This cream is the nucleus of the emulsion and the theory of its formation is : When a particular volume of water is added to the mixture of oil and gum, the latter substance begins to dissolve in the water, forming a thick mucilage. In this thick fluid the large globules of oil are caught between the pestle and the mortar, and as the pestle is rotated each globule is drawn out and divided into two smaller globules. The more the mixture is stirred at this stage, the smaller the globules of oil are sub-divided, and the more perfect their suspension. This takes place in all parts of the mixture, and as the smaller globules are formed they become coated with a film of mucilage which prevents them from coalescing to form larger globules once more which would separate out.

Several minutes stirring always in the same direction are needed to complete this nucleus.

Now calculate what further volume of water is required to produced the required 4 fl. oz. of emulsion, and add this in successive small portions of about 1 fl. drachm, continuing the trituration all the while.

Take time to make the emulsion and do not unduly hasten the additions of water, or the mucilage may become too dilute in one portion of the mixture and allow the oily globules to coalesce. If the first few additions of water are made carelessly the emulsion will change from a thick cream to a thin liquid, and the emulsion is said to " break " or " crack." What really happens is that the emulsion has been converted from an oil in water emulsion to a water in oil preparation, and can then only be diluted with more of the continuous phase—that is, the oil. In this condition the emulsion is entirely unsuitable for the purpose for which it is intended. If an emulsion should " break " during preparation, no amount of manipulation will ever get the ingredients to combine together again, and it can only be thrown out and a fresh start made.

Note particularly the proportions in which the essential ingredients are employed to form the nucleus of the emulsion :

Oil	4 parts.
Water	2 ,,
Powdered gum	1 part.

These proportions are applicable to all fixed oils and liquid paraffin, but are not suitable for volatile oils.

Let us go over the main points again :

(1) Place the powdered gum in a perfectly dry stone mortar.
(2) Add all the oil and stir.
(3) Add, all at once, an amount of water equal to half the volume of oil used.
(4) Stir this mixture for several minutes to form the thick white cream which is the nucleus of the emulsion.
(5) Calculate how much more of the vehicle is needed to produce the required volume, and add it in small successive quantities of about 1 fl. drachm.

The oil in an emulsion prepared by this process will not separate out, but after standing for several hours a cream will rise to the surface which, however, diffuses readily on shaking.

Volatile Oil Emulsions.

The proportions of essential ingredients in an emulsion of this type are :

Volatile oil	4 parts.
Water	4 ,,
Powdered gum	2 ,,

Note that the quantity of gum required for the emulsification of a volatile oil is twice that required for a fixed oil, and that the water to be added all at once is also doubled. Apart from this difference in proportions, the emulsion is prepared in exactly the same manner as previously described. The most common volatile oil to be administered in the form of an emulsion is oil of turpentine.

The Wet Gum Method.

℞

Olei Morrhuæ	℥iv
Olei Ricini	℥ij
Mucilag.	℥iss
Aq.	ad ℥iv. Ft. emulsio.

Emulsions may be made by using the mucilage of acacia or tragacanth singly or combined, instead of powdered gum, but the result is not, as a rule, so good, and the product shows a greater tendency to cream.

Method of Compounding. Pour the mucilage into a mortar and add the mixed oils in a very thin stream, with constant trituration. Continue the stirring for several minutes until the mixture assumes a uniform creamy appearance, then begin to add the vehicle in successive small portions as previously described until the required volume is reached.

An alternative method is to weigh out a quantity of powdered gum corresponding to the mucilage prescribed, place it in a mortar, and add water in the proportion recommended in the dry gum method ; this will form a thick mucilage. Add the oil drop by drop with continual trituration and complete the emulsion as previously described. Should the preparation at any time exhibit a characteristic " ropiness," the addition of oil should be discontinued until a little water has been incorporated and the original creaminess reappears.

Tragacanth Emulsions.

A small proportion of tragacanth powder is frequently prescribed, along with gum acacia, for the emulsification of

oils, and this addition does not necessitate any departure from the customary methods of compounding. Occasionally, however, simple powdered tragacanth may be used as the sole emulgent, as in the following example :

℞

Olei Terebinthinæ	..	℥ij
Tragacanth Pulv.	..	gr. xx
Aq. Anisi ..		ad ℥vj. Ft. emulsio.

Choose a perfectly dry bottle, pour in the oil, and then add the powdered gum. Shake gently to disperse the gum, but note that it does not dissolve. Now add about half the available quantity of aniseed water as rapidly as possible, and shake vigorously. The mucilage formed breaks up the oil and suspends it, although the globules formed are not very small, and the resulting emulsion is comparatively coarse. Add the remainder of the vehicle in small amounts, shaking after each addition.

Yolk of Egg Emulsion.

Yolk of egg has excellent emulsifying properties, especially if a little tragacanth be used in addition. One yolk will usually suffice to emulsify 4 fl. oz. of a fixed oil, or 2 fl. oz. of a volatile oil.

℞

Olei Morrhuæ.	..	℥iv
Ovi Vitelli ..	..	i
Pulv. Tragacanth.	..	gr. xxiv
Syrup. Ferri Iodid.	..	℥ss
Aq.		ad ℥x. Ft. emulsio.

Method of Compounding. Break the egg and separate the yolk from the white. Mix a little of the oil with the tragacanth powder in a mortar, add the yolk, and mix very thoroughly together. Now add further quantities of oil with constant stirring, with sometimes a little of the vehicle to maintain the consistence of a cream. When all the oil has been added, gradually complete to volume with vehicle, reserving only a little with which to dilute the syrup before adding. If egg emulsions are to be stored for any length of time it will be necessary to add a preservative such as sodium benzoate.

Male Fern Emulsion.

For a single draught of the extract, quite a good mixture can be made by placing the extract in a mortar and adding fresh milk a little at a time to produce a volume of about 2 fl. oz.

For a larger quantity, mucilage of acacia may be used, employing twice the amount of mucilage as of extract ordered. A satisfactory preparation can also be made by using an equal amount of tincture of Quillaia as an emulgent.

More difficult Emulsions.

When salts, alcoholic solutions, acids, syrups, etc., are introduced into an emulsion, complications are likely to arise, as such preparations are hostile to emulsion-formation. Ingredients other than the essential ones, may exert a considerable influence on the emulsion, such influence being inclined towards making the emulsion more difficult to prepare and more likely to separate on standing.

Alkaline salts and solutions are more favourable to emulsification as the alkali saponifies a portion of the oil. On the other hand, acid salts and solutions, alcoholic preparations, and syrups, make the emulsion more troublesome to prepare.

℞

Copaiba	.. ..	℥vj
Olei Santali	.. ..	ʒjj
Pulv. Acaciæ	.. ..	ʒij
Potass. Citras	..	ʒj
Spts. Ether Nit.	..	ʒij
Aq.		ad ℥iv. Ft. emulsio.

Method of Compounding. In compounding such an emulsion, pick out the essential ingredients from which the nucleus of the emulsion can be formed. In this example, the Copaiba, Oleum Santali, Pulv. Acacia, and a portion of the water are employed to form the thick, pasty nucleus. A further portion of the vehicle may be gradually incorporated, reserving just sufficient in which to dissolve the Potassium Citrate and to dilute the Spirits of Nitrous Ether before adding to the remainder of the preparation. These solutions are to be added with only gentle stirring.

Saponified Emulsions

The making of an emulsion by this process depends for its success upon the chemical action between oils and resins on the one hand and caustic alkalis and soaps on the other.

In emulsions made by the various methods of suspension already described, the oil does not alter either in chemical or therapeutic properties; it is merely divided into minute globules. In saponified emulsions, at least some of the oil is chemically changed, and in some cases much of the therapeutic value of the oil is lost.

The various classes of substances employed as emulgents in saponified emulsions are (*a*) soaps, (*b*) caustic alkalis, and (*c*) saponins.

Soap Emulsions.

Soaps are not suitable emulgents for preparations intended for internal administration, but they are excellent for liniments and creams for external use.

Both Hard Soap (Sodium Oleate) and Soft Soap (Potassium Oleate) may be used for emulsification purposes, but their method of use varies. When using Sapo Durus it is best to place the finely-powdered emulgent into a dry bottle, add all the oil, shake gently and add the aqueous vehicle by degrees, shaking thoroughly after each addition until the required volume is reached.

No better example of the formation of an emulsion by means of Sapo Mollis can be given than the preparation of the official Liniment of Turpentine. In this case the soap enhances the penetrating powers of the liniment and gives a product of good appearance which does not separate.

℞

Sapo Mollis	.. ..	grs. 393¾
Camphor	.. ..	grs. 262½
Ol. Terebinth.	..	℥vij. ℿ384.
Aq. dest.	..	ad ℥xij. Ft. liniment.

Method of Compounding. Place the Soft Soap into a large mortar and dissolve it by gradually adding a little over an ounce of warm distilled water. Every speck of the green soap must be rubbed down and dissolved, otherwise the full benefit of the saponifying powers of the soap will not be obtained. Dissolve Camphor in the Oil of Turpentine and gradually add the latter solution to the former with thorough trituration. As each successive portion of the Turpentine solution is added, the emusion is partially broken and exhibits a stringy or curdy appearance which, however, disappears as trituration is continued. The first few additions of the Turpentine solution are the most difficult to incorporate, but becomes easier as the product becomes more fluid. Finally add sufficient distilled water to produce volume.

The emulsions formed by hard and soft soaps are of the oil in water emulsion type and are white creamy preparations.

Alkali Emulsions.

Emulsions prepared by the use of caustic alkalis are more suitable for external application than internal administration although examples of the latter are occasionally seen.

The alkalis commonly used for the purpose are potassium and sodium hydroxides in solution, solution of ammonia, and lime water. Emulsification takes place because nearly all fixed oils contain free fatty acids which interact with the alkali to form a small amount of a soap ; it is this soap which acts as the emulgent. Volatile oils do not, as a rule, contain free acid and cannot, therefore, be emulsified by alkalis in this way. It may be mentioned here that alkalis containing monovalent metallic radicals (potassium, sodium, and ammonium) produce emulsions of the oil in water type, whereas those containing a divalent metallic element (calcium) form water in oil emulsions.

℞

Olei Ricini	.. ..	℥ii
Liquor Potassii Hydroxidi	.. ..	℥ii
Aquæ	.. ..	ad ℥vj. Ft. emulsio.

Method of Compounding. Divide the liquor into three equal portions of 40 minims each, and dilute each portion with a little of the vehicle. Pour the first of these dilutions of the alkali into the bottle, add all the oil and shake vigorously. Now add the second dilution, shake thoroughly once more and gradually incorporate about half the available amount of vehicle. Finally, add the last alkaline dilution and make up to volume. The object of dividing the potash solution into three portions is to ensure as thorough saponification of the oil as possible. Such emulsions separate on standing, a creamy layer rising to the surface, but they shake together quite well.

℞

Pulv. Amyli	.. ..	ʒss
Zinci Oxidi	.. ..	ʒiij
Olei Olivæ	.. ..	℥ij
Olei Lavandulæ	..	♏x
Liquor Calcii Hydroxidi	..	ad ℥iv. Ft. cremor.

Method of Compounding. In compounding preparations of this type, the best method is to thoroughly triturate the mixed powders with the oils, transfer to a wide-mouthed bottle or jar capable of holding rather more than the required quantity, add the lime water all at once, and shake until a thick cream results. Separation will certainly follow if the lime water be added by degrees.

Saponin Emulsions.

Saponin is the name given to a group of glucosides found in certain plant specimens. Quillaia and Senega are examples

of Saponin-containing drugs, and the tinctures of these drugs are sometimes used to make emulsions both for internal and external use.

℞

Olei Morrhuæ ..	..	℥ij
Tinct. Senegæ..	..	ʒj
Aq.		ad ℥iv. Ft. emulsio.

Method of Compounding. Place the tincture in the bottle, add all the oil and shake well together. The vehicle is to be added in several portions, shaking after each addition.

The Liquid Extract of Male Fern may be emulsified in this way using equal amounts of the Extract and saponifying Tincture.

Liquor Picis Carbonis B.P. is an example of the use of Quillaia as a saponifying agent. A tincture is made from Quillaia Bark and alcohol, the prepared Coal Tar is added, and the mixture digested for two days. At the end of this period all the oils and resinous constituents of the Coal Tar are saponified.

Emulsion Making on the Large Scale.

The processes and emulgents so far described have only been suitable for the preparation of a few ounces of an emulsion at the dispensing counter. In processes on a manufacturing scale the emulgents which find most favour are Casein and Mucilage of Irish Moss.

Casein.

Is the natural emulgent found in milk, and may be precipitated from the latter by means of dilute acids. For commercial use a mixture of Casein and Sodium Bicarbonate, known as Soluble Casein, is employed. The Casein and oil are mixed together and the vehicle added gradually and with constant trituration. A preservative such as sodium benzoate or chloroform is necessary.

Irish Moss.

Is a seaweed which yields a mucilage on digestion with water. The moss is washed in cold water, and 1 part is heated with 40 parts of water for about 15 minutes, after which the mucilage is strained off. The oil is added gradually to the mucilage with continual stirring, and volume is reached by the gradual addition of the vehicle. A preservative must be added.

Commercial emulsions are made by machinery and very thorough emulsification is attained by means of mechanical "shearers" or "beaters." Almost perfect emulsions can be made by forcing a coarse emulsion through a homogenizing apparatus. The essential parts of this apparatus consist of an agate needle valve which is retained in position against the valve seating by means of a powerful spring. The coarse emulsion is subjected to a pressure of perhaps 2,000 to 3,000lb. per sq. in. Under this pressure the resistance of the valve-retaining spring is overcome and the needle valve opens to the extent of a few thousandths of an inch. As the coarse emulsion is thus forced through the valve orifice, the large globules of oil are broken down into the finest possible particles which are thereby enabled to remain in almost perfect and permanent suspension.

INCOMPATIBILITY

Incompatibility, from the dispenser's point of view, infers the inability of substances to mix together in proper form.

We speak of a mixture of substances being incompatible when :

(1) The drugs will not mix or combine together.
(2) Drugs having opposite therapeutic actions are prescribed in the same medicine.
(3) Some chemical change takes place.

These examples of incompatibility are usually known as :

(1) Physical Incompatibility.
(2) Therapeutic Incompatibility.
(3) Chemical Incompatibility.

