



TITLE

Date: / /

Mo Tu We Th Fr Sa Su

(2) Electronic spectroscopy -orUV - visible spectroscopy -

$$\text{frequency } (\nu) = 2 \times 10^{14} \text{ to } 2 \times 10^{16} \text{ sec}^{-1}$$

Wave length, $(\lambda) = \frac{2 \times 10^8 \text{ m sec}^{-1}}{2 \times 10^{14} \text{ sec}^{-1}}$	$\frac{2 \times 10^8 \text{ m sec}^{-1}}{2 \times 10^{16} \text{ sec}^{-1}}$
$= 2 \times 10^8 \times 10^{-14}$	$10^8 \times 10^{-16} \text{ m.}$
$= 10^{-6} \text{ m.}$	10^{-8} m.
$\lambda = (1 \mu\text{m.} \text{ --- } 10 \text{ nm.})$	

Energy

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

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

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

$$= 10^8 \text{ cm}^{-1}$$

$$\text{Energy } E = h\nu$$

$$= 6.626 \times 10^{-34} \text{ J sec} \times 2 \times 10^{14} \text{ sec}^{-1}$$

$$= 1.3252 \times 10^{-19}$$

$$= 1.33 \times 10^{-19} \text{ Joules.}$$

$$= 6.626 \times 10^{-34} \text{ J sec} \times 2 \times 10^{16} \text{ sec}^{-1}$$

$$= 1.33 \times 10^{-17} \text{ Joules.}$$

$$1.33 \times 10^{-17} \text{ Joules.}$$

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Introduction:-

When a molecule 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 spins of electrons are parallel, it is called excited triplet state. & if the spins of electrons are paired, it is called singlet excited state.

The absorption of UV or visible light results in the ~~of~~ 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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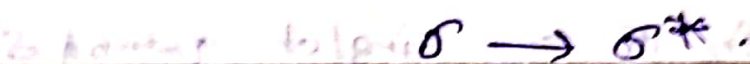
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* Different electronic energy levels.

According 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 orbital.

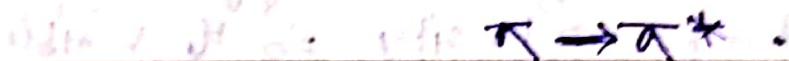
(i) σ to σ^* transition takes place when σ (sigma) electron is promoted to antibonding (σ^*) orbital.

It is denoted by —

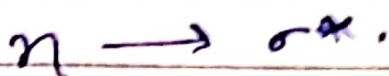


(ii) ~~When~~ π to π^* transition takes place when π (p_i) electron is promoted to antibonding (π^*) orbital.

It is denoted by —



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

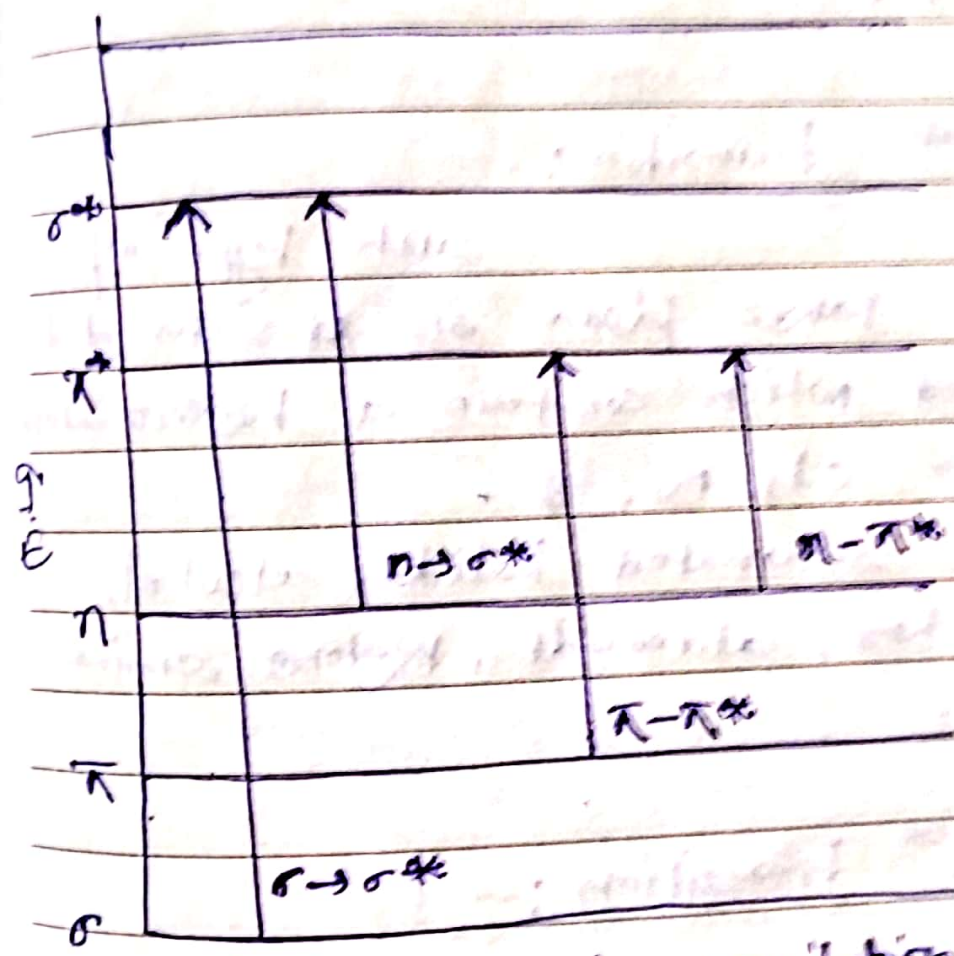


(iv) when a non-bonding electron (n) get promoted to an antibonding (π^*) orbital, it is denoted

by $n \rightarrow \pi^*$.

The energy required for various transitions obey the following order

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



electronic excitation energy \rightarrow