

Unit-1 Light induced processes in everyday life

The Nature of Light, Photosynthesis, Vision, Photoresponse Mechanisms in Plants and Animals, Photomedicine, Photochemical effects of Visible and UV light, Bioluminescence, Photodegradation, Imaging processes

Unit 2 - Photochemistry - Principles and Reactions

Rates of absorption, Beer Lambert's Law, Stark-Einstein Law, Fluorescence lifetimes, quantum yield; Fluorescence, Phosphorescence, Jablonski diagram, cis-trans isomerisation, Paterno-Buchi reaction, Norrish Type I and II reactions, photo reduction of ketones, di-pimethane rearrangement, photochemistry of arenes, Hoffmann-Löffler-Freytag reaction, Barton reaction, Photochemistry of cyclohexadienones.

Unit 3- Excited state processes

Adiabatic and Non-adiabatic processes, Monophotonic and multihotonic processes, Primary and secondary photochemical processes, kinetics of photochemical reactions, photo-ionization, light induced electron capture and electron transfer reactions, Intramolecular and intermolecular electron transfer, Marcus-Hush Model of Electron transfer, Electronically excited molecules- Excimers and Exciplexes, Charge transfer in excited states, twisted intramolecular charge transfer state, quenching of excited states, Stern Volmer equation, electron transfer, energy transfer, paramagnetic quenching, concentration quenching, static and dynamic quenching

Unit 4-Mechanisms of Photochemical reactions

Organic Photochemistry -Quenching, Sensitization, Unimolecular and bimolecular reactions, Photoelectrochemistry-reactions at electronically excited semiconductor electrodes, Inorganic photochemistry, photochemistry and photophysics of metal complexes, Photochemistry in solids and organized assemblies, Photochemical reactions in glasses, excitons in polymers and crystals, photochemistry in micelles, photochemical reactions of free radicals

Unit 5- Light in Industry

Photographic processes-Spectral sensitization, Colour photography, Instant photography, Electrophotography, Photopolymerisation and photochemical degradation of polymers, Phototchemistry in synthesis –photochlorination of polymers, Synthesis of caprolactam, Vitamin D, Photochemistry of Dyes and Pigments, Photochromism, Energy conversion and storage – photoelectrochemical cells, Ozone layer-its photochemical formation and degradation.

TEXT BOOKS / REFERENCES:

1. Modern molecular photochemistry- N. J. Turro (University Sci. 1991)
2. Chemistry and Light- P. Suppan (RSC 1999)
3. Organic and Inorganic Photochemistry; Volume 2 of Molecular and supramolecular photochemistry - V. Ramamurthy, Kirk S. Schanze (M. Dekker, 1998)

4. Organic Photochemistry- James Morriss Coxon, Brian Halton, (Cambridge University Press, 1987)
5. Principles of Organic Synthesis- R.O.C. Norman & Coxon (CRC Press; 1993)
6. Fundamentals of Photoinduced Electron Transfer- G. J. Kavarnos (Wiley-VCH, 1993)
7. Essentials of Molecular Photochemistry - A Gilbert and J Baggott (Blackwell,1991)
8. Principles and applications of photochemistry- R. P. Wayne (OUP 1988)
9. Photochemistry - C. E. Wayne and R. P. Wayne (OUP Primer