

Q What are molecular spectra?

Ans Molecular spectra are important physical properties of compounds because different regions of the electromagnetic spectrum are very useful to determine the structures of atoms and molecules. Spectroscopy has dramatically shortened the time required to determine the structure of a compound. It usually defied the life work of a chemist of the 19th or early 20th century. The spectrum is obtained in minutes using a few mg of the sample which can also be recovered.

Spectra of compounds are the response of radiation on compounds. A spectrophotometer gradually and continuously allows a radiation of successively changing frequency over a small part of the electromagnetic spectrum to pass through a sample of compounds and detects the amount of absorbed or transmitted (i.e. unabsorbed) radiation. Thus it gives a spectrum i.e. a graph of absorption vs. frequency. The absorption is reported as the Percent transmittance (%T) in IR spectra while as the absorbance (A) in UV-VIS spectra. The %T is the percent of the intensity of the original radiation that passes through the sample -

$$\% T = \frac{\text{intensity}}{\text{original intensity}} \times 100$$

A 100% transmittance means no absorption and if all the radiation is absorbed it is 0% Absorption of radiation at a particular frequency decreases the % T which appears as dip called band or peak in the spectrum.

Absorbance (A) is the measure of the absorption of radiation by the sample -

$$A = \log \left( \frac{\text{original intensity}}{\text{intensity}} \right) = \log \frac{I_0}{I}$$

So, the increase in absorption causes decrease in the peak.