B.Tech
BS 1103

SPECIAL EXAMINATION, 2012
CHEMISTRY-I (NEWCOURSE)
Full marks-70
Time: 3 Hours

*Answer Question No. **1** which is compulsory and any **FIVE** from the rest.*
The figures in the right hand -margin indicate marks.

1. Answer the following questions: **2x10**

(a) Two bodies A and B move with same speed. If the mass of A is twice that of mass of B, what is the relationship between the wavelengths associated with them?

(b) Indicate the number of phases and components in the following:
Brass; Oil and water mixture;
KCl-NaBr-H_2O system; Mixture of Benzene and chloroform.

(c) What is the coordination number of both the ions in CsCl structure?

(d) The half life period of a chemical reaction doesn't change when the concentration of the reactant becomes double. What is the order of the reaction?

(e) For the reaction A+B→C+D rate=k [A] [B].
What is the order of the reaction when B is present in excess?

(f) Calculate the change in molar entropy when a sample of oxygen gas expands isothermally to twice its initial volume.

(g) Which is the reference state of carbon at 298 K?

(h) Calculate the standard potential of the cell $Pt(s)|H_2(g)|H^+(aq)|Ag^+(aq)|Ag(s)$.
Given: $E^0_{Ag^+/Ag} = +0.8V$

(i) Which crystal system has/have primitive and body centered crystal lattice only?

(j) Can a promoter alone act as a catalyst? Justify your Answer.

2. (a) By the help of molecular orbital theory, explain why He_2 does not exist? **[5]**

(b) Describe the electron sea model of metallic structure. Explain the common properties of metals with the help of this model. **[5]**

3. (a) Predict the spontaneity of the reaction $Ce^{3+} + Fe^{3+} \rightarrow Ce^{4+} + Fe^{2+}$

Given: $E^0_{Fe^{3+}/Fe^{2+}}$ =+0.76V and $E^0_{Ce^{4+}/Ce^{3+}}$ = +1.60V [4]

(b) How pH of an unknown solution can be determined by using quinhydrone electrode? [6]

4. (a) Draw and discuss the phase diagram for the sulphur system. [6]

(b) What is reduced phase rule? When is it applied? [4]

5.(a) A compound containing three elements X, Y and Z, where X has CCP arrangement, Y & Z are present in all the octahedral and tetrahedral voids respectively. What is the formula of the compound? [3]

(b) How many Na^+ and Cl □ ions are there in its unit cell? [2]

(c) Discuss briefly the various defects observed in crystals. [5]

6.(a) Derive the kinetic expression of a second order reaction when two different reactants are given. [5]

(b) Discuss the collision theory of reaction rates [5]

7. (a) Show that $C_P - C_v = \left(\frac{\partial V}{\partial T}\right)_p \left[\left(\frac{\partial E}{\partial V}\right)_T + P\right]$ [4]

(b) State and explain Hess's law. [3]

(c) Show that: $\left(\frac{\partial S}{\partial p}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_p$ [3]

8.(a) Write the cell reaction of lead-acid storage cell during discharging. [2]

(b) Show that for a first order reaction, the time requires for 99.9% completion of the reaction is ten times that requires for half the reaction. [4]

(c) Distinguish between eutectic reaction and peritectic reaction. [4]