



I Semester M.Sc. Examination, January/February 2018  
(CBCS Scheme)

CHEMISTRY

C-105 : Photochemistry (SC)

Time : 3 Hours

Max. Marks : 70

**Instruction** : Answer Question No. 1 and **any five** of the **remaining**.

1. Answer **any ten** of the following : **(10×2=20)**
- State the Grothus-Drapper law and Stark Einstein's law.
  - Calculate the value of Einstein corresponding to radiation of wavelength 300 nm.
  - What is meant by inverted multiplets ?
  - Phenol is a stronger acid in the excited state. Justify.
  - What is pre-dissociation ? How does it occur ?
  - Mention the involved energies and the time required for electronic, vibrational and rotational transitions.
  - Phosphorescences is a delayed fluorescence. Justify.
  - What is meant by L-S coupling ?
    - Explain photosensitization with an example.
    - Comment on photodegradation of polymers.
  - What are impurity semiconductors ? Give two examples.
    - Give the effect of light intensity on the rate of photochemical reaction.
2.
  - Explain the splitting of electronic energy levels, in atoms due to spin-orbit coupling considering the example of carbon atom.
  - State Franck-Condon principle. Explain how this principle is helpful in predicting the shapes of absorption bands. **(5+5=10)**
3. Write notes on :
  - Selection rules for electronic transitions in atoms and molecules.
  - Fates of excited species. **(5+5=10)**

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4. a) Discuss the classification of photochemical reactions with suitable example for each class.
- b) Write a note on quantum mechanical formulation of Franck condon principle.
- c) State and explain the non-crossing rule of Teller. **(3+3+4=10)**
5. a) Fluorescence spectra bears a mirror image relationship with absorption spectra whereas phosphorescence spectra does not. Justify.
- b) Outline the experimental techniques for the study of intermediates in a photochemical reactions. **(5+5=10)**
6. a) Explain different types of photo isomerization and mercury sensitized reactions.
- b) Discuss the mechanism of conductivity in semiconductors. **(6+4=10)**
7. a) Explain the construction and working of p-n junction solar cells.
- b) Describe the photochemical method of treatment of hazardous waste.
- c) Mention the Hunds rules. **(3+3+4=10)**
8. a) Comment on the rate constant and life times of reactive energy states for unimolecular and bimolecular reactions.
- b) Write a note on gas phase photolysis. **(6+4=10)**
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