Physical Incompatibility

This condition is largely a question of a drug being insoluble in its vehicle. So far as mixtures and other liquid preparations are concerned, all insoluble salts, oils, resins, and powdered vegetable drugs, are physically incompatible with water and aqueous vehicles. The condition presents a dispensing problem which can, however, be overcome in nearly all cases by making suitable additions to the ingredients and by skilful compounding.

℞

Olei Amygdalæ	..	℥iv
Olei Cinnamomi	..	♏v
Aquæ		ad ℥vj. Ft. mist.

In this prescription, both oils are insoluble in water, and if the ingredients are simply added together, the oils will speedily separate out and it would be impossible to pour out a dose containing an accurate proportion of the active ingredients. In such instances, even if not ordered in the prescription, the dispenser must make the necessary additions and compound an emulsion.

℞

Bismuth. Salicylas	..	℥ij
Salol	..	℥j
Aquæ Chlorof.		ad ℨvj. Ft. mist.

The two solid ingredients are insoluble in, and therefore physically incompatible with water. Mucilage must be added to suspend the powders before a presentable mixture can be made.

In the above examples it is not necessary to refer to the prescriber for his instructions, the dispenser is relied upon to make such very necessary additions and to compound the mixture in the form most suitable for administration whilst complying strictly with the intentions of the prescriber.

℞

Phenazon. ..	..	gr. iv
Sodii Salicylas.	..	gr. x
Ft. pulv. ..	..	mitte tales sex.

When these substances are triturated together, a damp mass results, or liquefaction may occur, owing to the formation of a third compound. The only satisfactory method of sending out the prescription is to wrap each ingredient separately and to direct the patient to take one of each powders for a dose. Each packet of powders must bear some distinguishing mark, or they may be wrapped in different coloured papers.

Other substances which mutually liquefy each other, and which can be treated in a similar manner, are **camphor, menthol, thymol, chloral hydrate,** and **phenol.** Any pair of these when triturated together will form a liquid. Trouble of a similar nature may be experienced when compounding powders containing the following drugs—Acetanilidum, Salol, Resorcin, Naphthol, and Phenacetin. Salts with water of crystallization may go damp on mixing and one or more may require exsiccating to give a dry powder.

Tinctures of Tolu and Benzoin, indeed all resinous tinctures, are physically incompatible with water as the resin is precipitated from solution.

Borax and mucilage form a granular, pasty mass which will not mix properly in any circumstances.

Therapeutic Incompatibility

This type of incompatibility is governed by the action of drugs upon the human system, and is the responsibility of the physician. When drugs of opposite actions are administered together, the physiological action of one drug is expended in counteracting the effect of the other, and the medicinal value of both drugs is lost. Thus, Digitalis is administered as a heart stimulant and Aconite as a cardiac sedative. If full doses of both drugs were to be administered at the same time, it is likely that the drugs would interfere with each other's action on the cardiac structure, and much of the therapeutic force would be expended in mutual neutralization.

One drug is seldom the complete antagonist of another because few drugs have a simple action on one kind of tissue only. The action of drugs is selective but highly complicated ; they may act as a stimulus to one kind of tissue yet depress another. It is likely then that two antagonistic drugs will be so in respect of one action alone, and that other therapeutic actions of the conflicting drugs will remain unaltered. In support of this statement mention may be made of the prescribing of Strychnine Hydrochloride (stimulant) in the same medicine as Potassium Bromide (sedative).

Poisons and their therapeutic antidotes neutralize one another in respect of their main physiological action, and it is a general rule of prescribing not to order a drug along with its antidote or therapeutic antagonist.

The following therapeutic groups are incompatible :

Cathartics with Astringents.
Mydriatics with Myotics.
Acids with Antacids.
Anhidrotics with Diaphoretics.
Aphrodisiacs with Anaphrodisiacs.
Sedatives, Depressants, Narcotics } with Stimulants.

Chemical Incompatibility

Chemical incompatibility is by far the most important of the three groups ; it presents many difficulties and the examples which might be given are innumerable. Some of the reactions are intentional and have been ordered for some special therapeutic effect, but many more are unintentional and it is for examples of the latter class that the dispenser must be continually on the watch.

No rule can be laid down as to when an incompatibility

can be disregarded. The only safe guide in this connection is that if in the opinion of the dispenser, the mixture may be dangerous to the patient if compounded as originally prescribed, he is justified in refusing to compound it until the prescriber has been consulted or until some other competent authority has given a ruling. If the incompatibility is of such a nature that it cannot be harmful to the patient, it is the duty of the dispenser to compound the preparation so as to give the best result.

The laws of chemistry are fixed and if these laws point to a reaction between certain compounds, then little or nothing can be done to prevent the action from taking place, although the reaction may be conducted into safe channels.

The changes that may result from mixing chemical compounds may be grouped as follows :

(1) Interaction and neutralization of acids and alkalis.
(2) Combination of two or more salts in solution resulting in the precipitation of an insoluble compound.
(3) Liberation of poisonous or irritant elements, such as chlorine, bromine or iodine.
(4) Formation of an explosive or inflammable compound.
(5) Precipitation of alkaloids or insoluble alkaloidal salts from solution.

The Incompatibility of Acids and Alkalis.

Acids and alkalis are chemically opposed and cannot exist together in solution without chemical action taking place between them.

Let us examine the following chemical equations :

No. 1.

$$H_2SO_4 + 2KOH = K_2SO_4 + 2H_2O.$$

This equation shows that sulphuric acid acts upon alkaline potassium hydroxide, forming the new compounds potassium sulphate and water. The original compounds were definitely acid and alkaline respectively, but both of the new compounds are neutral. If this acid and alkali are mixed in molecular proportions they will completely neutralize each other and not a trace of free acid or free alkali will remain. When the solutions are mixed no apparent change occurs in the liquid, and the dispenser must learn to detect such reactions in the prescription before he begins to compound.

No. 2.

$$2HCl + Na_2CO_3 = 2NaCl + H_2O + CO_2.$$

This equation differs from No. 1 in that a third new substance is formed—carbon dioxide—which is liberated as a gas. It

is this gas being evolved that causes effervescence and it is always a sign of chemical decomposition. Effervescence can only take place when an acid acts upon a carbonate or bicarbonate.

In addition to the acids which are definitely named such, there are a number of preparations in the Pharmacopœia that have an acid reaction, although the name of the preparation may not indicate any such acidity. It is, therefore, necessary for the student to be familiar with the composition of the B.P. galenicals and to recognize these acid substances.

List of Acid Preparations

Acetum Scillæ.
Extractum Cinchonæ Liquidum.
Liquor Morphinæ Hydrochloridi.
Liquor Ferri Perchloridi.
Oxymel.
Oxymel Scillæ.
Spiritus Ætheris Nitrosi.
Syrup. Ferri Phosph. Comp.
Syrup. Easton's.
Syrup. Scillæ.
Syrup. Limonis.

With regard to the alkalis, all **oxides, hydroxides, carbonates,** and **bicarbonates,** also solutions containing free **ammonia** are acted upon by acids and acid preparations.

List of Alkaline Preparations

Elixir Cascaræ Sagradæ.
Liquor Ammoniæ.
Liquor Quininæ Ammoniatus.
Liquor Potassii Hydroxidi.
Creta.
Pulvis Rhei Compositus.
Pulvis Cretæ Aromaticus.
Liquor Plumbi Subacetatis.
Spiritus Ammoniæ Aromaticus.
Liquor Calcii Hydroxidi.

Many examples of these reactions between acids and alkalis are seen in prescriptions, and providing the incompatibility is recognized and suitable steps taken, many of these mixtures may be compounded. They are really incompatibilities of a minor nature, although it would be unwise to account all examples in this group as negligible.

℞

Ammon. Carb. ..	..	gr. xxxvj
Tinct. Opii Camph.	..	℥iv
Tinct. Ipecac. ..	..	℥ij
Syrup. Scillæ ..	..	℥vj
Infus. Senegæ ..	ad	℥vj. Ft. mist.

The Ammonium Carbonate (because it is a carbonate) is alkaline, and Syrup of Squills is acid (it contains acetic acid). The chemical action between the two cannot be avoided,

and this being the case, should be induced to take place before the mixture is bottled. Powder the carbonate in a mortar and dissolve it in a little of the vehicle ; add the syrup and stir. Effervescence takes place, and no other ingredient should be added until the reaction is complete. Much of the carbonate of ammonium has been converted into ammonium acetate, but this is of little account. When the reaction has died down the mixture may be completed without fear of further decomposition.

A similar action takes place in the following example, and it may be compounded in the same way. In this case it is the citric acid formed by dissociation of the caffeine compound which is the cause of the trouble.

℞

Caffein. Citras ..	.. ℥j
Sodii. Bicarb. ..	.. ℥iij
Tinct. Card. Comp.	.. ℥ij
Aq.	ad ℥vj. Ft. mist.

It is a matter of opinion whether the following prescription should be compounded at all, as there seems to be no justification for allowing the incompatibility to occur.

℞

Sodii Bicarb. ..	.. ℥vj
Acid. Phosph. Dil.	.. ℥ss
Spts. Chlorof. ..	.. ℥j
Aquæ	ad ℥viij. Ft. mist.

This cannot possibly be considered as a minor incompatibility as the substances concerned are the active ingredients of the mixture. It would seem that the prescriber has entirely overlooked the incompatibility between the first two ingredients, which results in the formation of sodium phosphate. No advantage can possibly be gained by making sodium phosphate in this way, and the matter should be referred to the prescriber.

℞

Calcii Carbonas	.. gr. 75
Acid. Lactic. ..	.. ℿ 200
Chloroform ..	.. ℿ 5
Aquæ	ad ℥viij. Ft. mist.

This also contains an obvious incompatibility, but in this case it is intended. Calcium lactate decomposes with long keeping and so does not then form a clear solution with water ; the object of this mixture is to form fresh calcium lactate by interaction. Dissolve the chloroform in about

6 fl. oz. of the vehicle by shaking, pour into a wide measure and stir in the precipitated chalk. This does not dissolve, but, being in particularly fine powder, remains suspended. Add the lactic acid a little at a time, and stir rapidly to promote evolution of the gas. It is best to compound this mixture in a pint measure as there is considerable frothing. When all the acid has been added and the effervescence has entirely subsided, the mixture may be completed to volume.

Precipitation of Insoluble Salts

This is brought about by interaction between two **soluble** salts, resulting in the formation of new compounds, one of which is **insoluble.**

These chemical changes only take place between salts in aqueous solution; interaction between insoluble salts is rare.

A knowledge of the general solubility of the more important salts is, therefore, essential, and the following list is provided to give an idea of the solubility of the groups of salts.

Solubility of Salts in Water.

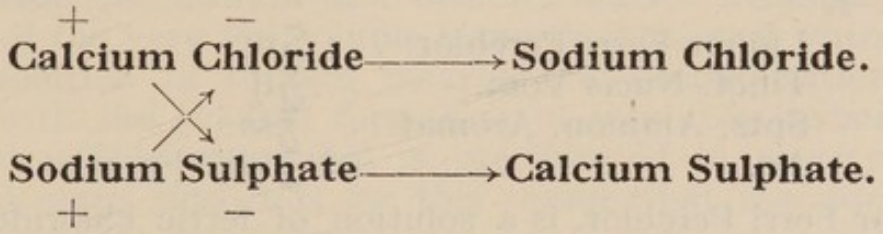
Ammonium **Sodium** **Potassium**	All ordinary salts of these are **freely soluble.**
Nitrates **Acetates** **Chlorates**	All **soluble** except **bismuth subnitrate.**
Carbonates and **Phosphates**	All **insoluble** except **ammonium, sodium, potassium carbonates** and **phosphates.**
Sulphates	All **soluble** except **calcium sulphate, barium sulphate, lead sulphate.**
Chlorides	All **soluble** except **silver chloride, lead chloride, mercurous chloride.**
Oxides	All **insoluble.**
Hydroxides	All **insoluble** except **ammonium, sodium,** and **potassium hydroxide.** The hydroxides of calcium and barium are sparingly soluble.
Bromides and **Iodides**	All **soluble** except **silver, lead** and **mercury iodides** and **bromides.**

Let us examine a prescription containing an example of this type of incompatibility.

℞

Calcii Chlorid. ..	.. ℥iss
Sodii Sulphas. ..	.. ℥iij
Spts. Menth. Pip	.. ℥j
Aq.	ad ℨiv. Ft. mist.

On referring to the table of solubilities it is found that both calcium chloride and sodium sulphate are soluble. Make a separate solution of each and mix the solutions together; immediately a white precipitate is thrown down. It is not necessary to write the equation to find out what action has taken place; simply cross over the opposite positive and negative radicals, thus:



The only new compounds that can possibly be formed are sodium chloride and calcium sulphate. On again referring to the solubility table we find that sodium chloride is soluble and therefore remains in solution, but that calcium sulphate is insoluble, and it is this substance being thrown out of solution that forms the white precipitate. It is not likely that the prescriber intended to give calcium sulphate (Plaster of Paris) to the patient, and the prescription should be referred to him for confirmation or alteration.

Soluble salts do not always result in precipitation when mixed together in solution, as the following example shows.

℞

Ammon. Chlorid.	.. ℥ij
Magnes. Sulph. ..	.. ℨss
Ext. Cinchonæ Liq.	.. ℥ij
Aq.	ad ℨviij. Ft. mist.

Both ammonium chloride and magnesium sulphate are freely soluble salts. When mixed together in solution, some interchange of radicals with formation of ammonium sulphate and magnesium chloride occurs, and these are also freely

soluble. No apparent change takes place in the mixture, and it is not regarded as an instance of incompatibility.

℞

Ferri Sulphas	.. ..	gr. xxxvj
Potass. Bicarb.	.. ..	℥ij
Tr. Nucis Vom.	.. ..	℥j
Infus. Quassiæ	..	ad ℨvj. Ft. mist.

Interaction between the soluble salts ferrous sulphate and potassium bicarbonate results in the formation of insoluble ferrous carbonate. This is an intended incompatibility, freshly precipitated iron carbonate being rather more active. If necessary a little mucilage may be added to suspend the deposit.

There are a number of preparations in the B.P. which are really solutions of metallic salts, and these are subject to the same chemical changes as the salts themselves.

℞

Liquor Ferri Perchlor.	..	℥iij
Tinct. Nucis Vom.	..	℥ij
Spts. Ammon. Aromat.	..	ℨss
Aq.	.. ..	ad ℨviij. Ft. mist.

Liquor Ferri Perchlor. is a solution of ferric chloride, and the Aromatic Spirit of Ammonia contains ammonium carbonate and strong solution of ammonia. The latter is a saturated solution of ammonia gas in distilled water, and for the purpose of chemical change, must be regarded as being a solution of ammonium hydroxide ($NH_3+HOH=NH_4OH$).

