

**Copy of a printed table referenced as "Heryberg table 35" [possibly variation on Herzberg]**

**Contributors**

Price, William Charles, 1909-1993

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displacements of the Y nuclei are in the direction XY, is the condition of constant (zero) moment of momentum fulfilled. The magnitude  $s_Y$  of the displacements of the Y nuclei is obtained from the condition that the component of the total linear momentum perpendicular to the plane  $\sigma_v(yz)$  is zero; that is, since the velocities are proportional to the amplitudes of the displacements,  $2m_Y s_Y \sin \alpha = m_X s_X$ , where  $\alpha$  is half the angle at the top of the triangle formed by the molecule,  $s_X$  is the displacement of the X nucleus and  $m_X$  and  $m_Y$  are the masses of X and Y. Thus the form

TABLE 35. NUMBER OF VIBRATIONS OF EACH SPECIES FOR THE POINT GROUPS HAVING NON-DEGENERATE VIBRATIONS ONLY.

Point group, total number of atoms	Species of vibra- tion	Ex- plained in Table	Number of vibrations <sup>30</sup>
$C_2$ ( $N = 2m + m_0$ )	A	12	$3m + m_0 - 2$
	B		$3m + 2m_0 - 4$
$C_s \equiv C_{1h}$ ( $N = 2m + m_0$ )	A'	12	$3m + 2m_0 - 3$
	A''		$3m + m_0 - 3$
$C_i \equiv S_2$ ( $N = 2m + m_0$ )	$A_g$	12	$3m - 3$
	$A_u$		$3m + 3m_0 - 3$
$C_{2v}$ ( $N = 4m + 2m_{xz} + 2m_{yz} + m_0$ )	$A_1$	13	$3m + 2m_{xz} + 2m_{yz} + m_0 - 1$
	$A_2$		$3m + m_{xz} + m_{yz} - 1$
	$B_1$		$3m + 2m_{xz} + m_{yz} + m_0 - 2$
	$B_2$		$3m + m_{xz} + 2m_{yz} + m_0 - 2$
$C_{2h}$ ( $N = 4m + 2m_h + 2m_2 + m_0$ )	$A_g$	13	$3m + 2m_h + m_2 - 1$
	$A_u$		$3m + m_h + m_2 + m_0 - 1$
	$B_g$		$3m + m_h + 2m_2 - 2$
	$B_u$		$3m + 2m_h + 2m_2 + 2m_0 - 2$
$D_2 \equiv V$ ( $N = 4m + 2m_{2x} + 2m_{2y} + 2m_{2z} + m_0$ )	A	13	$3m + m_{2x} + m_{2y} + m_{2z}$
	$B_1$		$3m + 2m_{2x} + 2m_{2y} + m_{2z} + m_0 - 2$
	$B_2$		$3m + 2m_{2x} + m_{2y} + 2m_{2z} + m_0 - 2$
	$B_3$		$3m + m_{2x} + 2m_{2y} + 2m_{2z} + m_0 - 2$
$D_{2h} \equiv V_h$ ( $N = 8m + 4m_{xy} + 4m_{xz} + 4m_{yz} + 2m_{2x} + 2m_{2y} + 2m_{2z} + m_0$ )	$A_g$	14	$3m + 2m_{xy} + 2m_{xz} + 2m_{yz} + m_{2x} + m_{2y} + m_{2z}$
	$A_u$		$3m + m_{xy} + m_{xz} + m_{yz}$
	$B_{1g}$		$3m + 2m_{xy} + m_{xz} + m_{yz} + m_{2x} + m_{2y} - 1$
	$B_{1u}$		$3m + m_{xy} + 2m_{xz} + 2m_{yz} + m_{2x} + m_{2y} + m_{2z} + m_0 - 1$
	$B_{2g}$		$3m + m_{xy} + 2m_{xz} + m_{yz} + m_{2x} + m_{2z} - 1$
	$B_{2u}$		$3m + 2m_{xy} + m_{xz} + 2m_{yz} + m_{2x} + m_{2y} + m_{2z} + m_0 - 1$
	$B_{3g}$		$3m + m_{xy} + m_{xz} + 2m_{yz} + m_{2y} + m_{2z} - 1$
	$B_{3u}$		$3m + 2m_{xy} + 2m_{xz} + m_{yz} + m_{2x} + m_{2y} + m_{2z} + m_0 - 1$

<sup>30</sup>  $m$  is always the number of sets of equivalent nuclei not on any element of symmetry;  $m_0$  is the number of nuclei lying on all symmetry elements present;  $m_{xy}$ ,  $m_{xz}$ ,  $m_{yz}$  are the numbers of sets of nuclei lying on the  $xy$ ,  $xz$ ,  $yz$  plane respectively but not on any axes going through these planes;  $m_2$  is the number of sets of nuclei on a two-fold axis but not at the point of intersection with another element of symmetry;  $m_{2x}$ ,  $m_{2y}$ ,  $m_{2z}$  are the numbers of sets of nuclei lying on the  $x$ ,  $y$ , or  $z$  axis if they are two-fold axes, but not on all of them;  $m_h$  is the number of sets of nuclei on a plane  $\sigma_h$  but not on the axis perpendicular to this plane.