

# Selection rule for vib. spectra

For a molecule to be IR active i.e., it show vibrational spectrum, it must either possess a permanent dipole moment ( $\mu$ ) or the dipole moment must change during a vibration. i.e.,

$$\frac{d\mu}{dr} \neq 0$$

Change in  $\frac{d\mu}{dr}$  dipole moment is the result of transition.

Selection rule for anharmonic oscillator are

$$\Delta v = \pm 1$$

i.e., change in vibration q/n no. should be unity. Plus sign applies to absorption and minus sign applies to emission spectra. Vibrational spectra are generally determined by absorption phenomenon. So the selection rule becomes

Teacher's Signature .....



Experiment No. ....

Date : .....

The transition from  $v=0$  to  $v=1$  is found to be most intense (high population of this energy level) and is called fundamental absorption.

The transition from  $v=0$  to  $v=2$  has a very weak intensity and is called first overtone.

The transition from  $v=0$  to  $v=3$  has still weaker and is called second overtone and so on.