We have then a mixture of substances containing three salts—ferric chloride, ammonium carbonate, and ammonium hydroxide. No interaction is possible between the two ammonium compounds, but each of these in turn must be tested with the iron preparation. From ferric chloride and ammonium carbonate (both soluble), we obtain the new compounds ammonium chloride and ferric carbonate. From ferric chloride and ammonium hydroxide (both soluble), we obtain the new compounds ammonium chloride and ferric hydroxide. By reference to the solubility table we find that both the carbonate and hydroxide of iron are insoluble, and so by mixing together Liquor Ferri Perchlor. and Spirits Ammon. Aromat, we obtain a precipitate consisting of a mixture of insoluble carbonate and hydroxide of iron.

It will be seen from this example how very important it is to know the composition of these compound B.P. preparations and to be able to pick out the essential reacting ingredients.

Quite a large number of chemically incompatible prescriptions are made up for various special reasons.

℞

Sodii Bicarb.	℥iij
Tr. Cardam. Comp. ..	℥ij
Liq. Bism. et Ammon. Cit.	℥j
Syrup. Zingiber. ..	℥ss
Aq.	ad ℥viij. Ft. mist.

The incompatibility here is well hidden, and lies between the bicarbonate and the solution of bismuth and ammonium citrate. This solution, although no longer official, is still frequently prescribed, and is to be regarded as a solution of two soluble salts bismuth citrate and ammonium citrate. Again we have three salts to deal with, but as there can be no incompatibility between the sodium and ammonium compounds (all salts of these are freely soluble), we must seek for it between the sodium and bismuth salts. Bismuth citrate is one of the very few soluble bismuth salts, and when added to a solution of sodium bicarbonate, decomposition takes place with the gradual formation of insoluble carbonate of bismuth. This compound is precipitated in a very finely divided state, and it is for this reason that the mixture is compounded in this form.

Experience alone can give the dispenser the clue as to whether the chemical change is intended or not.

Liberation of Irritant Elements

Attention has already been drawn to the special precautions to be observed in dispensing potassium iodide with Spirits of Nitrous Ether in order to prevent the liberation of free iodine. Oxidizing agents have the power of liberating the free halogen from solutions of metallic iodides and bromides. Chief amongst these oxidizing agents are : **nitric acid, potassium chlorate, paraldehyde, spiritus ætheris nitrosi, liquor hydrogenii peroxidi, potassium permanganate,** and **chromates.**

In mixtures containing an iodide or bromide with Spirits of Nitrous Ether or Paraldehyde, we prevent liberation of the irritant element by neutralizing the acid solution with a little sodium or potassium bicarbonate, but this is not possible in other cases.

℞

Potass. Chloras	℥ij
Tinct. Aurant.	℥j
Syrup. Ferri Iodid. ..	℥j
Aq.	ad. ℥vj. Ft. mist.

The two reacting ingredients are potassium chlorate (oxidizing agent) and the Syrup of Iodide of Iron, and after a time both **iodine** and **chlorine** are liberated. This is a particularly dangerous combination as the incompatibility cannot be prevented. We cannot neutralize the potassium chlorate as it is already a neutral salt, and therefore the the mixture must not be compounded.

Liquor Ferri Perchlorid. is incompatible with potassium iodide and Syrup Ferri Iodid., free iodine being liberated. The mixture should not be dispensed.

Explosive and Inflammable Compounds

Combinations of the following substances may result in the formation of inflammable or explosive compounds. The substances named in Group " A " all contain a high proportion of oxygen, and form dangerous compounds when triturated with any of the substances in Group " B " most of which are reducing agents.

Group " A." (**Oxidizing Agents.**)	Group " B." (**Reducing Agents.**)
Picric Acid.	Glycerin.
Chromic Acid.	Hypophosphites.
Potassium Bichromate.	Iodine.
Potassium Chlorate.	Phenol.
Potassium Permanganate.	Tannic and Gallic Acids.
Sodium Nitrite.	Sulphur.
Silver Oxide.	Sugars.
	Volatile Oils.

℞

Potass. Chloras . . . . ℥iij
Liquor Ferri Perchlor. . . ℥j
Glycerin. . . ad ℨij. Ft. pigmentum.

In order to compound this paint, the potassium chlorate would have to be triturated with glycerin to effect solution, and in doing so sufficient heat would be generated by friction to start a chemical action which would probably result in an explosion. Compare this prescription with :

℞

Potass. Chlor. . . . . ℥iij
Liquor Ferri Perchlor. . . ℥j
Glycerin. . . . . ℥ij
Aquæ . . . . ad ℨviij. Ft. gargarisma.

This prescription can be compounded safely provided that the chlorate and glycerin are not directly mixed. Following

the general rule for dealing with soluble salts, the potassium chlorate is dissolved in a portion of the vehicle, and when this has been done the glycerin may be added without any fear of disastrous results.

℞

Liquor Iodi Fort.
Liniment. Camph.
Ammon. of each ℥ij
Ft. liniment

The iodine of the liquor and the strong ammonia solution of the liniment combine to form a dangerous explosive compound—Nitrogen Iodide (NI_3), which settles down as a black deposit. Only free iodine and free ammonia combine in this way, a preparation containing potassium iodide and ammonium chloride would be perfectly safe.

When iodine and oil of turpentine are mixed the oil takes fire.

Incompatibilities of Alkaloids and their Salts

Alkaloids and their salts are substances of delicate chemical structure, and are easily decomposed by strong chemicals.

Alkaloids and their salts are incompatible with the following groups :

Concentrated Acids	Cause decomposition.
Potassium Permanganate ..	Causes decomposition.
Alkaline substances, including Borax and preparations containing free Ammonia.	The pure alkaloid is precipitated from solutions of alkaloidal salts.
Tannic acid and all vegetable astringents.	Formation of insoluble tannates of alkaloids.
Free Iodine and Bromine, also soluble Iodides and Bromides.	Formation of insoluble iodides or bromides of alkaloids.

Note " concentrated acids " in the above table ; dilute acids are perfectly compatible with alkaloids and their salts, and only render them more soluble. This is instanced in the treatment of quinine sulphate mixture, and in the addition of dilute acids in some of the B.P. alkaloidal solutions.

Double iodide solutions are particularly incompatible with alkaloidal salts.

℞

Liquor Morph. Hyd. .. ℥iij
Liq. Arsen. et Hydrarg. Iodid. .. .. .. ℥iss
Aq. .. .. ad ℥vj. Ft. mist.

A precipitate of morphine iodide is thrown down. Such a mixture is dangerous and should not be compounded.

℞

Hydrarg. Perchlor.	..	gr. ij
Potass. Iodid. ..	..	℥j
Liquor Strychnin. Hyd.		℥j
Aq. ..	..	ad ℨviij. Ft. mist.

This is another example of a double iodide interaction. The mercuric salt reacts with potassium iodide to form insoluble mercuric iodide which, however, dissolves in excess of the iodide forming a double iodide salt (Potassio Mercuric Iodide). The latter in turn precipitates the strychnine as insoluble strychnine iodide. A dangerous combination.

℞

Potass. Bromid. ..	..	℥iij
Liquor Strychnin. Hyd.		℥ij
Syrup. Aurant. ..	..	ℨss
Aq. ..	..	ad ℨvj. Ft. mist.

In this case, interaction between the bromide and the solution of strychnine hydrochloride results in the formation of insoluble strychnine bromide. The mixture is perfectly clear at the time of dispensing, and the insoluble compound only separates on standing. Such precipitates are all the more dangerous as they are small in bulk and may lie at the bottom of the bottle without being noticed, and the whole of the sediment may be taken in the last dose of the mixture. The bromide and strychnine are also, to some extent, therapeutically incompatible.

℞

Tinct. Nucis Vom.	..	♏xv
Tinct. Gentian. Comp. ..		♏xx
Spts. Ammon. Aromat.		♏xxv
Aq. Chlorof. ..		ad ℥i. Ft. mist. mitte ℨviij.

The tincture of Nux Vomica contains an alkaloidal salt of strychnine in solution, and this is incompatible with the alkaline Aromatic Spirit of Ammonia, which converts the soluble alkaloidal salt into the almost insoluble pure strychnine alkaloid. The tincture contains 0·125 per cent. of a strychnine salt, or $\frac{1}{8}$ grain in 110 minims. The 8 oz. of the mixture contain 120 minims of the tincture which is equivalent to

$$\frac{1}{8} \times \frac{120}{110} = \frac{12}{88} \text{ grs. of strychnine.}$$

The pure alkaloid is soluble about 1 in 7,000 parts of water, so that the 3,500 grains ($8 \times 437{\cdot}5$) of this mixture can retain

about ½ grain of strychnine in solution. As the mixture can only form $\frac{12}{88}$ grains of alkaloid it will be evident that this amount will still remain in solution. The theory of the reaction is important, as cases may occur in which the amount of pure alkaloid formed is in excess of that which can be held in solution, and a precipitate will be formed which may be very dangerous to the patient.

Quinine salts are incompatible with all the substances noted in the table of alkaloid incompatibilities, and also with soluble acetates, citrates, and salicylates. The reactions are not dangerous, but such mixtures require the addition of suspending agents, and careful compounding.

℞

Quinin. Hydrochlor.	..	gr. xl
Sod. Salicylas ..	..	℥ij
Tinct. Limonis ..	..	℥j
Syrup. ..	..	℥vj
Aq. ..	..	ad ℥vj. Ft. mist.

The first two ingredients interact and form a bulky, flocculent precipitate of insoluble quinine salicylate, and it is possible that the reaction may be intended. Make separate solutions of the reacting ingredients and add a fairly large quantity of strong mucilage of acacia—say, 1 fl. oz.—to the sodium salicylate solution. Now add the quinine solution a little at a time. As each amount is added a quantity of the insoluble salt is precipitated and suspended. When all the quinine solution has been added and the mixture well shaken, it may be completed in the usual manner.

Quinine sulphate with dilute sulphuric acid and a salicylate yields a very abundant precipitate of the alkaloidal salicylate and also free salicylic acid. It should be treated as above.

Quinine sulphate with dilute sulphuric acid and a soluble iodide interact on standing, and a red crystalline deposit of quinine iodosulphate is formed. The mixture is not dangerous and the only precaution to take is to label the bottle with a " Shake " label.

The drugs in the following list are incompatible with so many compounds and preparations that they are recommended to be administered in simple aqueous solution or with simple flavouring agents :

Potassium Permanganate.
Tannic Acid.
Silver Nitrate.
Corrosive Sublimate.
Lead Acetate.

Labelling and Bottling

For the purpose of labelling and bottling, all liquid medicines may be divided into two classes : (1) Medicines for internal use, and (2) Medicines for external application.

(1) **Medicines for internal use.** These include mixtures, emulsions, mouth washes, gargles, nasal douches, throat paints. etc.

Mixtures and other liquid preparations intended to be swallowed are to be dispensed in plain white glass bottles, and should bear a label on which the directions to the patient are clearly written. If necessary a " Shake the Bottle " label is also attached, but no matter what the medicine may contain a " Poison " label must never be affixed to any medicine which is to be swallowed.

Internal medicines other than mixtures, etc., are dispensed in plain bottles which may, according to the nature of their contents, be of white or tinted glass. Liquids which deteriorate or decompose on exposure to light, such as solutions containing Adrenalin, Chloramine, and Hydrogen Peroxide, may be protected by being issued in green or amber tinted bottles.

(2) **Medicines for external use.** These include embrocations, liniments, lotions, liquid antiseptics, etc.

These are to be dispensed in bottles distinguishable by touch from ordinary medicine bottles. There is nothing laid down as to the design or colour of the bottle to be employed, but the usual kind is a six-sided fluted or ridged bottle made of blue glass. Such liquid preparations are to be labelled with the name of the preparation (*e.g.* The Embrocation) and must also bear the words " For external use only."

In addition, if the preparation contains a substance named in the Poisons List, it must also be labelled " Poison " (see para. 304, Standing Orders, R.A.M.C.).

Gargles (Gargarisma)

Most gargles are compounded in the same way as mixtures, similar rules as to the dissolving of soluble salts being followed. Gargles rarely contain insoluble compounds and the question of the use of suspending agents does not, therefore, arise.

The following example calls for special treatment :

℞

Potass. Chloratis	..	℥ij
Acid Hydrochlor	..	ℿxl
Glycerin.	..	℥iv
Aq.		ad ℨviij. Ft. gargarisma.

Note that Hydrochloric Acid is to be used and not the dilute preparation. The object of the gargle is to obtain a solution containing free chlorine, and this can only be done by using the concentrated acid. The dilute acid is not capable of liberating free chlorine whatever method of preparation is adopted.

Method of Compounding. Choose a perfectly dry bottle and into it place the powder or crystals of potassium chlorate. Add the measured quantity of the concentrated acid without dilution. A brisk action takes place with the evolution of a greenish-yellow gaseous mixture of chlorine and chlorine peroxide. Lightly cork the bottle and set aside for from 5 to 10 minutes for the gas to generate, then quickly pour in several ounces of water and shake to dissolve the gas. Dilute the glycerin and add, finally make up to volume.

A similar preparation has sometimes been prescribed for internal administration. In this case the prescription should be endorsed " To contain free Chlorine " or the dispenser will, and rightly so, dilute the concentrated acid before adding, and no free chlorine will be obtained.

MISCELLANEOUS LIQUID PREPARATIONS

Lotions. These are cooling or antiseptic preparations intended to be applied to the skin without friction.

Evaporating or cooling lotions usually contain a large proportion of alcohol ; others contain glycerin to keep the surface to which the lotion is applied in a moist state.

The B.P. Lotion—Lotio Hydrargyri Nigra—contains a suspension of Black Mercurous Oxide, and it is intended to be employed as a stimulating application to syphilitic lesions.

℞

Zinci Oxidi	.. ..	℥ij
Calamin. ..	.. ..	℥iij
Glycerin.	.. ..	℥ss
Aq. Rosæ	..	ad ℥vj. Ft. lotio.

This is a familiar lotion which is intended to be dabbed on the skin to relieve irritation. Most samples of zinc oxide and calamine (a native zinc carbonate) are in fine powder, but occasionally the calamine may contain gritty particles which would be irritant to a tender or inflamed surface. Coarse particles may be separated from an insoluble powder by a process of washing known as elutriation. Place the calamine into a stone mortar and add a little of the vehicle. Stir rapidly

and allow to stand for only a few seconds ; then pour off the liquid portion which contains the finest particles in suspension, leaving heavier and coarser particles behind. Repeat this operation several times until only the gritty particles remain. The zinc oxide may be triturated with the diluted glycerin and the lotion completed without further difficulty.

