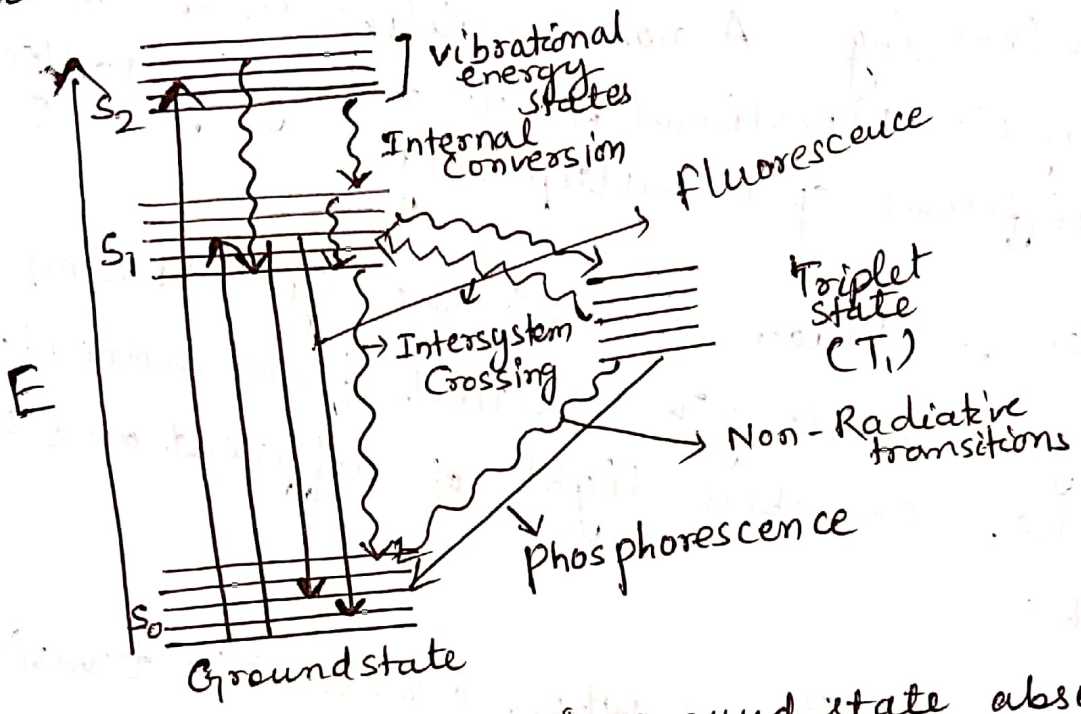
JABLONSKI DIAGRAM

In Molecular spectroscopy, a Jablonski diagram is a diagram that describes the electronic states of a molecule and the transitions between them.



* When a molecule in ground state absorbs radiation it gets excited from lower energy level to a higher energy level.

* S_0 is the singlet ground state of the molecule. S_1 is the first excited singlet state and S_2 is 2nd excited singlet state. T_1 is the first excited triplet state

* Radiative Transitions :- These are transitions between two molecular states where the energy difference is emitted or absorbed by photons and are represented in a Jablonski diagram by straight arrows.

* Non-Radiative transitions :- These are transitions bet' two molecular states without the absorption or emission of photons and are represented in a Jablonski diagram by undulating arrows.

Internal Conversion:- A non-radiative transition between two electronic states of the same spin multiplicity.

($S_2 \rightarrow S_1$, $S_1 \rightarrow S_0$)

Intersystem Crossing :- A non-radiative transition bet^n two isoenergetic vibrational levels belonging to electronic states of different spin multiplicity.

Fluorescence :- Fluorescence is the light of comparatively longer wavelength emitted from molecule after it has absorbed light of different and short wavelength.

Phosphorescence :- Process when a radiative transition occurs from an excited triplet state to a singlet ground state occurs.

FINGER-PRINT REGION

The region below 1500 cm^{-1} is rich in many absorptions which are caused by bending vibrations and those resulting from the stretching vibrations of C–C, C–O and C–N bonds. In a spectrum the no. of bending vibrations is more than the number of stretching vibrations. This region is called finger print region.

1500 cm^{-1} 700 cm^{-1}

Finger print region

finger print region can be divided into.

(i) 1500 - 1350 cm^{-1}

(ii) 1350 - 1000 cm^{-1}

(iii) Below 1000 cm^{-1}

Important Questions and Topics

Q1. Write Schrodinger Wave equation and derive the energy expression for particle in 1-D box.

Q2. Practice Numericals on Particle in 1-D box.

Q3. Basic principles of Microwave, IR, UV Spectroscopy. Mode of Vibrations.

Q4. Vibrational degree of freedom Calculation for Linear and Non-linear Molecules.

Q5. Energy expressions for allowed vibrational energy level for harmonic and anharmonic oscillator. Numericals also.

Q6. Draw and Explain Jablonski diagram and Frank condon Principle.

Q7 Read Selection Rules for Microwave, IR, UV spectroscopy. Vibrational frequency formula based numericals.

Q8. Expression and Numericals on Rigid Rotor.