



Code No. : 9272

FACULTY OF SCIENCE
M.Sc. II Semester Examination, May/June 2012
CHEMISTRY
Paper – III : Physical Chemistry

Time : 3 Hours]

[Max. Marks : 80

Note : Answer *all* questions.

SECTION – A (4×8=32 Marks)
(Short Answer Type)

1. a) Derive Gibbs-Duhem equation.
b) Define the terms (i) activity and (ii) activity coefficient of a non ideal solution.
2. a) What are fast reactions ? Give two examples.
b) Differentiate fluorescence and phosphorescence with suitable examples.
3. a) Solve the Schrodinger wave equation for a particle in one dimensional box.
b) What is spherical harmonics ? Define the terms (i) Atomic orbital (ii) Molecular orbital.
4. a) Write the expression for Curie-Weiss Law and explain terms in it.
b) How are the superconductors classified based on critical magnetic field ?

SECTION – B (4×12=48 Marks)
(Essay Type Questions)

5. a) How does chemical potential of a component vary with temperature and pressure ? Derive the equations.
b) Derive an expression for the elevation of boiling point of a solution.

OR

- c) State and explain Henry's law for ideally dilute solutions.
- d) Discuss the standard state conventions for nonideal solutions.



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6. a) In a certain photochemical reaction, 0.08 millimoles of a product is formed due to absorption of 271 J. of energy. If the wavelength of light used is 440 nm, calculate the quantum yield of the reaction.
- b) Explain the principle of flash photolysis.

OR

- c) Explain the photophysical kinetics of unimolecular reactions.
- d) Derive the expressions for fluorescence and phosphorescence quantum yields.
7. a) Explain the electronic spectra of conjugated molecules from the concept of particle in one dimensional box.
- b) What are radial distribution functions ? Draw the plots of $R_{1,0}(r)$ vs r and $R_{2,1}(r)$ vs r plots.

OR

- c) Construct the wavefunction for H_2^+ ion according to M.O. theory and discuss about its energy and stability.
- d) Explain the principle of variation method and apply it to Hydrogen atom.
8. a) Explain the classification of materials based on conductivity using band structure of solids.
- b) Explain the phase diagram of Y – Ba – Cu – O system.

OR

- c) Explain the BCS theory of super conductors.
- d) Explain the defective Pyroovskite structure of $YBa_2Cu_3O_{7-x}$.
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