Eye Lotions (**Collyria**). These are usually aqueous solutions containing mild antiseptics or astringents such as boric acid and zinc sulphate. Occasionally they contain a minute amount of an alkaloidal salt or potent metallic compound.

Only freshly distilled water should be used in the compounding of these preparations, and the solution should be filtered through filter paper until perfectly clear and bright, except in such rare cases as contain a sediment.

Eye Drops (**Guttæ**). Eye Drops usually consist of powerful drugs in aqueous or oily solution, intended to be dropped into the eye from a pipette or dropper.

A supply of freshly distilled water should be boiled and allowed to cool, and the prepared water used to thoroughly rinse the containing bottle and all apparatus used in the compounding. Castor oil is most frequently used for the oil-base drops, and before use it should be sterilized by heating in a hot-air oven for 1 hour at a temperature of 150°.

Eye drops do not, as a rule, present any difficulty in compounding, but the silver compounds—Protargol (Argentoproteinum) and Argyrol—are rather difficult to dissolve. The best way is to weigh the silver compound and drop it on to the surface of the sterilized water contained in a measure, and leave it to dissolve on its own accord.

These preparations should be dispensed in tinted bottles and labelled " Not to be Taken."

Nasal Douches (**Collunaria**). Solutions intended for irrigation of the nose. They present no special difficulty in compounding.

Mouth Washes (**Collutoria**). These are preparations, mostly of an antiseptic nature, intended for local application to the mouth.

Inhalations (**Inhalationes**). These are of two kinds : (1) Volatile liquids containing Camphor, Menthol, Creosote, and volatile oils in solution. A few drops are sprinkled on a handkerchief and the vapours inhaled, or a special nasal inhaler may be employed. (2) Aqueous liquids containing volatile substances in solution or suspension, intended to be

added to boiling water and the vapours inhaled. An example of the latter type is as follows :

℞

Menthol ..	..	.. gr. xv
Ol. Pini	..	.. ℿxxv
Creosoti ..	..	.. ℿxv
Eucalyptol	..	.. ℿxxx
Mag. Carb. Levis.		.. ℥j
Aq. ..	..	ad ℨij. Ft. inhalatio.

Dissolve the menthol in the mixed volatile oils and triturate this mixture with the light magnesium carbonate in a mortar. This latter substance is insoluble, and absorbs the oils and aids their dispersion, both in the concentrated product and when added to boiling water. A teaspoonful of the inhalation is directed to be added to a pint of boiling water and the vapours inhaled.

Liniments (Linimenta). Liniments are preparations for external use, intended to be painted on, or rubbed into the skin. They may have an aqueous, alcoholic or oily basis, and they are mainly anodyne or rubefacient in action.

Many liniments may be prepared by simple solution of the active ingredients in the vehicle, others are saponified emulsions prepared by the methods described in the section devoted to the compounding of emulsions.

Sprays (Nebulæ). These are liquid preparations used to carry medicinal agents to the mucous surfaces of the nose and throat in the form of a fine mist. They are mainly employed for their antiseptic or local anæsthetic qualities and are used in conjunction with an atomizer—an apparatus fitted with a rubber bellows which divides the liquid into a fine spray.

The vehicle of a spray may be water, alcohol or glycerin, but many are prepared with a basis of liquid paraffin which adheres well to the mucous surface, thereby maintaining the active remedy in contact with the membrane for an appreciable period.

℞

Cocain. Hyd.	..	.. gr. iv
Menthol. ..	..	.. gr. vj
Sod. Chlorid.	..	.. gr. x
Eucalyptol	..	.. ℿxx
Paraffin Liquid ..		ad ℨij. Ft. nebula.

Dissolve Menthol and Eucalyptol in a little of the vehicle. The salts are insoluble in Liquid Paraffin and must be reduced to the finest powder and thoroughly triturated with the vehicle

before being incorporated. It is of importance that these insoluble substances should be finely powdered otherwise the fine bore of the atomizer will become choked.

Powders and Cachets

Powders. Prescriptions for powders rarely present any great difficulty, but the following compounding hints will be a useful guide.

(1) Use a stone pestle and mortar for heavy grinding operations, but a glass pestle and mortar for the light trituration of small quantities of powders. This is important in the case of minute amounts of potent drugs like alkaloidal salts, hydrarg. perchlor., etc., and staining substances such as iodine.

(2) Take the smallest amount or the most potent drug first, and carefully triturate with a small quantity of one of the other ingredients, gradually increasing the bulk of the powder with constant light trituration. In this way the potent drug is certain to be evenly distributed throughout the bulk of the powder.

(3) Only mix fine powders together lightly; never use sufficient pressure to make the powder cake. After mixing, pass the powder through a sieve, or turn it out on to a piece of white paper and continue the mixing with a spatula.

(4) It should not be possible to distinguish coarse or coloured particles in a mixture of powders.

(5) If a single crystalline substance be ordered as a powder, the crystals must be reduced to fine powder so that the nature of the drug may not be recognized by the patient.

(6) Divide the powder mixture into separate powders by weighing and not by any process of guesswork.

(7) Deliquescent and hygroscopic substances, also powders containing volatile ingredients, should have an inner wrapper of waxed paper.

(8) Wrap all powders the same length and width, and take care that none of the powder gets into the end folds.

Special Cases. If liquid extracts or tinctures be prescribed they should be evaporated to a pasty consistence and sufficient of an inert powder (lactose, calcium phosphate, etc.) added to make a dry powder.

Volatile oils and other volatile liquids, which cannot be evaporated, should be absorbed by means of calcium phosphate, kaolin, or other absorbent.

Oxidizing agents (chlorates, picrates, bichromates, permanganates, etc.) may not be triturated with reducing agents (hypophosphites, tannic acid, gallic acid, sugars, sulphur, etc.) without danger of explosion. Combinations of these groups should be made by reducing the substances to powder individually, and mixing lightly together on a piece of paper. Certain substances mutually liquefy one another; details of these have been given under the heading of physical incompatibility. In small amounts the ingredients may be allowed to liquefy and then absorb the liquid with some inert absorbent. If the quantities are too large for this to be done, the ingredients must be powdered and wrapped separately.

Cachets. Powdered drugs of an unpleasant odour or taste are frequently dispensed in cachet form.

The cachets are made of rice flour, and are supplied in separate halves to allow of the powder being filled in. The halves of the cachets are placed in the hinged and perforated plates of the machine. It will be found that the cachets are a tighter fit in one plate than in the other, and require to be gently forced into position with a spatula or flat stopper. The powders for the cachets are mixed and weighed in the usual manner, and each powder is then filled into one half of the cachet by means of the metal funnel provided, and lightly tamped down with the thimble. When the cachets in one plate have all been filled, the edges of the empty cachets are slightly wetted with a piece of damp paper or a special roller, and the two halves pressed together.

Remove the cachets from the machine, allow the damp edges to dry, and dispense in a box in a single layer, protected from damage by a thin layer of cotton wool.

The greatest care must be taken in damping the edges of the cachets; too liberal damping will result in uneven and discoloured edges.

Pills (Pilulæ)

The pill form is a most useful method of administering drugs, and possesses advantages over all other forms of drug administration. Pills are easily swallowed, they may be carried about on the person, the patient is assured of an accurate dose of medicine at any time and under any conditions, and the nauseous taste of drugs is well covered by suitable coatings.

A well-made set of pills readily dissolve in the digestive juices, are all of equal size and weight, and contain an equal amount of the medicinal substances. On being broken open,

no coarse or separate particles are discernible. In addition they should be kept as small as possible, and should retain their shape.

In some instances the ingredients only require careful mixing in order to form a mass suitable for rolling and cutting into pills. These cases are rather exceptional, and in nearly every instance it is necessary to add some binding agent to make a successful mass. This agent is called the **excipient.**

When the ingredients are dry and powdery, the excipient used is of a syrupy or mucilaginous nature, in order to bind the loose powder together. **Glycerin of Tragacanth, Glucose, Syrup of Liquid Glucose,** and **Mucilage,** are such excipients.

For very soft, or semi-liquid substances, dry inert powders, such as powdered **Liquorice, Tragacanth powder,** or **Kaolin,** are added to give pilular consistence.

As a rule the excipient is not ordered in the prescription, and it is left to the dispenser to decide which excipient to use and the amount of it. In certain circumstances the dispenser might be justified in altering the excipient already ordered by the physician, but he would need to have very good reasons for so doing.

Excipients

For Solid Drugs

Proctor's Paste. This is a preparation composed of Tragacanth 1, Water 1, and Glycerin 3½. It is an excellent excipient for general use ; it is easy to handle, and very little is required. The only disadvantage is that it contains glycerin which is liable to absorb atmospheric moisture and cause the pills to lose their shape. This excipient cannot be used for massing pills containing such substances as Potassium Permanganate or Silver Nitrate, as these are incompatible with glycerin.

Glucantha. A mixture of Tragacanth, Water, and Syrup of Liquid Glucose. A very good general excipient without the disadvantage of Proctor's Paste.

Mucilage of Acacia. Only rarely used as the pills are liable to become too hard, and do not readily disintegrate.

Liquid Glucose. A good general excipient, but is rather difficult to handle. Is very sticky, and must be added only in very small quantities.

Alcohol. A special excipient for resinous substances. Is improved by the addition of a trace of glycerin.

Syrup of Liquid Glucose. Probably the best excipient of all for ordinary masses, and is employed in all the B.P. masses except Pil. Ferri Carb.

For Liquids and Semi-Solids

Liquorice Powder. Note that this excipient is powdered Liquorice Root and **not** the B.P. Compound Powder which can never be used for the purpose. The powder contains vegetable fibres which are of great assistance in binding loose particles together, and it gives toughness to soft vegetable masses.

Tragacanth and Pulv. Tragacanth Comp. Gives body and elasticity to a soft mass. Should not be used too freely or the pills become spongy, are difficult to round, and soon lose their shape.

White Wax. Makes a good mass with essential oils and Creosote, but the pills are rather insoluble.

Miscellaneous

Powdered Soap. Sapo Animalis (Curd Soap) is frequently added to resinous ingredients as a binding agent. It also makes a good mass with essential oils, using ½ grain of the soap and 2 grains of powdered liquorice for each minim of the oil.

Kaolin. Particularly recommended for use with drugs that easily decompose, such as Pot. Permang., Silver Nitrate, Silver Oxide, etc. Should be employed in conjunction with some greasy substance like lanolin or Oil of Theobroma.

Calcium Phosphate. Used in similar circumstances to Kaolin. A good absorbent of liquid drugs.

General Rules to be Observed

1. For pills containing 1 grain or more of active ingredients, use as little excipient as possible.

2. Pills containing less than 1 grain of medicinal ingredients must be made up to 1 grain with a suitable diluent—lactose or liquorice powder.

3. Make a note of the excipient employed, and weigh the mass before rolling and cutting, so that if the pills have to be repeated at some future date, they may be sent out the same size and weight as before.

4. If all the ingredients of a pill are without colour, use a white diluent if necessary, and mass with a colourless excipient, such as Proctor's Paste.

5. If a volatile ingredient is ordered, or one liable to change if exposed to the atmosphere, the pills must be varnish coated whether ordered or not.

A Simple Pill Mass.

℞

Ferri Redact.	.. ..	gr. ½
Ext. Aloes	.. ..	gr. i
Ext. Nucis Vom. Sicc.	..	gr. ¼
Glycyrrhizæ Pulv.	..	gr. ij. Ft. pil. mitte xxiv.

All the solid ingredients of a pill mass must be in as fine a powder as possible. If some of the ingredients are crystalline or gritty, they must be reduced to powder individually before adding to the other ingredients.

The Reduced Iron in the above example is a dense, gritty substance, which should be given a thorough trituration in a small stone mortar. The Extract of Aloes may now be added, as this also requires powdering, then the dry extract of Nux Vomica and lastly the powdered liquorice. These powders should be intimately mixed together in a special pill mortar or a small-sized shallow stone mortar. The best type of pestle is one with a small rounded head and a long handle.

Any of the general excipients may be used for this mass, and Syrup of Liquid Glucose will be found as good as any and better than most. The excipient is added by pouring one or two drops on to the head of the pestle, and incorporated by squeezing and pressing between the head of the pestle and the side of the mortar. The pestle should be held with the wooden head pressing against the palm of the hand, and using the edge of the mortar as a fulcrum, a lever action is obtained with the pestle which exerts considerable pressure on the mass. Simply stirring or triturating is not sufficient ; keep the elbow well raised and press down with the full weight of the body. By this means the mass will be made to bind with the minimum amount of excipient. It is a golden rule to remember that " A little more excipient can always be added but if too much has been employed, it cannot be taken out." The first few additions of the excipient will not seem to have much binding power and the student will at first be tempted to add a rather larger quantity, and will be surprised to find that the mass has become much too soft. Avoid this error, and continue to add only small amounts of excipient until the particles are bound together into a tenacious and plastic mass. A good mass will bind under the pressure of the pestle and will come clean away from the sides of the mortar. Remove the mass

from the mortar and squeeze it between the fingers, a procedure which serves to toughen it and yet keeps it soft and workable.

The mass is now placed upon the wooden slab of the pill machine, which has been previously dusted over with a thin film of French Chalk. Using the back of the cutter the mass is gradually rolled into a pencil of uniform thickness. Keep the ends of the cylinder squared off, and when the correct length has been reached, as indicated by the divisions on the brass scale, place under the cutters and divide into separate pills. It is then usual to take the pills in turn between the thumb and forefinger and round off the rough angles with a rotary motion. The final rounding is done by means of a flat, circular, boxwood pill-finisher. The slab is dusted lightly with French Chalk, the pills placed thereon, covered with the boxwood finisher which is held lightly but firmly with the fingers, and rapidly rotated in a circular motion.

Dispense the pills in a shallow box sufficiently large to hold them in a single layer, with a pinch of Talc or French Chalk scattered over to prevent them from sticking.

If during the making of the mass it is found that too much excipient has been added and the mass is too soft and pasty, it may be stiffened by the addition of a little dry excipient such as lactose, compound tragacanth powder, or liquorice powder. This procedure is undesirable as it increases the size and weight of the pills, and can always be avoided by adding the excipient in small quantities.

The above methods are applicable to all ordinary masses.

