SUBJECT - CHEMISTRY
CLASS - B.Sc (Hons) PART-III
PAPER V
TOPIC - UV-Vis-SPECTROSCOPY

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Q Explain (i) Chromophores
(ii) Auxochromes
(iii) Absorbance.

Ans (i) chromophores: Unsaturated Covalent species having π-orbitals are called chromophores e.g Carbonyl ($>C=O$) group, nitro ($-N\leq^{O}_{O}$) group, benzene nucleus, etc These are Colour producing groups. They absorb UV-Vis radiations and give rise to characteristic absorption bands. The presence of a chromophoric group decreases the energy of electronic transitions and hence shifts the absorption bands from UV to Visible region and we observe batho(or red) Shift e.g benzene is colourless but nitrobenzene is yellow due to the presence of Chromophoric $-NO_2$ group.

(ii) Auxochromes: Auxochromes are Saturated groups with non-bonded electrons. when it is attached to a chromophoric group, it changes the wavelength as well as intensities of absorption e.g $-NH_2$ $-OH$, etc

These are either acidic or basic in nature. If the atoms of an auxochromic group are alkylated or acylated, the Colour intensity is increased but if these are acylated or benzoylated, the Colour intensity is decreased and we observe hypso (or blue) Shift.

(iii) Absorbance: It is denoted by A. It is usually measured directly in UV-Vis spectrophotometer. It is obtained from Lambert-Beer's law:

When a beam of monochromatic light of intensity I_0 passes through an absorbing medium of path length l, then the intensity of transmitted light I, is always less than I_0. Hence the absorbance is directly proportional to the optical path length i.e

$$A \propto l \quad \text{..... Lambert's Law}$$

The absorbance is directly proportional to the molar concentration (c) of the substance in a medium of single absorbing substance i.e

$$A \propto c \quad \text{--- Beer's Law}$$

Combining these two laws, we get

$$A \propto l.c$$

This is called Lambert-Beer's law. If I_0 and I be the intensity of incident and transmitted or unabsorbed light respectively, Then the absorbance is given as $A = \log_{10} I_0/I$

Hence $\log_{10} I_0/I \propto l.c$ or $\log_{10} I_0/I = \epsilon . l.c$

where ϵ is the Molar Extinction Coefficient. Therefore,

$$\epsilon = \frac{\log_{10} I_0/I}{l.c}$$

The molar extinction coefficient is expressed in litre $mol^{-1} cm^{-1}$

The range of absorbance recorded is generally from 0 to 2.0