* Difference bet^{n} Raman & I.R Spectra

Raman Spectra	I.R Spectra
1. It is observed due to Scattering of light by vibrating molecules.	1. It is result of absorption of light by vibrating molecules.
2. Polarizibility of the molecule will decide whether the Raman Spectra will be observed or not.	2. The presence of a permanent Dipole moment is the Criteria of I.R Spectra.
3. Water can be used as a Solvent.	3. Water cannot be used because it is opaque to I.R radiation.
4. optical systems of the Spectrometer are made up of glass or quartz.	4. Optical systems of the Spectrometer are made up of special crystals. Such as CaF_2, NaCl etc.

5	In Raman effect Vibrational frequencies of large molecules can be measured.	5 The vibrational frequencies of very large molecule cannot be measure
6.	Homonuclear diatomic molecules are Raman active i.e. N_2, O_2 etc show Raman spectra.	6 Homonuclear diatomic molecules are IR in-active. i.e, N_2, O_2 do not show IR-spectra.

* Vibrational modes of CO_2

∵ No of modes of vibration = $3n - 5$
$= 3 \times 3 - 5$
$= 4$

1) ← O − C — O → Raman active but IR in-active
Symmetric stretching

2) → ← O — C — O → Raman active & but IR active
Asymmetric stretching

3) ↑ ↑ O — C — O ↓ Bending in plane

4) ↑ O — C — O ↑ ↓ O Bending out of plane

Degenrate IR active

* Vibrational modes of H_2O

All three vibrational modes are Raman as well as IR - active.

* Vibrational modes of N_2O

No of Vib. modes = 3n - 5
= 3×3 - 5 = 4 modes

1) $\leftarrow N - N - O \rightarrow$ Symmetric str. — Raman active, IR active

2) $\leftarrow N - N - O \rightarrow$ Assymmetric str. — IR & Raman active

3) $\uparrow N - N - O \uparrow$ ↓ Bending in plane

4) $\uparrow N - N - O \uparrow$ ↓ Bending out of plane

Degenerate Raman in-active IR active

As the two Raman lines appear in the I.R of N_2O it means absence of centre of symmetry of molecule (If there is centre of symmetry only one Raman appear)