

## \* Difference bet<sup>n</sup> Raman & I.R Spectra

### Raman Spectra

1. It is observed due to scattering of light by vibrating molecules.

2. Polarizability of the molecule will <sup>decide</sup> whether the Raman Spectra will be observed or not.

3. Water can be used as a solvent.

4. Optical <sup>systems</sup> of the Spectrometer are made up of glass or quartz.

### I.R Spectra

1. It is result of absorption of light by vibrating molecules.

2. The presence of a permanent Dipole change moment may be change <sup>is</sup> regarded as Criteria of I.R Spectra.

3. Water cannot be used because it is opaque to I.R radiation.

4. Optical <sup>systems</sup> of the Spectrometer are made up of special crystals. Such as  $\text{CaF}_2$ , NaBr etc.



5. In Raman effect  
Vibrational frequencies  
of large molecules  
can be measured.

6. The vibrational  
frequencies of  
very large molecule  
cannot be measured.

6. Homonuclear diatomic  
molecules are Raman  
active i.e.  $N_2$ ,  $O_2$  etc  
show Raman spectra.

6. Homonuclear  
diatomic molecules  
are IR inactive,  
i.e.  $N_2$ ,  $O_2$  do not show  
IR-spectra.

+ Vibrational modes of  $CO_2$  are

$$\begin{aligned}\therefore \text{No. of modes of Vibration} &= 3n - 5 \\ &= 3 \times 3 - 5 \\ &= 4\end{aligned}$$

1)  $\leftarrow O - C - O \rightarrow$   
Symmetric stretching

Raman active but IR inactive

2)  $\rightarrow O - C - O \leftarrow$   
Asymmetric stretching

Raman inactive but  
IR active

3)  $\begin{array}{c} \uparrow \\ O - C - O \\ \downarrow \end{array}$

Bending in plane

4)  $\begin{array}{c} \nearrow \\ O - C - O \\ \searrow \end{array}$

Bending out of plane

Degenerate IR active