

FACULTY OF SCIENCE
M.Sc. II - Semester Examination, April / May 2014

Subject : CHEMISTRY
Paper – III: Physical Chemistry

Time : 3 hours

Max. Marks : 80

Note: Answer all questions from Part - A and Part - B. Each question carries 4 marks in Part - A and 12 marks in Part - B.

PART – A (8 x 4 = 32 Marks)
[Short Answer Type]

- 1 a) What is chemical potential? Explain its variation with T.
 b) How do you determine partial molar property by method of intercepts?
- 2 a) Explain photosensitization with an example.
 b) Explain the Franck Condon principle in electronic transitions.
- 3 a) Discuss the plots of ψ and ψ^2 of particle in a one dimensional box.
 b) Write the Schrodinger wave equation for Hydrogen Atom in spherical polar coordinates.
- 4 a) How solid state reactions are classified?
 b) Write a short note on super conductivity.

PART – B (4 x 12 = 48 Marks)
(Essay Answer Type)

- 5 a) What are partial molar properties? Discuss the methods of determination of partial molar properties.
 b) One mole of component A & two moles of component B are mixed at 27°C to form an ideal binary solution. Calculate ΔH_{mix} , ΔG_{mix} and ΔS_{mix} . ($R = 8.314 \text{ J. K}^{-1} \text{ mole}^{-1}$).
OR
 c) State and explain Raoult's law and Henry's law. Show that if in any solution the solvent obeys Raoult's law, the solute obeys Henry's law.
 d) The partial pressure of bromine over a bromine-carbon tetrachloride solution containing mole fraction of bromine equal to 0.025 is 10.27 mm Hg. If the vapour pressure of pure bromine at the same temperature is 213mm Hg, what is the activity coefficient of bromine in the given solution.
- 6 a) Outline the principle underlying in flash photolysis.
 b) What are the different types of photochemical reactions? Give an account of them.
OR
 c) The quantum yield of a photochemical reactions is 1.0×10^5 at a wavelength of 6000 Å. Calculate the number of moles of product formed per joule of radiant energy absorbed.

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- d) Give an account of electron transfer and isomerization reactions.
- 7
- a) Explain the principle of variation method and apply it to the particle in a box.
 - b) Write the Φ equation for hydrogen atom and discuss its solution.
- OR**
- c) What is molecular orbital theory? What are bonding and non-bonding orbitals? Illustrate your answer for H_2^+ ion.
 - d) Derive the Schrodinger wave equation for a particle moving in a one dimensional box and obtain the expressions for its energy and wave function.
- 8
- ✓ a) Describe the phase diagram of Y-Ba-Cu-O system.
 - ✓ b) Explain Schotky, Frenkel, line and plane defects.
- OR**
- c) Discuss band theory of solids.
 - d) Outline the preparation of 1-2-3 materials.