Special Pill Masses

Soft and Liquid Extracts. Pills containing soft or liquid extracts may be dealt with in one of two ways :

(1) Sufficient absorbent powder of an inert nature may be added to absorb the excess of moisture, or

(2) Remove excess of moisture by evaporation of the extract on a water bath.

The former method is the easier but it frequently happens that the amount of absorbent material required is so large as to make the pills of excessive size ; in such cases the extract must be evaporated.

Liquids other than Extracts. The liquids ordered in pill form may be volatile oils, or drugs like Creosote and Croton Oil. In special cases the dry ingredients may liquefy each other, as is the case with combinations of Camphor, Menthol, Thymol, Phenol, Chloral Hydrate, etc. Evaporation cannot be resorted to as this would result in loss of strength by volatilization of active ingredients.

The special excipients and methods of treatment in such cases are noted below.

Croton Oil. To each minim of oil add ½ grain powdered Curd Soap and mass with Calcium Phosphate or Compound Tragacanth Powder.

Phenol. Add 1 grain of wheaten flour to each grain of the crystalline acid, and mass with Glycerin Tragacanth.

Avoid soap in Phenol pills as the latter combines with the alkali of the soap.

Silver Nitrate. This salt decomposes when brought into contact with most organic substances. Add an equal weight of Kaolin or Calcium Phosphate and make into a mass with Lanolin or White Paraffin Ointment.

Camphor. When the pills consist entirely of Camphor a mass may be made as follows : Powder the drug by adding a few drops of alcohol and triturating, and when the spirit has evaporated leaving a smooth paste, mass with Glycerin Tragacanth. A little Compound Tragacanth Powder may also be added if desirable.

Remember the liquefaction properties of Camphor with other stearoptenes, Phenol, Chloral Hydrate, etc. The best way of treating such a combination is to allow the substances to liquefy and to add sufficient powdered Liquorice or other absorbent, together with a little Tragacanth to form a mass.

Creosote. A good mass may be made from : Creosote 1 minim, powdered Soap ½ grain, powdered Liquorice 2½ grains.

Metallic Salts. Soluble salts should be reduced to a fine powder and a mass made with Glucanth, adding a little absorbent powder if necessary.

Insoluble salts may usually be massed with Glucanth alone.

Volatile Oils. These may be massed with a mixture of powdered soap 1 part and powdered Liquorice 5 parts ; 3 grains of this mixture are sufficient for 1 minim of the oil.

Another method is to add about ½ grain of white Beeswax or Oil of Theobroma to each minim of oil, and mass with Glycerin Tragacanth.

Scale Preparations of Iron. Lanolin or Kaolin Ointment are good excipients, but avoid those containing Glycerin as the pills rarely harden and rapidly lose shape.

Potassium Iodide. Rub the crystals to a smooth paste with a drop of water and mass with Compound Tragacanth Powder or powdered Liquorice.

Potassium Permanganate. Powder the salt with half its weight of Kaolin and mass with Lanolin.

Quinine Sulphate. Glycerin Tragacanth alone makes a good mass, but it is usual to add about 1 part in 8 of Tartaric Acid in order to reduce the bulk of the Quinine.

Calomel. Use Lactose and Syrup of Liquid Glucose.

Pill Coating

Varnish Coating. There are many formulæ for the varnish used for pill coating, most of them containing Gum Sandarac and Balsam of Tolu dissolved in a mixture of ether and alcohol.

Pills containing volatile ingredients, or substances liable to oxidation, those which absorb atmospheric moisture, or possess an objectionable odour or taste, are all improved by coating with varnish. The coating is applied at the discretion of the dispenser.

Pills to be varnished should be fairly hard, perfectly round, and free from cracks and other imperfections. French Chalk or other powder used in rounding the pills, may be removed by shaking them in a flannel bag or by gently rolling between the palms of the hands. Blemishes on the surface of the pills are rendered more noticeable, rather than hidden, by coating.

The method of applying the varnish is quite simple—prepare a white tile by rubbing a drop of almond oil over its surface so as to leave an oily film. Place the pills in a porcelain jar or chip box, add a few drops of varnish, and rotate the container for a few seconds. Turn the pills out on to the prepared tile, separate any which adhere together, and allow them to dry. The pills should be moved occasionally so that the coating may not be marked where it has come in contact with the tile. A single coat is all that is necessary if the object is simply to improve the appearance of the pills, but further coats may be required if it is desired to exclude the possibility of air penetrating the coating. Each coat must be given time to dry and harden before a second is applied.

Pills which have been coated must not be dusted over with powder when placed in the pill box.

Silver Coating. This coating is not now used very much, as although the coat is of good appearance, it hinders the disintegration of the pills. The pills, which should be perfectly round and free from powder, first of all receive a thin even coating of mucilage. This may be done by smearing one or two drops of weak mucilage over the inside of a small jar or chip box, placing the pills therein, and rotating until they have acquired a thin, but complete film of mucilage. An alternative

plan is to smear the mucilage over the palm of the hand and to move the pills round with the index finger until a tacky coating has been received.

The pills are now turned into a second jar containing the silver leaf ; one piece of leaf is sufficient for 6 to 12 five-grain pills. Rapidly rotate the jar until the pills are completely covered in the silver leaf, and then set aside to dry.

Pills containing Asafetida, Sulphur, Sulphides, or Mercury, must be varnish coated before they can be silvered, otherwise the coating turns black within a short time.

The most frequent cause of failure in silver coating is the result of applying too much mucilage ; the dampness shows through the outer coating and the pills do not take a high polish.

Pearl Coating. This process is somewhat unsatisfactory on a small scale, and belongs more to the sphere of the manufacturing chemist who employs special machinery for coating thousands of pills at one time in wax-coated pans.

The coating is really composed of French Chalk or Talc, and if it be too thickly applied the pills do not dissolve, and have been known to pass completely through the alimentary tract almost unchanged.

For coating a few dozen pills, a thin film of coating solution must be first applied. This solution is composed of Mucilage Acacia, Mucilage Tragacanth, Syrup, and Water, and is applied in the same manner as the varnish coat. Then the pills are thrown into a pot containing the powder and rotated briskly. More of the powder is added if necessary, until the pills are unable to take up any more, when they may be turned into a clean jar to receive the final polish.

Sugar Coating. Not a satisfactory small-scale process. It is an excellent coating when properly applied, is of good appearance and is perfectly soluble. On a large scale, the pills are rotated in metal pans while syrup and powdered sugar are added until the coating has been built up.

Gelatin Coating. The gelatin coat is of good appearance and is perfectly soluble ; it provides a glazed finish and at the same time preserves the ingredients from the action of the atmosphere.

The recipe for the gelatin mixture is : Gelatin 1 oz., Gum Acacia 2 drachms, and Water 10 oz. Soak the gum and gelatin in water for 6 hours and then dissolve on a water bath. This cools to a solid mass, and requires to be remelted over a water bath before it can be used.

The pills are mounted on needle points fixed into a flat piece of cork and dipped into the gelatin mixture. Gently

withdraw and allow the excess of coating to drip off ; rotate in the air for a minute or so and set aside until the outer film is set, when the pills may easily be removed from the needles. The under surface does not harden for some time and as the coating contracts the tiny hole left by the needle soon closes. Alternatively a small spot of the gelatin mixture may be applied over the puncture.

On a commercial scale the pills are made to adhere by suction to the ends of a series of tubes. The exposed surface is then lowered into the liquid gelatin mixture, withdrawn, and allowed to dry. The pills are then brought opposite to a second series of tubes and are drawn from one to the other, thereby exposing the surface still to be coated. This surface is then coated in the manner described above. Pills which have been coated in this way can usually be distinguished by a fine ridge or line round each pill where the two coatings meet.

Enteric Coatings. These coatings are applied in order that the pills may pass through the acid digestive juices of the stomach unchanged, and dissolve in the alkaline intestinal secretions within a period of 2 hours.

Three coatings are employed for this purpose :

Keratin Coating. Pills to be coated with keratin should be massed with a fatty excipient or, if this is not possible, they should first of all receive a coating of white wax or Oil of Theobroma. The keratin solution is made by digesting horn shavings in a mixture of Pepsin, and Hydrochloric acid for several days. The insoluble residue is collected, dissolved in solution of Ammonia, and evaporated to the consistence of a thick varnish which may be applied in the same way as the varnish coat. Several coatings are required, each coat being allowed to dry thoroughly before another is applied.

Glutoid Coating. Pills coated with gelatin are immersed in Solution of Formaldehyde for 10 minutes and allowed to dry. The Formaldehyde combines with the gelatin to form a compound which possesses all the properties required in an enteric coating. It has the advantage of being easy to apply.

Salol coating.—Melted Salol, or a Salol in ether varnish, may also be used as a substitute for the above but has no advantage over either.

Capsules

Three kinds of capsules are in common use :

(1) Soft Gelatin Capsules.
(2) Hard Gelatin Capsules.
(3) Glass Capsules.

Soft Gelatin Capsules. These capsules are rounded, flexible receptacles, used chiefly for the administration of oily or resinous fluids, especially such as have a nauseous taste. Ordinary aqueous solutions cannot be enclosed in gelatin capsules, as the water would soften and ultimately dissolve the capsule walls, but oily liquids do not dissolve gelatin.

As a rule these capsules are purchased, ready filled, from the manufacturing chemists, and may be obtained containing such active remedies as Copaiba, Oil of Turpentine, Creosote, Extract of Male Fern, Santalwood Oil, Cod Liver Oil, etc.

Only rarely are capsules of this type required to be made at the dispensing counter, and only a brief outline of the process will be given.

A capsule mass is prepared from Gelatin 4 oz., Glycerin 2 oz., Mucilage Acacia 1 oz., and Water 7 oz. Steep the Gelatin in water until thoroughly softened, add Glycerin and Mucilage, place over a water bath and heat until dissolved. The mixture sets to a firm jelly on cooling and requires to be remelted before use.

The moulds on which the empty capsules are made consist of solid oval pieces of brass or gunmetal, rounded at the base and tapering to a slender stem. Three or four dozen moulds are mounted on a wooden base for ease in handling. The capsule base having been liquefied and the moulds wiped over with an oily cloth, the moulds are lowered into the gelatin until the liquid reaches about half way up the stems. Rotate the moulds in the mixture to obtain an even coating and gently withdraw them, allowing excess of the mixture to drain away. Immediately invert the moulds and rotate them in the air for a few moments for the gelatin to set, and then put on one side to dry. When quite cool the capsule shapes may be readily stripped off the oiled moulds.

The capsules are usually filled by means of a syringe, and a small air space is left at the top of each capsule so as not to interfere with the sealing. As each capsule is filled it is stood upright in a shallow tray and when the full number has been filled, the necks are trimmed with a scissors, and the opening sealed with a spot of gelatin mixture applied with a glass rod or camel hair pencil. Gelatin capsules are also made so that they will pass through the stomach unchanged, by immersion in solution of Formaldehyde as described under Glutoid (enteric) coating.

Manufactured capsules are made out of sheets of glyco-gelatin and the capsule is both made and filled by a single operation. These capsules have a much better finish than those made by extemporaneous means.

Hard Gelatin Capsules. The empty capsules, of various sizes, may be obtained from the manufacturing chemists. The capsules are in two halves, the upper portion fitting tightly over the lower.

Nauseous powders (Quinine, etc.), soft extracts, and pill masses, are suitable for putting into capsules of this type. Powders may be filled in with a small metal funnel and rod, or may be made into a firm mass with liquid paraffin, cut into equal portions, and inserted into the capsule.

One disadvantage of this type of capsule is that they are somewhat bulky and are not very readily swallowed.

The capsules are closed by inserting one half into the other, and may be rendered airtight by damping the edges with water or weak mucilage before closing.

Glass Capsules. These are usually filled with volatile liquids for administration by inhalation. Amyl Nitrite in doses of 2 to 5 minims, is put up in this way. Such capsules cannot be made at the dispensing counter, and they are purchased from the wholesale chemists.

The fragile capsules are filled with the liquid, sealed, and wrapped in cotton wool and gauze tissue. When required for use the capsule is broken, the liquid is absorbed by the cotton wool, and by holding under the nose the vapours may be inhaled.

Compressed Tablets (Tabellæ)

Medicines in compressed tablets, although a comparatively modern feature of Pharmacy, have largely taken the place of certain other forms of drug administration. They certainly possess advantages over most other methods of administering medicines, and their popularity is evidenced by the ever-increasing number of proprietary medicines that are put on the market in this form.

Perhaps the greatest value of the tablet lies in its portability ; they are easily carried on the person, and the patient is assured of an accurate dose of medicine at any time and under any conditions. In addition, they are easy to swallow on account of their relatively small size and convenient shape, and are almost tasteless.

The tablet is particularly suitable for war purposes ; a great many can be packed into a small space, they can be packed into metal or vulcanite containers to withstand rough handling, and above all it affords the medical officer in an advanced position a much greater choice of remedies than would be possible with drugs in liquid form.

There seems to be no limit to the ingenuity of manufacturers

in rendering preparations suitable for compressing into tablets, even antitoxic serums being available in this form.

Tablets are employed as substitutes for powdered drugs, lozenges, and hypodermic injections, and they must be so made as to feature the original qualities of these preparations. When used in place of powdered drugs they should readily disintegrate in the stomach; those used as substitutes for lozenges should be compressed hard so as to dissolve slowly, and those for hypodermic use must contain only such ingredients as are suitable for injection.

Only a few drugs, which occur or which can be produced in a naturally granular form, can be compressed directly into tablets. Examples of such drugs are potassium chlorate, calcium lactate, ammonium chloride, and potassium bromide.

In most cases the following stages of production are necessary :

(1) Mixing the ingredients.
(2) Granulation and drying.
(3) Lubrication.
(4) Compression.

(1) **Mixing the Ingredients.** As in the case of compound powders and pills, all ingredients must be finely powdered and thoroughly mixed. When the tablets contain a single crystalline drug it may only be necessary to reduce the crystals to a coarse powder. Should the tablet contain less than 1 grain of active remedy, or when it is necessary to make each tablet up to a definite weight, pure cane sugar or lactose is used.

Many sparingly soluble salts and compounds, such as Aspirin and Phenacetin, are not suitable for compressing alone, as the tablets do not readily break up and dissolve when swallowed. In such cases starch is added to the ingredients; this swells up in contact with the digestive juices and aids disintegration of the tablet.

