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II Semester M.Sc. Degree Examination, November/December - 2022

CHEMISTRY

Photochemistry (Soft Core)

(CBCS Scheme 2019-20)

Paper : Ch 205

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates: Answer question No.1 and any five of the remaining questions.

Answer any **Ten** of the following:

(10×2=20)

1.
 - a) Give the term symbols for $S = 1$ and $L = 3$.
 - b) What is the wave length of light for dissociating a molecule when the bond energy of a molecule is 1.5×10^2 K cal. mol^{-1} ?
 - c) State Stark-Einstein's law of photochemical equivalence.
 - d) Define singlet and triplet states.
 - e) State and explain non-crossing rule.
 - f) What are spontaneous emission and stimulated emission?
 - g) Explain the terms "inter-system crossing" and "intra-system crossing"
 - h) Illustrate the photo-dissociation and pre-dissociation.
 - i) Outline the mechanism of conductivity in semiconductors.
 - j) Give the working principle of photovoltaic cells.
 - k) What is p-n junction solar cell?
 - l) State the Hund's rule.

2.
 - a) Illustrate spin-orbit coupling of oxygen. **(4+3+3=10)**
 - b) Write an explanatory note on Laporte's selection rules.
 - c) Calculate the quantum efficiency for the processes of decomposition HBr, when 1.85×10^{-2} moles per 1000 calories of radiant energy is involved. The wavelength of the incident radiation is 253 nm.

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(3+3+4=10)

3. a) State and explain the Frank-Condon Principle.
b) Explain the potential energy diagram of excited species.
c) Discuss the dipole moment and redox potential changes associated with the electronically excited molecules.
4. a) Discuss the effect of solvent-solvent interaction on the electronic spectra.
b) Explain the laser beam experiment for the study of electronically excited states.
c) Describe the principles and applications of phosphorescence and fluorescence.
5. a) What is photo fragmentation? With a suitable example discuss the kinetics of photo-fragmentation reaction.
b) Classify the photochemical reactions with examples.
6. a) Explain the phenomenon of photosensitization. Illustrate the various mechanisms of mercury photosensitized reactions.
b) What are Schottky barrier solar cells? Explain with an example.
c) Discuss the bonding and conductivity in semiconductors.
7. a) What is meant by TiO_2 Photocatalysis? Explain the photo-degradation of industrial effluents on irradiated TiO_2 .
b) What are impurity semiconductors? Explain with examples.
c) Give an account of atmospheric photochemistry.
8. a) Discuss the photolysis of water over suspended colloidal particles.
b) Outline the importance of photochemistry.
c) Discuss the rules of transition between the two energy states.

