Code No. : 630

FACULTY OF SCIENCE
M.Sc. II Semester Examination, April/May 2013
CHEMISTRY
Paper – III : Physical Chemistry

Time : 3 Hours] [Max. Marks : 80

***Note** : Answer **all** questions.*

SECTION – A **(4×8=32 Marks)**

(Short Answer Types)

1. a) Define fugacity ? Explain the method of determination of fugacity.

   b) Discuss in brief about Excess functions.

2. a) Give an account of E-type delayed fluorescence.

   b) Explain hydrogen abstraction and photodissociation reactions with examples.

3. a) Calculate the energy required to promote an electron moving in a one dimensional box of length 1.0 $\mathring{A}$, from its ground state to the second excited state (Mass of electron is 9.1×10^{-28} g).

   b) Compare the MO and VBT treatments of H_2 molecule.

4. a) Explain line defects and plane defects.

   b) What is Meissner effect ? Explain in detail.

SECTION – B **(12×4=48 Marks)**

(Essay Type Questions)

5. a) Derive an explicit relation between the amount of solute and depression in freezing point.

   b) Calculate ΔG_{mix} and ΔS_{mix} per liter of a mixture containing 12 moles N_2, 15 moles of H_2 and 10 moles of NH_3 at S.T.P.

OR

c) Define activity and activity coefficient. How do you determine the activity coefficient from vapour pressure of a solution ?

d) Derive Gibbs-Duhem equation and explain its significance.

6. a) Explain the Franck Condon principle and Photosensitization.

b) How are the rate constants of different photophysical processes are determined ?

OR

c) Explain the method of determination of Quantum yield.

d) What is Quenching ? Derive Stern-Volmer equation for Quenching.

7. a) Write the Schrodinger equation for the hydrogen atom in spherical polar co-ordinates r, θ, ϕ and separate the variables.

b) Draw the radial and probability density plot of 2s orbital and explain its significance.

OR

c) Set up and solve the Schrödinger wave equation for a particle in a three dimensional box with potential energy zero inside the box.

d) An electron in a one dimensional box of width 10 $\mathring{A}$ undergoes a transition from the ground state to first excited state. Calculate the wave length of photon absorbed.

8. a) Describe in detail the Band theory of metallic structure. Explain how this model accounts for high conductivity of metals.

b) Explain the structure of defect Perovskite.

OR

c) What is the cause of Schottky defects ? Derive an expression for the number of Schottky defects in a crystal.

d) Explain the BCS theory and write the applications of super conductors.