2. **Granulation and Drying.** Fine powders cannot be compressed directly into tablets, and the difficulty is only overcome by converting the powder into granules. This is done by damping the mixture of powders with either (*a*) spirit and water, (*b*) dilute syrup or mucilage, or (*c*) a special theobroma emulsion. The damp mass is forced through a No. 22 or No. 30 sieve and the granules formed are spread out in a thin layer on trays or sheets of paper. Drying is carried out in hot-air ovens at a temperature not above 40°, or if the tablets contain a volatile ingredient or a preparation that would be harmed by heat, the granules are allowed to dry in dust-proof cupboards.

(3) **Lubrication.** It is necessary to lubricate the granules in order that they may pass at a regular rate through the compressing machine, and to prevent them from adhering to the lower punch. French Chalk (Talc) or Boracic Acid, up to a limit of 5 per cent. may be used for external use tablets; liquid paraffin in the form of a fine spray is employed in most cases for tablets intended for internal administration.

(4) **Compression.** A simple compression apparatus consists of a hollow, cylindrical, metal tube or die, at the bottom of which is situated the concave lower punch. The granules are weighed out for each tablet, and each portion is introduced in turn into the cylinder, the upper punch is lowered into position, and compression effected by a sharp rap with a wooden mallet.

Machines of various sizes and types, the larger of which are capable of turning out a thousand or more tablets a minute, have been invented. The granules are contained in a hopper from which they are fed automatically to the punches. The machines are capable of taking different sizes of punches and can be regulated to deliver the exact weight to the punches for compression. The punches are usually made of polished steel, but for certain substances which corrode steel, they may be of copper or agate.

The degree of compression depends upon the nature of the tablet and the use for which it is intended. Tablets of potassium chlorate to be used as lozenges are compressed hard to give slow solubility, whereas those which are intended to dissolve in the stomach are only compressed sufficiently to withstand handling without breaking.

Plasters (Emplastra)

The operation of making a plaster usually means the spreading of one of the B.P. plasters upon a suitable material. Occasionally the ingredients of the plaster substance will be stated in the prescription, in which case this will need to be prepared before the plaster can be spread.

The material upon which a plaster may be spread may be either white sheep-skin, calico, adhesive plaster, or even brown paper.

℞

Emplast. Belladonnæ .. 5 in. × 4 in.
to be spread on leather

The first step is to cut a piece of the material sufficiently large to leave a 1-in. margin all round the spread surface—

that is, 7 in. by 6 in. Cut also a piece of stiff white paper to the same size, and from this cut away the central portion leaving a frame 1 in. wide.

Pass the warm plaster iron over the surface of the leather to remove creases, and stick the paper frame to the leather after moistening it with a little soft soap. Weigh out the required amount of the solid plaster, allowing from 10 to 15 grains per square inch of surface to be covered. Heavy plaster substances such as Lead Plaster will need the full 15 grains per square inch, while Resin Plaster will suffice with 10 or 12 grains. There is a considerable wastage of material in spreading the plaster and the student should allow himself the full 15 grains per square inch.

5 in. $\times$ 4 in. = 20 sq. in. of surface to be covered.
20 $\times$ 15 grains = 300 grains of plaster substance.

The solid plaster is now melted in a porcelain dish over a water bath, or by applying the hot iron to the plaster substance on a piece of stiff paper. It is best to melt the plaster over a water bath as there is then no danger of overheating, and by pouring the liquid direct from the dish on to the surface of the leather, wastage is avoided. If melted by means of the hot iron, the liquid plaster should be scraped towards the edge of the paper, and with a few sweeping strokes of the iron, spread the plaster over the surface. Whichever method is adopted it will be advisable to spread towards the corners, leaving the centre to take care of itself. Allow a few minutes for the surface to set and then carefully peel off the paper frame, trim the margin down to about half an inch, and round off the corners.

Great care must be taken not to overheat the plaster substance or the plaster iron, or the active ingredient may be volatilized or destroyed by the heat. The temperature of the plaster substance may be regulated by the use of the water bath, and the temperature of the iron may be tested by applying it to a scrap of the leather—it should not discolour or curl the leather.

Gas and electrically-heated irons are available and the temperature of these can be regulated to a nicety, but the student will do well to practise with the old-fashioned implement.

Plasters of various shapes are ordered to fit parts of the body, such as the chest, shoulder, behind the ear, etc. Breast plasters are circular, about 7 in. in diameter, and have a hole of 1 in. diameter in the centre. A cut is made from the centre to the circumference to allow the plaster to be adapted to the curved surface.

Plasters with Adhesive Margins. A plaster required to have an adhesive margin is usually spread on adhesive plaster, but may be spread upon other material. In the latter case the central portion of the material is covered with a paper mask exposing a margin of about $\frac{1}{4}$ in. all round. This margin is now spread with adhesive plaster (Emplastrum Colophonii B.P.) and allowed to set. Remove the paper mask and spread the central portion with the medicated plaster in the manner already described.

Machine Spread Plasters. The dispenser is rarely called upon to spread a plaster in these days of machine-made plasters. The latter are spread by machines having heated rollers and have a much better finish than those spread by hand. Manufactured plasters are usually made with a rubber basis so that they will adhere to the skin under the softening influence of the warmth of the body. Plasters to be applied to a large area are perforated at intervals over the entire surface to allow the pores of the skin to function.

Blisters. Unless special ingredients are ordered, a blister consists of the official Cantharidin Plaster spread on adhesive plaster or other suitable material. They are usually quite small, and may be either circular, or of special shape for application behind the ear.

Cantharidin or Blistering Plaster is much softer than other plaster masses in order that the blister may be removed from the vesicated surface without undue pain.

The plaster material and a paper mask are cut to the required dimensions as previously described. A piece of the Cantharidin Plaster is softened between the fingers and is then spread over the exposed surface with the thumb; only a thin film of the plaster mass is required. The finish may be improved by passing a warm spatula over the surface. Afterwards the paper mask is removed and the margin trimmed down to about $\frac{1}{8}$ in.

The surface of plasters and blisters should be protected by a piece of waxed paper, and they should be sent out perfectly flat in a box.

Ointments (Unguenta)

An ointment consists of one or more active medicaments incorporated in a fatty basis, and may vary in consistence from a thick cream to a stiff solid.

From the therapeutic point of view an ointment may be employed (*a*) to introduce an active agent into the system through the skin, or (*b*) for a surface antiseptic or healing action. Those in group (*a*) are made with an absorbent

basis such as Lard, Benzoinated Lard or Wool Fat, while those in group (*b*) have a non-absorbent basis of one of the Paraffin mixtures.

Ointments may roughly be divided into two classes :

(1) Those containing ingredients soluble in the basis, and

(2) Those containing ingredients insoluble in the base.

℞

Camphor	.. ..	gr. xx
Soft Paraffin	..	ad ℥i. Ft. ung.

This is a simple example of an ointment containing a soluble ingredient. Melt the paraffin base, using as little heat as possible, dissolve the Camphor in the oily fluid, and stir until cold. If the base be overheated the ointment will lose strength by volatilization of the Camphor.

Alkaloidal ointments frequently contain oleic acid to make the alkaloid soluble in the fatty base.

℞

Cocain. ..	.. ..	gr. vj
Oleic Acid	.. ..	♏xxv
Adipis ..	.. ..	℥i. Ft. ung.

Triturate the alkaloid with the oleic acid and dissolve with gentle heat. Add a small amount of the lard and mix intimately together ; gradually incorporate more of the base until it has all been used and a perfectly smooth product results.

When more than one base is ordered, that with the highest melting point should be shredded and melted in a dish over a water bath, and the others added in order to their melting points. In this way it is possible to avoid overheating bases with a low melting point.

℞

Creosote ..	.. ..	♏40
White Beeswax ..	..	gr. 30
Lard ..	.. ..	gr. 30
Hard Paraffin ..	..	gr. 30
White Soft Paraffin	..	℥i. Ft. ung.

The four bases are to be melted in the following order : (1) White Beeswax (M.P. 62–64°), (2) Hard Paraffin (M.P. 50–60°), (3) White Soft Paraffin (M.P. 40–46°), and (4) Lard (M.P. 34–41°). When all the bases have been liquefied, allow to cool a little, add the Creosote and continue stirring until the ointment is cold.

The following is an example of an ointment containing an active ingredient insoluble in the base.

℞

Chrysarobin	.. ..	gr. xx
Ung. Simplicis	.. ..	℥i. Ft. ung.

Triturate the Chrysarobin in a mortar until quite smooth, and incorporate a little of the base. When the active ingredient is evenly dispersed throughout this portion of the base, a little more may be added and the trituration continued. Continue adding further amounts of the base until all has been used.

Large quantities of such ointments are best made in a mortar, but small quantities may be made on an ointment slab. The best form of slab is a piece of marble, which affords a good grip on the ingredients ; if this is not available a white porcelain tile about 12 in. square may be used, and the mixing done with a flexible steel spatula. Such substances as would corrode a steel knife (mercury, iodine) are mixed with a vulcanite or horn spatula.

Metallic salts and other compounds which are soluble in water may be dissolved in a small amount of water before being added to the other ingredients. Insoluble salts of a gritty nature frequently require to be rubbed down with a little oil before adding the base. If the base is of Lard or Wool Fat, the oil should be of vegetable origin (olive, arachis or almond oil) ; should the base be of paraffin, a little liquid paraffin may be used.

℞

Resorcin ..	.. ..	gr. 30
Starch ..	.. ..	gr. 60
Aqua Dest.	.. ..	℥ 40
Adeps Lanæ	.. ..	gr. 120
Paraffin. Molle Alb.	..	℥i. Ft. ung.

Dissolve Resorcin in distilled water and mix with the Starch to form a smooth paste. Add the Wool Fat and triturate until smooth, and gradually incorporate the Soft Paraffin.

Some ointments containing insoluble ingredients require to be heated in order to produce a smooth preparation.

℞

Acid. Boric.	.. ..	℥i
Paraffin Ointment	..	℥i. m. Ft. ung.

Melt the base on a water bath, remove from the source of heat, and just as it begins to thicken, sift the Boric Acid in fine powder on to the surface, and stir until cold. Ointments

made in this way are improved by turning them out, when cool, on to an ointment slab and continuing the mixing with a spatula.

Special Cases.

Iodine ointments usually contain a little Potassium Iodide in addition, as a solvent of the Iodine. Triturate the Iodine and Potassium Iodide together with a few drops of water until a solution is obtained, afterwards adding the base a little at a time. If Potassium Iodide is not prescribed, rub the Iodine smooth with a few drops of Alcohol Dehydratum.

Mix Iodoform, in fine powder, with the base in the cold; this substance coagulates with heat.

Use Yellow Soft Paraffin for coloured, and White Soft Paraffin for colourless or white ingredients, unless otherwise ordered.

Eye Ointments (Oculenta) are prepared with a sterilized base, on the lines indicated for the B.P. preparations.

Suppositories (Suppositoria)

Suppositories are small, conical or torpedo-shaped masses, containing an active remedy incorporated with a suitable base, for the introduction of medicines per rectum.

Similar preparations for other uses are :

Pessaries. Flattened, conical masses, weighing from 60 to 120 grains each, for the introduction of remedies per vagina.

Bougies. Slender cylindrical masses, weighing from 15 to 30 grains each, for introduction into the male urethra.

Suppositories are about 15 grains in weight, except the Glycerin Suppository, which is made in various sizes weighing up to 120 grains.

Whatever the therapeutic intention, a suppository must readily melt at body temperature, and it is for this reason that Oil of Theobroma is so largely used as the base. This is a solid oil which readily melts at body temperature, is non-irritant, and does not become rancid with keeping. Another base is the gelatin-glycerin base similar to that used for Glycerin Suppository B.P.

℞

Iodoform.	.. ..	gr. iij
Ol. Theobrom.	.. ..	q.s.
Ft. suppos.	.. ..	mitte tales vj

As there is always considerable wastage of materials, it is advisable to weigh out the ingredients for one or two extra suppositories to ensure the moulds being completely filled.

Moulds are made to hold 15 grains of Oil of Theobroma each, but a trial suppository should be made using the oil only, and weighed as a check on the correctness of the capacity.

Calculating the quantities. The Iodoform required for 8 suppositories is 24 grains and the Oil of Theobroma is $8 \times 15 = 120$ grains, less an allowance for space occupied by the medicament. This allowance is obtained by dividing the total weight of active ingredient by its density as compared with that of Oil of Theobroma.

The relative density of Iodoform is 4, and the calculation for 8 suppositories is made as follows :

Iodoform $8 \times 3 = 24$ grains.

Oil of Theobroma $8 \times 15 = 120$ grains

$$\text{less } \frac{\text{total weight of medicament}}{\text{relative density}}$$

$$= 120 - \frac{24}{4} = 114 \text{ grains.}$$

The relative densities of other substances used in suppositories are : Lead Acetate 2·5, Tannic Acid 1·6, Lead Iodide 10, Bismuth Salts 4·5. Alkaloidal salts may be reckoned to have a relative density of 1·0.

Lubricating the Mould. The mould should be taken to pieces, thoroughly cleaned, and lubricated, either with almond oil or a mixture of equal parts of Soap Liniment and glycerin. The lubricant may be applied with a small tuft of cotton wool on a match stick. Each cavity of the mould must be lubricated, whether all are to be used or not, otherwise the dispenser may pour the mixture into the wrong cavities, in which case they will be difficult to remove without spoiling their shape.

After the mould has been lubricated, turn it upside down so that excess of the lubricant may drain away.

Making the Suppositories. Cut the Oil of Theobroma into shreds and place in a porcelain dish over a water bath to melt. Never melt the oil over a naked flame as the melting point is thereby lowered, moreover the active ingredient may be decomposed or congealed.

Powder the Iodoform finely and place on a white tile. As soon as the oil has melted **remove it from the source of heat,** and pour a little on the slab with the Iodoform. Mix together as if making an ointment. The mixture soon solidifies in contact with the cold slab, when it is to be scraped off with

a spatula and once more returned to the dish containing the remainder of the still liquid oil. Stir the contents of the dish until the mixture begins to thicken, and pour into the moulds whilst continuing to stir. Fill the moulds to overflowing, and place on one side to cool. Pass the edge of a spatula over the top of the mould so as to remove excess of the mass, and when the suppositories have had time to harden, unscrew the moulds and gently force them out from the broad end.

Dispense in a single layer in a shallow box lined with wax paper, but **no** cotton wool.

In hot weather the moulds may require to be stood on ice or in a freezing mixture before the suppositories will set. In tropical climates, from ½ to 1 grain of white wax may be added to the suppository mass to harden the product, omitting an equal weight of Theobroma.

