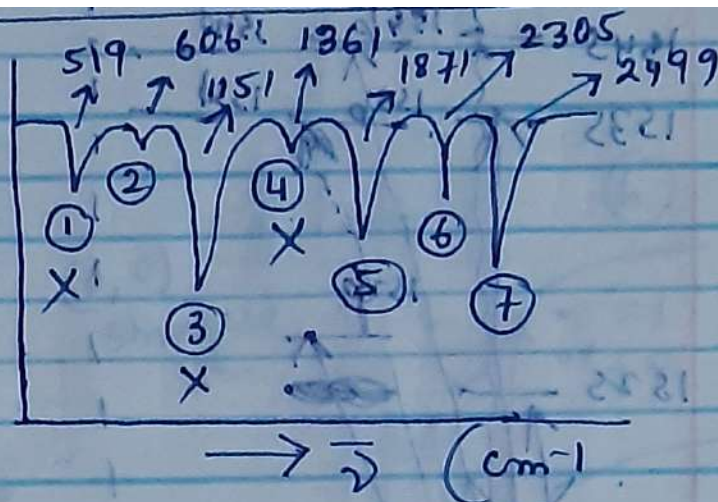


For SO_2

$$3N - 6$$

$$= 9 - 6 = \textcircled{3}$$



① $\nu_1 = 1151 \text{ cm}^{-1} (\text{F})$

② $\nu_2 = 519 \text{ cm}^{-1} (\text{F})$

$\nu_3 = 1361 \text{ cm}^{-1} (\text{F})$

Combination

$\nu_1 \pm \nu_2$

$\nu_1 \pm \nu_3$

$\nu_2 \pm \nu_3$

⑥

Possible

$\nu_1 - \nu_2 = 606 \text{ cm}^{-1}$

$\nu_2 + \nu_3 = 1871 \text{ cm}^{-1}$

$\nu_1 + \nu_3 = 2499 \text{ cm}^{-1}$

Combination Overtone

$2\nu_1 = 2305 \text{ cm}^{-1}$ } overtone

$2\nu_1, 3\nu_1, 4\nu_1$

$2\nu_2, 3\nu_2, 4\nu_2$

$2\nu_3, 3\nu_3, 4\nu_3$

1st overtone 2nd overtone 3rd overtone

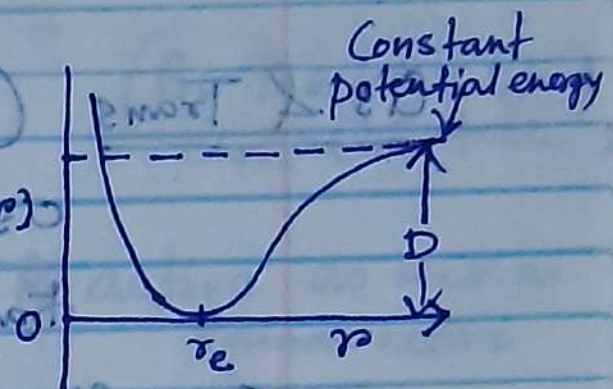
Morse Potential \Rightarrow

For a diatomic molecule, the potential energy function depends only on a single internuclear distance.

then, we can write

$$V = V(r)$$

As the separation between atoms becomes larger due to elongation, the interaction between them is almost negligible and energy will be that of individual atoms. Thus $V(r) = \text{Constant}$.



Consider now the electrostatic interactions at smaller internuclear distances due to compressions ($r < r_e$). The mutual repulsion increases. Nuclear-nuclear repulsion will be simultaneously effective and adds to the total repulsive potential.

$$V = \frac{1}{2} K x^2$$

$$V(r) = D \left[1 - e^{a[r_e - r]} \right]^2$$

\downarrow
Dissociation energy of the molecule

$a =$ measure of the curvature or narrowness of the function

empirical relation

- (i) The potential energy $V(r)$ is minimum at $r = r_e$ and the derivative, $\left(\frac{\partial V(r)}{\partial r} \right)_{r=r_e} = 0$.
- (ii) As ' r ' approaches infinity ($r \rightarrow \infty$), the potential energy variation with ' r ' must be asymptotic and energy must be constant.
- (iii) When $r \rightarrow 0$, the potential energy goes to infinity.