

Assignment-2

- Which of the following molecules will show rotational spectrum: H_2 , HCl , CH_4 , CH_3Cl , CH_2Cl_2 , H_2O and SF_6 ?
- What is meant by the term polarizability in Raman spectra?
- What is Stokes and anti-stokes lines in Raman spectrum?
- 'IR spectra are often characterized as finger print region'. Comment on it.
- What is the selection rule for the molecule to show rotational spectrum? .
- Explain, which one will exhibit higher value of λ_{max} in UV/Visible spectra of CH_3COCH_3 and $CH_2=CHCOCH_3$.
- Discuss the quantum theory of Raman spectroscopy and how the Stokes and anti-Stokes lines appear in the Raman Spectroscopy? How does it differ from IR spectroscopy?
- What type of electronic transitions is involved in UV- visible spectroscopy? Explain the Absorption and Intensity shift in the UV spectroscopy and support with examples. Illustrate, the effect of polar and non polar solvent on $\pi - \pi^*$ transition in acetone?
- Among H_2 , HCl , CO_2 , H_2O molecules identify which will be IR active and why?
- Explain different mode of vibrations observed in CO_2 molecule. Out of the following pairs which one is expected to absorb at higher frequency for stretching vibrations? Also state reason.
 - $HCHO$, CH_3CHO ;
 - $C \equiv C$, $C=C$;
 - O- H, C-C.
- What is finger print region and functional group region in IR spectroscopy? Two isomers A and B of the molecular formula C_3H_6O gives IR absorption at 1650 cm^{-1} and 1710 cm^{-1} respectively. Assign structural formula to A and B isomers?
- State the selection rule for Raman spectroscopy. What technological advances have enabled the routine use of Raman spectroscopy? Which of the following spectroscopy (IR or Raman) would you use to measure the vibrational frequency of the following bonds:
 - The stretching frequency of $^{14}N-^{15}N$
 - The $C \equiv C$ Str in Ethyne, $CH \equiv CH$
 - The $C=O$ Str in acetone, CH_3COCH_3
 - The Re-Re str in compound, $(CO)_5Re-Re(CO)_5$
- What is Beer-Lambert law in UV-Visible absorption spectroscopy? A compound having concentration 10^{-3} g/l resulted absorbance value 0.20 at λ_{max} 510 nm using 1.0 cm cell. Calculate its absorptivity and molar absorptivity values. Molecular weight of compound is 400. Can ultra-violet spectral data be useful to distinguish the following compounds? Give reasons.
 - Ethyl benzene and styrene.
 - $CH_2=CH-CH_2-CH=CH_2$ and $CH_2=CH-CH=CH-CH_3$.
 - The percentage transmittance of an aqueous solution of unknown compound is 20% at 25° C and 300 nm for a $2 \times 10^{-5}\text{ M}$ solution in a 4 cm cell. Calculate the absorbance and the molar extinction coefficient.
- Write short notes on (**any TWO**)
 - Shift
 - Applications of IR spectroscopy
 - Molecular vibration
- Give the basic principle of UV- spectroscopy. Explain various types of electronic transition. Predict electronic transition in $Cl-CHO$.