Once the active ingredient has been incorporated with the liquid oil, it should not be necessary to again heat up the mixture ; suppositories containing Iodoform, Tannic Acid, or Extract of Belladonna are liable to congeal if treated in this way.

Gelatin Base. The proportions for the B.P. Glycerin Suppository are :

Gelatin	14 grammes.
Glycerin	70 ,,
Distilled water	A sufficient quantity.

Soak the gelatin in distilled water until thoroughly softened, drain well, add the glycerin and dissolve on a water bath. Evaporate until the product weighs 100 grammes, and pour it into lubricated moulds. In this case it is not necessary to fill the moulds to overflowing, as the amount of contraction that takes places is negligible.

Ampoules

These are sealed glass containers employed for storing sterilized solutions for administration by injection. The capacity of the ampoule varies ; those for hypodermic solutions are rarely more than 5 mils capacity, whilst those for storing saline solutions may be as much as 500 mils. Whatever the size of the ampoule, it should be capable of holding rather more than the prescribed quantity.

The glass of which ampoules are made must pass the Pharmacopœia test for limit of alkalinity ; otherwise alkaloidal solutions may decompose. Tinted ampoules are supplied for such solutions as may be decomposed by exposure to light.

℞

Morphin. Hydrochlor.	..	gr. ¼
Aq. Steril.	..	ad ℥xv
Ft. ampoule	.. ..	mitte tales xii.

Obtain some freshly distilled water and thoroughly cleanse the filling syringe, funnel, measures, glass rods, and any other apparatus to be used.

Always make up a little more solution than is required for the ampoules to allow for wastage during filtration, etc., and fill one or two more than the required number as there may be breakages during sterilization. In the above example it is suggested that 4 grains of the Morphine salt should be dissolved in sufficient Aqua Sterilisata B.P. to give 240 minims of solution. The solution is then filtered through fine white filter paper.

The ampoules, as received from the manufacturer, are already sealed and a small portion of the slender neck must be broken off, and the ampoules well washed with distilled water.

The solution is introduced into the ampoules by means of a hypodermic syringe fitted with a long needle. Take up about 18 minims of the solutions in the syringe and inject into the ampoule ; the few minims extra are allowed so that the full 15 minim dose may be extracted without difficulty. The ampoules should not be more than about threequarters full. As each ampoule is made it is sealed by rotating in the flame of a bunsen burner.

The ampoules are now wrapped in lint, placed in a beaker or wire basket, and subjected to a temperature of 115° in an autoclave for 30 minutes. Solutions which cannot withstand this temperature may be sterilized by Tyndallization or by filtration.

After sterilization each ampoule is labelled to show the weight of active remedy in a given volume of the solution. Ampoules are packed upright in boxes internally divided into single compartments, and a small file is included with which to open them.

Multiple dose injections. A number of doses for injection are sometimes required to be put up in one container. In such cases the solution, made in the manner previously described, is filled into a bottle of suitable size. The bottle is then fitted with a rubber cap which is secured by wire, and after sterilization the cap may be coated over with paraffin wax.

As the solution may have to be stored for a period, the B.P. requires the addition of an antiseptic " in such concentration

as will prevent the growth of organisms at least as effectively as 0·5 per cent. w/v of Phenol."

Before a dose is withdrawn it is customary to swab the cap with an antiseptic (solution of Iodine). A dose is taken up by inverting the bottle and puncturing the cap with the hypodermic needle, drawing up the required amount, and withdrawing the needle. The tiny hole made by the needle immediately closes.

Sterilization

The object of sterilization is to render solutions, apparatus, etc., free from germs. This may be effected by destroying the organisms either by means of chemicals or heat, or by removing them by filtration.

Sterilization by Chemicals. Various chemical substances, Phenol, Cresol, Corrosive Sublimate, Iodine, Formaldehyde, Acriflavine, etc., have the property of inhibiting (restraining) the growth of germs or of destroying them altogether. Weak solutions which may merely inhibit the growth and reproduction of germs are known as **antiseptics**, and those which are capable of killing organisms are called **germicides or disinfectants.**

Solutions intended for injection cannot be sterilized by this means as the concentration of chemical required to kill the organisms would be harmful to the patient.

Antiseptics have a limited use in the preservation of antitoxic sera, vaccines, and solutions for injection. When such products are stored in multiple doses an antiseptic may be added in such a concentration as to be at least as effective as 0·5 per cent. Phenol in its power of inhibiting the growth of germs. It should be noted that this concentration is not sufficient to kill germs already present, but merely prevents the growth of organisms in a previously sterilized solution.

The sterilizing processes referred to in the British Pharmacopœia are :

(1) Heating in an autoclave.
(2) Tyndallization.
(3) Filtration.
(4) Heating at 150° C. for oily solutions.
(5) Emergency methods.

In addition to the above, mention may be made of the use of the bunsen flame for the rapid sterilization of hypodermic needles, glass rods, points of forceps, necks of containers, etc. A very short exposure is sufficient owing to the high temperature of the flame.

Sterilization by Heating in an Autoclave. This is a process of sterilization by moist heat at a temperature of 115° to 116° C.

The autoclave is a specially constructed copper boiler, provided with a heavy metal lid which is secured by means of thumb screws. The joint between the lid and the boiler is sealed by a rubber or asbestos washer. The lid is perforated by a branched pipe which carries a manometer (pressure gauge), safety valve, and a vent cock.

The boiler is mounted in the upper part of an iron casing and is heated by primus stoves or gas burners. A removable basket is provided which fits inside the boiler. The manometer or pressure gauge is scaled to show pressure in excess of atmospheric pressure and is indicated in lb. per sq. in.

The temperatures obtained as a result of increased pressure are :

Pressure in Excess of Atmospheric Pressure.	Temperature.
5 lb.	109°
10 lb.	115°
15 lb.	121°
20 lb.	126°

The various steps in the process of sterilization are as follows :

(1) Fill the boiler with water until the level is just below the bottom of the perforated basket.
(2) Place the articles to be sterilized in the basket.
(3) Replace the lid and tighten the screws.
(4) Open the vent-cock (to allow escape of expanded air) and light the burners.
(5) When steam is issuing freely from the vent-cock it is closed, and the internal pressure allowed to rise.
(6) Wait until the pressure-gauge registers 10 lb. per sq. in., and then regulate the safety valve and burners to maintain this pressure.
(7) Allow sterilization to proceed for 30 minutes.
(8) Extinguish the burners and wait for the pressure gauge to fall to zero.
(9) Open the vent-cock slowly and allow the internal pressure to adjust itself to that of the atmosphere.
(10) Remove the lid and take out the sterilized articles.

Half an hour is sufficient for small quantities of solutions, but for volumes of more than 100 mils a longer period is

required to ensure that the whole of the solution in the container has been maintained at 115° for half an hour.

The following are some of the substances that are directed to be sterilized (in solution) by heating in an autoclave. Solutions of—

Indicarmine.	Dextrose.
Barbiton. Solubile.	Histamin. Acid Phosph.
Strychnin Hyd.	Quinin. Hyd.
Antim. et Pot. Tart.	Bism. et Sod. Tart.
Antim. et Sod. Tart.	Calcii Chlorid Hydrat.
Sodii Citras.	Sodii Thiosulphas.
Injectio Bismuthi.	Inject. Sod. Chlor. et Acaciæ.

Liquor Sod. Chlorid. Physiologicus.

Tyndallization. This is a method of sterilization applied to solutions that can withstand a temperature of 80°, but which might be harmed by the temperature reached in the autoclave. The sterilization is usually performed in a hot-air oven fitted with a thermostatic control. The solution is exposed to a temperature of 80° for 1 hour on three successive days.

The principle of this " intermittent " method of sterilization is that one exposure is sufficient to kill the vegetative forms of bacteria, but not their spores. In the interval between heatings the spores germinate and are then destroyed by subsequent exposures.

Some of the substances which are directed to be sterilized by this means are :

Iodophthaleinum.	Amylocainæ Hydrochlor.
Procainæ Hydrochlor.	Hyoscinæ Hydrobrom.
Ergotoxinæ Æthanosulph.	Cocaine salts.
Physostigminæ Salicyl.	Morphine salts.
Injectio Mersalyli.	Inject. Bismuth Oxychlorid.
Sodii Bicarbonas.	Sodii Salicylas.

Filtration. This method is employed when the use of heat or chemicals is to be avoided. Various types of filters may be employed, those in common use being the Berkfeld, Seitz, and Chamberland filters. In each case sterilization is effected by passing the fluid through some porous material, the pores of which are sufficiently small to prevent the passage of bacteria. In the Berkfeld and Chamberland filters a " thimble " or " candle " is employed. Such filters are made of unglazed porcelain or diatomaceous earth, and they have the advantage of being able to be cleaned and used again. In the Seitz filter the filtering agent is a disc of asbestos composition which is discarded after once being used. The type of

Seitz filter sufficiently fine for the removal of bacteria is known as the **EK** filter ; coarser forms are used for the clarification of liquids.

The filter is attached to a filter flask, and either suction or pressure is employed to aid filtration. Suction is usually employed, a sufficient negative pressure being obtained by means of a water pump.

When this method is employed the solution must be submitted to tests for sterility.

Sterilization of Oils, etc. Oils and oily solutions are sterilized in a hot-air oven by heating to a temperature of 150° C. for 1 hour. If the dissolved substance is such that it cannot withstand exposure to this temperature, the oil should be sterilized by itself, allowed to cool, and the active ingredient dissolved in the sterilized oil with all aseptic precautions.

The base used for the preparation of the official Oculenta is sterilized by this method, as are also the injections of Mercury and Calomel.

Emergency Methods. When time does not permit of complete sterilization being carried out as indicated in the above processes, the B.P. directs that the solution is to be prepared by aseptic methods and an antiseptic added in such concentration as will prevent the growth of bacteria at least as effectively as 0·5 per cent. Phenol. The solution is distributed into previously sterilized containers and these are sealed. The sealed containers are then heated by immersion in water, or by other means, so as to maintain the temperature of the solution at 80° for not less than 30 minutes. The labels on the containers are to be dated and the following warning inscribed thereon " Keep in a cool place, and use within 4 days."

For solutions intended for intravenous injection the antiseptic is omitted ; the solution is prepared by aseptic methods and then boiled for 15 minutes.

This method may not be employed for solutions for intrathecal injection.

Note.—In any emergency in which the methods described above cannot be applied, it is the duty of the dispenser to inform the prescriber that complete sterilization cannot be attempted, and to obtain the prescriber's authority for the method to be adopted.

CRITICISM OF PRESCRIPTIONS

A number of prescriptions are here given which contain certain irregularities, overdoses, or incompatibilities. Many of these points of comment can be spotted at once, but in studying the more complicated examples it is advisable to have some definite plan of procedure in mind.

1. First of all check through the example and notice if all the essential parts of the prescription are present. These include the ingredients (properly named) and their weight or measure, directions to the dispenser and to the patient. Drugs may be wrongly named, or the name may be so contracted that it is by no means certain which preparation is intended to be used; the directions to the dispenser may not fit in with the nature of the preparation; the directions for taking or using the product may be at variance with the remainder of the prescription.
All these are points for comment or criticism.

2. Check every dose. Do not be satisfied by testing the doses of the main ingredients only; it may be the vehicle which is being given in too large a dose.

3. Check for incompatibilities.

Examples

No. 1.

℞

Acid. Sulph.	℥ij
Sod. Bicarb.	℥j
Tinct. Gent. Co.	gr. xxx
Aq. ad	℥vj

Ft. lotio. ℥ss. to be taken every four hours.

(*a*) The name "Acid. Sulph." is too contracted; it might be either Acid Sulphuric or Acid Sulphurous. The former has no dose and is not intended to be prescribed for internal use, although as there is plenty of water in the mixture with which to dilute the concentrated acid, it should not be refused on these grounds alone.

(*b*) Tinct. Gentian. Comp. should be ordered by volume and not by weight.

(*c*) The ingredients are for a mixture, but the directions to the dispenser are "Make a Lotion."

(*d*) Incompatibility between the acid and the alkaline Sod. Bicarb.

No. 2.

℞

Ext. Nucis Vom. Sicc.	gr. ¾
Aloin	gr. ½
Ext. Aloes	gr. j
Glycyrrhiz. Pulv.	gr. ij

Ft. pil. mitte tales xxiv.

Sig. Two to be taken at bedtime.

(*a*) This appears to be correct until the dosage is examined closely. Each pill contains ¾ grain of dried extract of Nux Vomica (maximum dose 1 grain), but the dose is **two pills,** which represents an overdose of ½ grain of the extract.

No. 3. Baby Thompson. (10 months.)

℞

Sodii Bicarb.	gr. xxiv
Tinct. Rhei Comp.	ℿxxxvj
Acid. Hydroc. Dil.	ℿvj
Aq. Eucalypti	ad ℥ij

Ft. mist. One teaspoonful every three hours.

(*a*) There is no such preparation as Eucalyptus Water.

(*b*) The name " Acid. Hydroc. Dil " is too contracted : it might be either Acid Hydrochloric Dil. or Acid Hydrocyanic Dil. Neither would be correct in this case : the former would be incompatible with the Bicarbonate, and the latter is never given to such young children.

No. 4.

℞

Ammon, Carb.	℥ij
Potass. Iodid.	℥j
Tinct. Senegæ.	℥ij
Ext. Glycyrrhizæ Liq.	℥ss
Infus. Digitalis	ad ℥viij

Ft. mist.

One ounce t.d.s.

(*a*) Overdose of Ammonium Carbonate (maximum dose 10 grs.) ; prescribed dose is 15 grains.

(*b*) Overdose of Infusion Digitalis (maximum repeated dose=300 minims).

No. 5.

℞

Syrup. Ferri Iodid	ℿ30
Syrup. Eastonii	ℿ30
Syrup. Aurantii	ℿ60
Aq.	ad ℥ss
Ft. mist.	mitte ℥vj

One tablespoonful three times daily after food.

(*a*) Interaction between Ferrous Iodide and the Strychnine of the Easton's Syrup results in the precipitation of insoluble Strychnine Iodide. A dangerous combination and should not be dispensed.

No. 6.

℞

Sodii Bicarb.	℥iij
Liq. Ferri Perchlor.	℥ij
Syrup. Zingib.	℥iv
Infus. Gentian. Comp. ..	ad ℥viij

Ft. mist.

M.D.U.

(*a*) Directions to the dispenser read "Make a Mixture," but the directions to the patient are "To be used as directed."

