



I Semester M.Sc. Degree Examination, January 2017
(CBCS)
CHEMISTRY
C – 105 : Photochemistry (Softcore)

Time : 3 Hours

Max. Marks : 70

Instructions : Answer question number 1 and **any five** of the remaining questions.

1. Answer **any ten** of the following : **(10×2=20)**
- Give the values of magnetic quantum number for $L = 3$ and $S = 1$ and write the term symbols.
 - Compare the cases of Eu^{3+} and Tb^{3+} and justify that they are inverted multiplets.
 - Calculate the energy involved in light of wavelength 200 nm in terms of kg/mol.
 - Give the energies involved and time taken for electronic, vibrational and rotational transitions.
 - Draw the potential energy curves for ground and excited molecule and describe it.
 - Give the quantum mechanical formulation of Franck Condon principle.
 - Mention any two methods of determining the intermediates in a photochemical reaction.
 - What is meant by Stoke's shift ?
 - What is the effect of light intensity on the rate of photochemical reaction ?
 - Explain the mechanism of mercury photosensitized reaction.
 - List the properties that change on electronic excitation.
 - Describe the GaAs solar cell.
2.
 - Describe the energy levels and term symbols of oxygen atom illustrating spin-orbit coupling and Hund's rules.
 - State and explain the Laporte selection rules. **(7+3)**

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3. a) Describe the conditions in which the potential energy curves can cross with one another.
- b) State the Franck Condon principle and how are the shapes of the absorption band predicted based on this principle. **(5+5)**
4. a) Describe the rate constant and life times of reactive energy state for a hypothetical photochemical reaction.
- b) What are the eight possible reactions which can occur from a excited state molecule ? **(6+4)**
5. a) Describe the process of photoelectrochemistry and photocatalysis related to energy and environment problems.
- b) What is photovoltaic effect ? **(6+4)**
6. a) Illustrate the interaction of spin and orbital angular momenta and how do you obtain term symbols.
- b) State all the three Hund's rules. **(6+4)**
7. a) Give the condition to obtain mirror image relationship between absorption and emission spectra. What is meant by solvent redshift and blueshift ?
- b) State and explain Beer's Lambert's law. **(6+4)**
8. a) Describe the bonding and conductivity in semiconductors.
- b) Write short notes on the following :
- i) Atmospheric photochemistry.
- ii) Photo isomerization reaction. **(5+5)**
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