Reg. No.										

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

II SEMESTER B.S. DEGREE EXAMINATION – NOV. / DEC.2016

SUBJECT: CHEMISTRY (CH 121)

(BRANCH: COMMEN TO ALL)

Wednesday, 7 December 2016

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer any FIVE FULL Questions.**
- ✓ **Draw a neat labeled diagram and equations wherever necessary.**

1A. i) What is cathodic protection? Explain sacrificial anode and impressed current techniques for prevention of corrosion.

ii) Explain the construction and working principle of Weston Standard Cadmium cell.

1B. i) The value of K_p for the equilibrium (T = 673 K)

$2H_2O_{(g)} + 2Cl_{2\,(g)} \rightleftharpoons 4HCl_{(g)} + O_{2\,(g)}$ ($R = 0.0820$ l atm K^{-1} mol^{-1})

is 0.035 atm at 400^{O} C when the partial pressures are expressed in atmospheres. Calculate the value of K_c for the same reaction.

ii) Draw the molecular orbital diagram of O_2 and find out the bond order and its magnetic behavior.

1C. Derive Gibb's-Helmholtz equation. **(8+8+4)**

2A. i) What is lattice energy? Describe how lattice energy of ionic solid is evaluated by Born-Haber cycle.

ii) Describe dispersion (size reduction and electro dispersion) method for the preparation of colloidal solution.

2B. i) Explain the following terms

(a) Heat capacity at constant volume (b) Heat capacity at constant pressure

ii) The activation energy of a reaction is 225 kcal mol^{-1} and the value of rate constant at 40^{o}C is 1.8×10^{-5} sec^{-1}. Calculate the frequency factor, A.

2C. Write short notes on hydrogen bonding.

(8+8+4)

3A. i) Derive expressions for the hydrolysis constant, degree of hydrolysis of weak acid and strong base.

ii) Explain the construction and working of the calomel electrode.

3B. i) Explain the following

(a) Pitting corrosion (b) Galvanic corrosion

ii) A second order reaction in which the initial concentration of both the reactions are same is 25 % complete in 600 sec. How long will it take for the reaction to go to 75 % completion?

3C. Give the difference between a covalent bond and ionic bond by giving suitable example.

(8+8+4)

4A.i) What are acid-base indicators? Illustrate the mechanism of their action taking suitable examples.

ii) Explain the VSEBR with the examples of NH_3.

4B.i) Describe conductors and non-conductors on the basis of molecular orbital theory of metallic bonding?

ii) Discuss the proton transfer theory of acids and bases.

4C. A cell is constructed by coupling a zinc electrode dipped in 0.5M $ZnSO_4$ and a nickel electrode dipped in 0.05M $NiSO_4$. Write the cell representation and cell reaction. Calculate the EMF of the cell, given that standard reduction potential of Zn and Ni and as -0.76 and – 0.25 V respectively.

(8+8+4)

5A. i) Define stress corrosion. Explain caustic embrittlement of mild steel.

ii) Describe the theory of electrical double layer to account for the charge on the colloidal particles.

5B. i) What is a first-order reaction? Derive an expression for rate constant of first order reaction.

ii) Calculate ΔH^o for the reaction at 298 K

$Ba^{2+}(aq) + SO_4^{2-} \longrightarrow BaSO_{4(s)}$

Given that ΔH_f^o [$Ba^{2+}{}_{(aq)}$], [SO_4^{2-} (aq)], [$BaSO_{4\,(s)}$] = -538.36 kJ, -907.51 kJ, -1465.24 kJ.

5C. Explain the following with examples:-

(a) Dipole-dipole interaction (b) Dipole-induced dipole interaction

(8+8+4)

6A. i) 10 moles of HI were produced by the interaction of 15 moles of H_2 and 5.2 moles of I_2 vapour at 444^0 C. Calculate the equilibrium constant for the reaction: $H_2 + I_2 \rightleftharpoons 2HI$

ii) Draw a phase diagram of lead-silver system and discuss salient features of it.

6B i) Explain the action of phenolphthalein in the acid-base titration.

ii) Write short notes on vander waals forces and london forces.

6C. Describe condensation methods for the preparation of colloidal solutions.

(8+8+4)

7A. i) Give the postulates of Valence bond theory of covalent bonding.

ii) 25 ml of 0.01 $AgNO_3$ solution is mixed with 25 ml of 0.0005 M aqueous NaCl solution. Determine whether the precipitate of AgCl will be formed or not.

Given $K_{sp}(AgCl) = 1.7 \times 10^{-10}\ M^2$.

7B. i) Write short notes on galvanizing in corrosion control.

ii) Discuss the term Gibb's free-energy and how does free energy vary with temperature and pressure?

7C. Define the following:-

(a) Single electrode potential (b) Enthalpy (c) Common ion effect (d) Dipole moment

(8+8+4)

8A. i) Explain the term hybridization. Give an account for sp^3 hybridization with suitable examples.

ii) If the dissociation constant of HCN be 7.2×10^{-10} and that of ammonia be 1.75×10^{-5}, find out the hydrolysis constant for ammonium chloride and also its degree of hydrolysis.

8B.i) Explain the following:-

(a) Solubility product (b) Collision theory

ii) What is meant by corrosion inhibitors? Explain how corrosion can be minimized using cathodic inhibitors?

8C. Write short note on electrochemical cells.

(8+8+4)