(*b*) Sodii Bicarb. (alkaline) incompatible with Liquor Ferri Perchlor. (acid), giving rise to effervescence and also to the formation of insoluble Carbonate of Iron.

(*c*) Perchloride of Iron is incompatible with all vegetable preparations containing any form of Tannic Acid, and the Liquor will, therefore, react with the Infusion, giving a black mixture containing Tannate of Iron.

No. 7.

℞

Potass. Iodid.	℥ij
Sodii Chlorid.	℥j
Liq. Hydrogen. Perox.	℥j
Aq.	ad ℥x

Ft. collutorium.

Ten drops in water twice daily.

(*a*) Mouth Washes are not intended to be taken internally, as the directions to the patient seem to indicate.

(*b*) Hydrogen Peroxide (oxidizing agent) liberates free Iodine from Potassium Iodide. This will not matter a great deal in a mouth wash, but might be dangerous in a mixture.

No. 8.

℞

Quinin. Sulph.	℈j
Acid. Acetic. Dil.	℥j
Tinct. Aurant.	℥ij
Spts. Chlorof.	℥j
Aq.	ad ℥vj

Ft. mist.

℥ii to be taken occasionally.

(*a*) Although most dilute acids dissolve Quinine Sulphate, Acetic Acid does not on account of the formation of insoluble Quinine Acetate. This may be intended, in which case a suspending agent will be required.

No. 9.

℞

Menthol .. .. gr. ½
Chloral Hydrat. .. .. .. gr. ij

Ft. cachet. mitte tales quinque.

(*a*) No directions to the patient indicated.

(*b*) This cannot be dispensed in cachet form, as the two ingredients form a liquid when mixed together.

No. 10.

℞

Acid. Tannic. .. .. gr. iij
Suppos. Glycerin. B.P. .. .. gr. xij

Ft. suppos. mitte tales vi
As directed.

(*a*) Tannic Acid forms an insoluble compound with Gelatin. These suppositories should, therefore, be made with a Theobroma base.

No. 11.

℞

Potass. Tartras. .. .. .. ℥ij
Magnes. Sulph. .. .. .. ℥ij
Tinct. Calumbæ .. .. .. ℥j
Syrup. Limonis .. .. .. ℥j
Aq. .. .. ad ℥ss

Ft. mist. mitte ℥vj
One tablespoonful twice daily.

(*a*) The prescription reads "water up to half an ounce," but the other ingredients already total more than half an ounce, and a mixture cannot be dispensed unless the amount of the vehicle be greatly increased.

(*b*) Potassium Tartrate and Magnesium Sulphate are incompatible: a precipitate or Magnesium Tartrate is deposited on standing.

No. 12.

℞

Sodii Salicylas .. .. .. ℥ij
Spts. Camphor. .. .. .. ℥iss
Quinin. Hydrochlor. .. .. .. ℥ss
Aq. Chlorof. .. .. .. ad ℥vj

Ft. haustus.
One ounce every four hours.

(*a*) A draught (Haustus) is a single dose of a medicine: this should be styled a mixture.

(*b*) Quinine Hydrochloride is incompatible with Sodium and other soluble Salicylates, insoluble Quinine Salicylate being formed. The reaction may be intended: if so, the precipitate requires suspending.

No. 13.

℞

Ferri et Quinin. Cit.	℥iij
Tinct. Aurant.	ʒij
Liq. Strych. Hyd.	ʒj
Spts. Ammon. Aromat.	℥iij
Aq.	ad ℥ij

Ft. mist.

Two drachms t.d.s.a.c.

(*a*) Iron preparations and tonics are usually given after meals not before.

(*b*) Overdose of Ferri et Quin. Cit. (maximum dose 15 grs.): dose here given = 22½ grains.

(*c*) The alkaline Aromatic Spirit of Ammonia will precipitate pure Strychnine alkaloid from solution.

(*d*) The Ammonia of the Spirit will also throw down the Iron and the alkaloid from the scale preparation.

No. 14.

℞

Liquor Arsenicalis.	ʒj
Liquor Ferri Perchlor.	ʒij
Glycerin.	ʒiij
Aq. Chlorof.	ad ℥vj

Ft. mist.

℥i bis die.

(*a* Overdose of Liquor Arsenicalis (maximum dose 8 minims): dose prescribed 10 minims.

(*b*) Liquor Arsenicalis should not be prescribed with "per" salts of Iron owing to the danger of precipitation.

(*c*) Overdose of Liquor Ferri Perchlor. (maximum 15 minims): dose prescribed = 20 minims.

No. 15.

℞

Potass. Iodid.	ʒvij
Liquor. Hydrarg. Perchlor.	℥j
Spts. Chlorof.	ʒj
Aq.	ad ℥xij

Ft. mist.

One ounce three times a day.

(*a*) Overdose of Pot. Iodide (maximum=30 grs.): dose prescribed=35 grains. This may be intended as large doses of Iodides are tolerated in syphilis.

(*b*) Potassium Iodide reacts with the solution of Perchloride of Mercury, forming Red Iodide of Mercury, which, however, is not precipitated, as it is soluble in the excess of Potassium Iodide solution. This is a favourite antisyphilitic mixture.

No. 16.

℞

Argenti Oxid.	gr. ½
Phenol. Crystal.	gr. 1
Glycerin. Tragacanth.	q.s.

Ft. pil. mitte tales xxiv.
One t.d.s.

(*a*) Silver Oxide may explode when triturated with crystalline Phenol.

(*b*) Pills of Silver Oxide should be massed with a fatty excipient: this compound is incompatible with reducing agents such as Glycerin.

No. 17.

℞

Plumbi Acetas	gr. ij
Tinct. Catechu	ℿxxx
Acid. Sulph. Dil.	ℿx
Olei Cinnamon.	ℿj
Aq.	ad ℥j

Ft. mist. mitte ℥vj.
One ounce every three hours.

(*a*) Acid Sulphuric interacts with Lead Acetate, forming an insoluble compound—Lead Sulphate. This is not likely to be intended.

No. 18.

℞

Liquor. Morphin. Hyd.	ℿxx

in gelatin capsules. Mitte tales xx.
One to be taken as directed.

(*a*) Aqueous solutions cannot be enclosed in gelatin capsules, as the capsule walls would soften and ultimately dissolve.

No. 19.

℞

Antim. et Sod. Tart.	gr. iv
Spts. Menth. Pip.	℥i
Glycerin. Acid. Tannic.	℥ss
Aq.	ad ℥vj

Ft. mist.
One tablespoonful three times a day.

(*a*) Overdose of Antim. et Sod. Tart. (maximum = $\frac{1}{8}$ gr.) : dose prescribed = $\frac{1}{3}$ grain.

(*b*) Tannic Acid is the antidote for Antimony poisoning and, therefore, should not be prescribed with it. Insoluble Tannate of Antimony is formed.

No. 20.

℞

Alum Pulv.	gr. xl
Zinc. Sulph.	gr. xx
Sod. Bicarb.	℥ij
Tr. Lavand. Co.	℥j
Aq.	ad ℥xvj

Ft. lotio. M.D.U.

(*a*) Sodii Bicarb. incompatible with both Alum and Zinc Sulphate, decomposing both with the formation of insoluble carbonates of Zinc and Aluminium.

No. 21.

℞

Sodii Salicyl.	℥ij
Tinct. Limonis	℥ij
Acid. Citric.	℥ss
Aq.	ad ℥viij

Ft. mist.

One tablespoonful t.d.s.

(*a*) Citric Acid decomposes Sodium Salicylate and throws down free Salicylic Acid which is only soluble about 1 in 500.

No. 22.

℞

Atropin. Sulph.	gr. j
Sod. Bicarb.	℥ij
Tr. Nucis Vom.	℥ij
Spts. Chlorof.	℥j
Aq. ad	℥vj

Ft. mist.

℥i every four hours.

(*a*) Overdose of Atropine Sulphate (maximum dose = $\frac{1}{60}$ grain) : dose prescribed = $\frac{1}{48}$ gr.

(*b*) Atropine (sedative) therapeutically incompatible with Nux Vomica (stimulant).

(*c*) Alkaline Bicarbonate decomposes Atropine Sulphate, precipitating pure Atropine alkaloid.

No. 23.

℞

Bismuth. Subnit.	.. .. ..	℥ij
Potass. Bicarb.	.. .. ..	℥iij
Mag. Carb. Levis.	.. .. ..	℥j
Mucilag. Acaciæ	.. .. ..	℥j
Aq. Menth. Pip.	.. ..	ad ℥viij

Ft. mist.

One ounce three times daily after food.

(*a*) Bismuth Subnitrate (slightly acid) incompatible with Pot. Bicarb., Carbon Dioxide being liberated. Add warm water to the reacting ingredients to get all the effervescence off at once.

(*b*) Acacia is not a suitable suspending agent for Bismuth salts : substitute mucilage of Tragacanth.

No. 24.

℞

Chloral Hydras.	.. .. ..	℥iij
Syrup. Aurantii.	.. .. ..	℥iv
Spts. Ammon. Aromat.	.. ..	℥ij
Aq. Menth. Pip.	.. ..	ad ℥vj

Ft. mist.

℥i H.S.S.

(*a*) Overdose of Chloral Hydrate (maximum 20 grs.) : dose prescribed = 30 grains.

(*b*) Chloral Hydrate is incompatible with all alkalis (Aromatic Spirit of Ammonia) : Chloroform is gradually evolved with decomposition of the Chloral.

No. 25.

℞

Chloroform.	.. ..	ℿxl
Acid. Hydrobrom. Dil.	.. ..	℥ij
Ext. Glycyrrhizæ Liq.	.. ..	℥j
Aq.	.. ..	ad ℥iij

Ft. mist.

One tablespoonful twice daily, at 10 a.m. and 8 p.m.

(*a*) The Chloroform (soluble 1 in 150) will not dissolve in the amount of water available : mucilage of Acacia is required to suspend.

(*b*) Overdose of Chloroform (maximum dose 5 minims) : dose prescribed = $6\frac{2}{3}$ minims.

(*c*) Acids are incompatible with Extract. Glycyrrhizæ Liq. causing a precipitate.

No. 26.

℞

Liquor Iodi Fort.	℥v
Ext. Cinchonæ Liq.	℥x
Spts. Chloroform.	℥v
Aq.	ad ℨss *

Ft. mist. uitte ℨviij

* ℨi bis die p.c.

(*a*) The recipe is for half an ounce dose of mixture, but the directions to the patient are for a 1-ounce dose. The amounts marked * should agree : if they do not, it is advisable to give the smaller dose.

(*b*) Liquor Iodi Fort has no official dose. A comparison of the strengths of the official liquors shows that the 5-minim dose of the stronger Liquor is equivalent to 20 minims of the weaker (maximum dose 30 minims). There is no overdose of Iodine.

(*c*) Free Iodine incompatible with all alkaloids and, therefore, should not be prescribed with Extract. Cinchonæ Liq., which contains the alkaloids of the Quinine group.

No. 27.

℞

Pepsin.	gr. vj
Glycerin.	℥30
Spts. Ammon. Aromat.	℥20
Aq. ad	ℨj

Ft. mist. mitte ℨxij.

One ounce three times daily after meals.

(*a*) Pepsin is inactivated by alkalis, and should not be prescribed along with Spirit. Ammon. Aromat.

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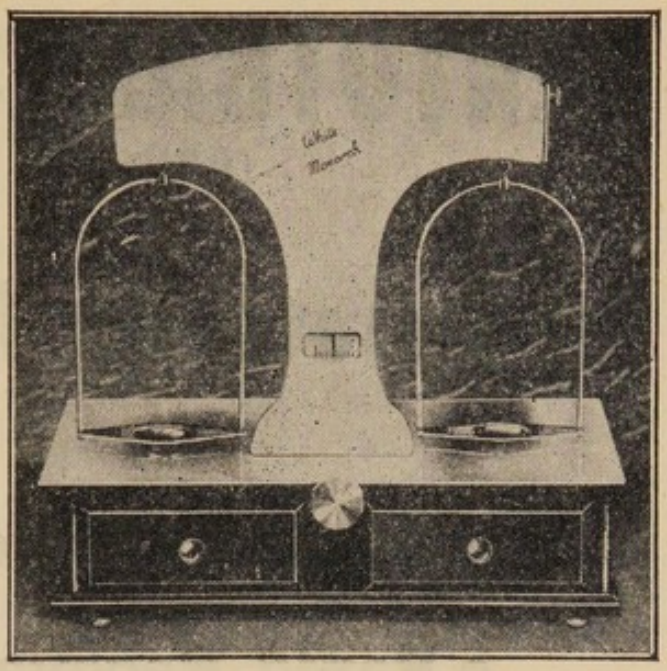
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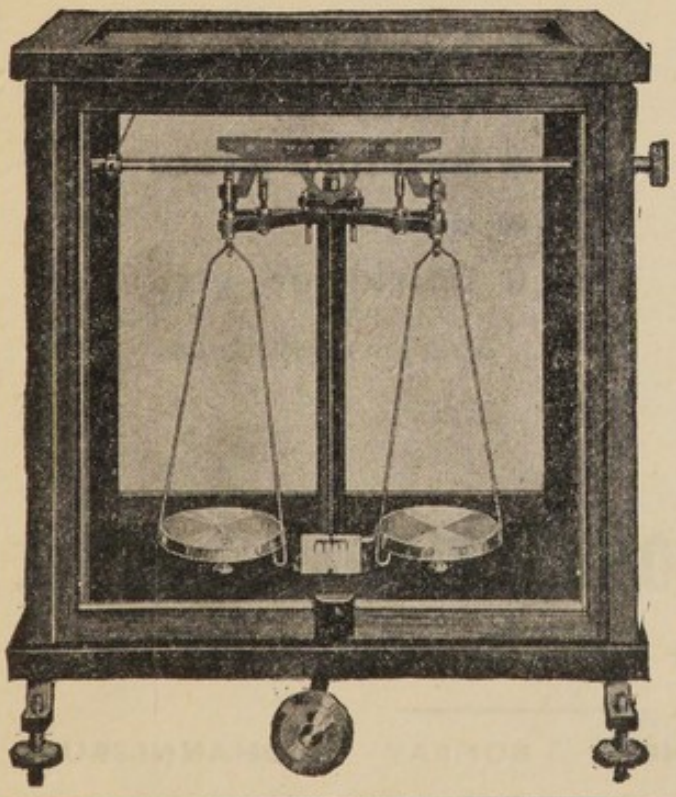
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