

# Spectroscopy

Spectroscopy is one of the most powerful tools available for the study of atomic and molecular structure. (and is used in the analysis of a wide range of samples)

## Types of Spectroscopy

### 1. Atomic Spectroscopy:-

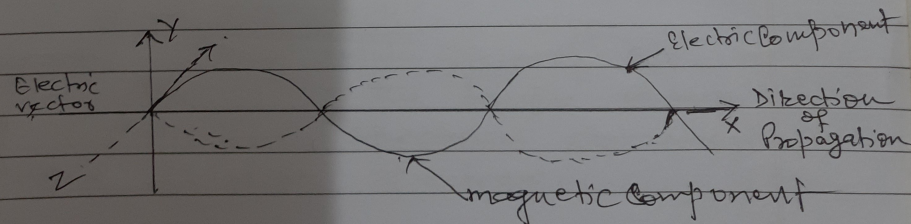
It deals with the interaction of electromagnetic radiation with atoms (which are most commonly in their lowest energy state called the ground state).

### 2. Molecular Spectroscopy:-

It deals with the interaction of electromagnetic radiation with molecules.

### Electromagnetic Radiation:-

It is a form of energy that is transmitted through space at an enormous velocity.



Electromagnetic radiation is an alternating electrical and associated

magnetic force field in space.

Wavelength:-

It is the distance between two successive maxima on an electromagnetic wave.

It is denoted by  $\lambda$ .

Wave number:-

It is defined as the number of waves per centimeter in vacuum.

It is denoted by  $\bar{\nu}$

$$\bar{\nu} = \frac{1}{\lambda}$$

Wave velocity:-

The product of wavelength and frequency is equal to the velocity of the wave.

It is denoted by  $c$ .

which is equal to the velocity of light

$$\therefore c = \lambda \bar{\nu}$$

velocity of light in vacuum =  $3 \times 10^8$  m/s.

Emission spectrum:-

After interaction of em radiation with matter, the sample itself emits radiation. The spectrum obtained is called emission spectrum.

Absorption spectrum:-

After interaction of em radiation with matter, when the sample absorbs



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radiation. The spectrum obtained is called Absorption spectrum.

### Excited State:-

When the electron is present in any orbit other than the orbit of least energy for it, the electron as well as atom as a whole, are said to be in the excited state.

### Atomic spectra:-

Atomic spectra are discrete line spectra.

### Molecular spectra:-

Molecular spectra are band spectra.

### Band spectra:-

Band spectra means a cluster of nearly equally spaced lines.

### Luminescence:-

Re-emission after absorption of radiation by a material is known as Luminescence.

### Fluorescence:-

When re-emission is stopped the moment incident radiation is stopped is known as Fluorescence.

### Phosphorescence:-

If re-emission persists even after the stoppage of incident radiation is known as Phosphorescence.

It is also known as delayed emission.

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