

Selection rule of Raman Spectra

Selection rule for pure rotational Spectra of diatomic molecule, $\Delta J = 0, \pm 2$, ΔJ is the change in rotational quantum no. Operative part of change in rotational quantum no. $\Delta J = \pm 2$.

The Selection rule $\Delta J = 0$ corresponds to Rayleigh Scattering.

Energy of rotational level (in terms of wave no.) with quantum no.

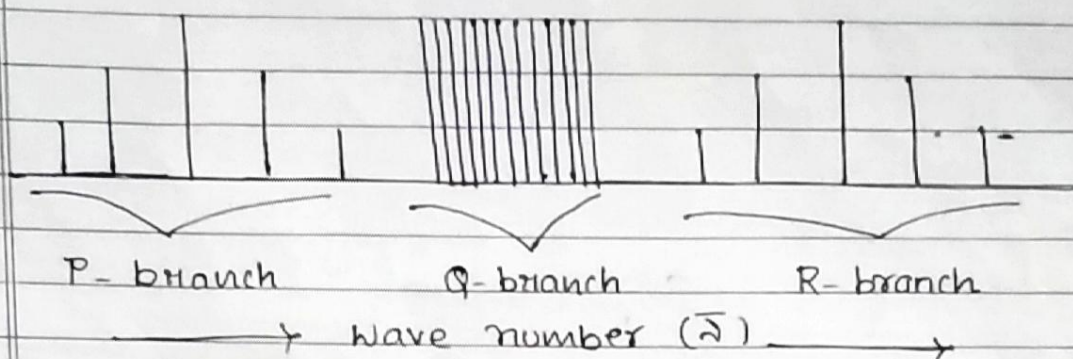
J is given by: $\bar{\nu} = BJ(J+1)$

Again, when a transition takes place from a lower rotational level with quantum number J to a higher rotational level with quantum number J' , the energy ~~also~~ absorbed in terms of wave number is given by

$$\Delta\bar{\nu} = BJ'(J'+1) - BJ(J+1)$$

In the rotational vibrational spectrum,

- 1) For $\Delta J = -1$; lines with frequency lower than the fundamental frequency are obtained. These lines are called P-branch of the spectrum.
- 2) For $\Delta J = +1$; lines with frequency greater than the fundamental frequency are obtained. These lines are called R-branch of the spectrum.
- 3) For $\Delta J = 0$; ~~the~~ when a vibrational transition occurs without being accompanied by rotational transition, a cluster of closely spaced lines appears at the centre. These group of lines are ~~also~~ called Q-branch of the spectrum.



* Advantages of Raman Spectroscopy over IR Spectroscopy

1. Raman Spectra can be obtained not only for gases also for liquid & solids whereas I.R Spectra for liquids & solids are diffused. *It can be also obtained from liqs and solids.*
2. Raman Frequencies are independent of the frequency of the incident radiation. Raman Spectra can be obtained in the visible spectrum range & easily observed whereas I.R Spectra is observed in difficult I.R range.
3. Raman Spectra can be obtained even for homonuclear diatomic molecules such as O_2 , N_2 , Cl_2 etc. which have no permanent dipole moment. Such a study is not possible by I.R Spectroscopy.

Py.