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Mo Tu We Th Fr Sa Su

(3) Electronic Spectroscopy —

OR

UV - visible Spectroscopy —

frequency (ν) : 2×10^{14} to 2×10^{16} sec^{-1}.

Wavelength (λ) :	$\frac{3\times10^{8}\ m\ sec^{-1}}{2\times10^{14}\ sec^{-1}}$	$\frac{3\times10^{8}\ m\ sec^{-1}}{2\times10^{16}\ sec^{-1}}$
	$= 1.5\times10^{8}\times10^{-14}$	$10^{8}\times10^{-16}$ m.
	$= 10^{-6}$ m.	10^{-8} m.

λ : (1 μm. —— 10 nm.)

Energy :

Wave no. ($\bar{\nu}$) $= \frac{1}{\lambda}$

$= \frac{1}{10^{-6}\ m}$

$= 10^{6}$ m

$= 10^{6}\ cm^{-1}$ —

Energy (E) : $h\nu$

$= 6.626\times10^{-34}$ J sec. $\times\ 3\times10^{14}$ sec^{-1}

$= 19878\times10^{-20}$

$= 1.99\times10^{-21}$ Joules.

$= 6.626\times10^{-34}$ J sec $\times\ 3\times10^{16}$ sec^{-1}

$= 1.99\times10^{-19}$ Joules.

1.99×10^{-21} Joules.

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Introduction:-

When a molecules absorbs UV & visible light, its electrons get excited from ground states to higher energy states.

In the ground state, these electrons are paired. In the higher state, if the spin of electrons are parallel, it is called excited triplet state. & if the spin of electrons are paired, it is called singlet exited state.

The absorption of UV or visible light results in the singlet ground state to excited singlet state transition.

* Electronic spectroscopy involves the promotion of electrons (σ, π, n electrons) from the ground state to the higher energy state.

Substance absorbs intensity in the visible range will appear coloured to the Human eye.

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* Different electronic energy levels.

A/c to the molecular orbital theory, when a molecule is excited by the absorption of UV or visible light, its electrons are promoted from a bonding to an antibonding orbitals.

(i) σ to σ^* transition takes place when σ (sigma) electron is promoted to antibonding (σ^*) orbital.

It is denoted by —

$$\sigma \longrightarrow \sigma^*.$$

(ii) π to π^* transition takes place when π (pi) electron is promoted to antibonding (π^*) orbital.

It is denoted by —

$$\pi \longrightarrow \pi^*.$$

(iii) when a non-bonding electron (n) get promoted to an antibonding (σ^*) orbital, It is denoted by —

$$n \longrightarrow \sigma^*.$$

(iv) when a non-bonding electron (n) get promoted to an antibonding (π^*) orbital, it is denoted

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by —

$n \rightarrow \pi^*$.

The energy required for various transitions obey the following order

$\sigma \rightarrow \sigma^* > n \rightarrow \sigma^* > \pi \rightarrow \pi^* > n - \pi^*$