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Total number of printed pages – 4

B. Tech  
BSCC 2101 / BS 1103 (O/N)

## First Semester Examination – 2010

### CHEMISTRY – I (Old and New Course)

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 followings : 2 × 10
- (a) What is the difference between the one component phase diagram and two component phase diagram (condensed system) ?
- (b) Write down the Schrodinger's wave equation in three dimensional form.
- (c) The Hexagonal closed packing arrangement described by.
- (i) ABAB.....
- (ii) ABC, ABC....
- (iii) ABA, AB...
- (iv) All of above.
- (d) What is the order of reaction ? If half life period and units of K depends on concentration.
- (e) Why CO must be removed completely in Harbers process for manufacture of ammonia ?

P.T.O.

- (f) Which of the following statement about spontaneous reaction occurring in a galvanic cell is always true
- $E_{\text{cell}}^0 > 0$ ,  $\Delta G^0 < 0$  and  $Q < K_{\text{eq}}$
  - $E_{\text{cell}}^0 > 0$ ,  $\Delta G^0 > 0$  and  $Q > K_{\text{eq}}$
  - $E_{\text{cell}}^0 > 0$ ,  $\Delta G^0 < 0$  and  $Q > K_{\text{eq}}$
  - $E_{\text{cell}} > 0$ ,  $\Delta G < 0$  and  $Q < K_{\text{eq}}$
- (g) For a gaseous reaction at 300K  $\Delta H - \Delta U = -4.98\text{KJ}$  assuming  $R = 8.35\text{JK}^{-1}\text{Mol}^{-1}$   $\Delta n_g$  is
- 1
  - 2
  - 3
  - 2
- (h) Calculate the free energy change when 5 mole of oxygen at 300K and 5 bar pressure expand isothermally to 1 bar pressure.
- Why metallic bond are non directional ?
  - What do you mean by salt bridge ? Why it is used ?
2. (a) Draw the schematic phase diagram of solid, liquid and vapour phase of substance. Define term critical points, triple points and critical temperature. 4
- (b) Explain the function of catalytic promoter poison with example. 3
- (c) For one mole of ideal gas  $T = f(T, V)$  show that  $\partial T$  is perfect differential. 3

Or

At 25°C the degree of ionization of water was found to be  $1.8 \times 10^{-9}$ . Calculate the ionization constant and ionic product of water.

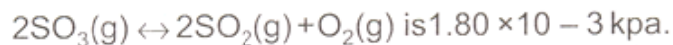
3. (a) A first order reaction is 50% complete in 30 min at 27°C and in 10 min at 47°C. Calculate Energy of activation for reaction. 4

(b) What do you mean by superconductor ? Write down its properties and some application. 3

(c) What do you mean by lattice energy ? Discuss Born haber cycle for sodium chloride. 3

Or

At 700K the equilibrium constant  $K_p$  for reaction



What is the numerical value of  $K_c$  in moles / liter for same reaction at same time ?

4. (a) Metallic gold crystallizes in a face centred cubic lattice .The length of unit cell is  $a = 4.070 \text{ \AA}$ . Calculate the density and packing fraction (atomic mass gold = 197amu). 4

(b) What will happen to the time period in first order reaction ? When concentration changes from 50% to 75% ? 3

(c) What is the difference between the primary cell and secondary cell ? Write down cell reaction of Drycell. 3

5. (a) The EMF of the following cell is 0.265V at 25°C and 0.2595V at 35°C. Calculate heat of reaction taking place at 25°C.  $\text{Pt}(\text{H}_2)/\text{HCl}(\text{aq})//\text{AgCl}/\text{Ag}$ . 4

(b) What do you understand by term L.C.A.O ? Discuss condition for combination of atomic orbital to form M.O (Molecular orbital). 3

(c) Prove that  $C_p - C_v = [P + \{\partial U / \partial V\}_T] [\partial V / \partial T]_p$ . 3

Or

State and explain Lechateller's principle with example.

6. (a) How can you determined the  $P^H$  of a solution using Quinhydrone electrode? Discuss its merits and Demerits. 4

(b) Discuss the important features of CCP Structure. Give some example of metal belongs to CCP structure. 3

- (c) What do you mean by Bond energy ? Write down the factor affecting bond energy. 3
7. (a) If  $\partial A = -S\partial T - P\partial V$  Then show that  $[\partial S/\partial V]_T = [\partial P/\partial T]_V$ . 4
- Or
- The work function of Calcium is 1.96eV
- Calculate the
- (i) Threshold wave length
- (ii) Threshold frequency of radiation
- (b) For galvanic cell 3
- $Zn/zn^{+2}(1.0M)//Cl^{-}(1.0M)/AgCl(s)/Ag$
- The EMF at 298K is 0.985V.
- (i) Write down the cell reaction
- (ii) Calculate  $\partial G$  at 298 K for the cell reaction
- (c) Write down the three important condition for formation of metallic Bond. 3
8. (a) Discuss the phase Diagram of the Bi-Cd system and explain eutectic point. 4
- (b) Write down the difference between the following. (at least three point each) 3×2
- (i) Order and molecularity
- (ii) Galvanic cell and Electrolytic cell
- (iii) Frenkel Defects and Schottky defects.