Second Semester Examination - 2011

CHEMISTRY - I

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:

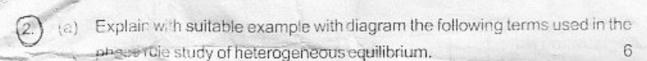
2×10

- (a) Why the fusion curve of ice in phase diagram is slightly inclined toward pressure axis.
- (b) Write the time indepdent Schrödinger equation for particle of mass M with potential V.
- (c) Identify the crystal system in following cases:
 - (i) if a = 4 nm, b = 7 nm, c = 9 nm and $\alpha = \beta = \gamma 90^\circ$
 - (ii) $a = 6 \text{ nm}, b = 6 \text{ nm}, c = 6 \text{ nm} \text{ and } \alpha = \beta = \gamma = 90^\circ$
- (d) In an ionic crystal of general formula AX. The co-ordination number is six and value of radius ratio is in the range.
 - (i) 0.155-0.215

(ii) 0.215-0.414

(iii) 0.732-1

- (iv) 0.414-0.732
- (e) Why it is essential to remove the arsenic in contact process for manufacture of H₂SO₄?
- (f) Write down electrode reaction of calomel electrode and oxygen gas electrode.
- (g) Calculate the entropy change in melting 5 gm of ice at 0° C. Given that molar heat of fusion of ice 1440 cal.
- (h) What do you mean by heat of hydration? Give an example.
- What do you mean by fuel cell? Write down the fuel cell reaction of H₂-O₂ fuel cell.
- (j) What do you mean by intensive properties? Justify emf of the electrochemical cell is a intensive properties.



- (i) Triple point
- (ii) Eulectic point
- (iii) Univariant system.

(b) If
$$\partial U = T\partial S - P\partial V$$
 then show that $[\partial T/\partial V]_c = -[\partial P/\partial S]_V$.

- (a) What do you mean by gas electrode? How you determined PH of solution with help of hydrogen electrode? Write down the construction of S.H.E. 6
 - (b) Heat of reaction for combustion of glucose at constant pressure is 651 kcal at 17°C. Calculate the heat of reaction for same at constant volume. 4
- (a) Calculate EMP cell
 Pt,H₂(1atm)/HCl (0.2M)//Cl₂(1.0 atm)/Pt E⁰ Cl₂/Cl = 1.36 V.
 - (b) Justify the order stability in. O₂⁺, O₂⁻, O₂⁻, O₂⁻, O₂ by molecular orbital theory. Compare their bond orders, bond rengths and magnetic properties using their molecular orbital electronic configuration. E
- (a) What is the effect of temperature on reaction rate? Give Arrhenius equation.
 Plot the graph showing variation of K with temperature. What can you calculate from slope.
 - (b) What do you mean by body centered unit cell? At room temperature, sodium metal crystallize in body centered cubic cell with a = 4.24 A°. Calculate the theoretical density of sodium. Molar mass of sodium is 23.0 gm mol⁻¹.
- (a) Define term (i) molecularity, (ii) order (iii) half life period of reaction with example. Describe any one method for determination of order of reaction.
 - (b) Calculate the voltage required to accelerate an electron to have velocity 1.42 × 10⁹ ms⁻¹. What will be debrogile wave length?

BS 1103 (N) 2 Contd.

- State and explain Hess's law. The molar heat of combustion of C₂H₂(g),
 C (graphite) and H₂(g) are 310.62,94.05 and 68.32 Keril espectively.
 Calculate heat of combustion of C₂H₂(g).
 - (b) Calculate the standard potential of Ni⁺²/Ni electrode. If the cell potential of the cell Ni/Ni⁺²(0.01M)//Cu⁺²(0.1M)/Cu is 0.59 V, E⁰ (Cu⁺²/Cu) = 0.35 V. 4
- (a) Derive Gibb's Helmholtz equation in term of free energy change and enthalpy change. With help of above equation explain how emf of the calculated.
 - (b) What do you mean by eigen value and eigene function? Write-Jown the some application of Schrodinger's equation.