Reg. No.										

INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(Manipal University)

II SEMESTER B.S. DEGREE EXAMINATION – NOV. 2017

SUBJECT: CHEMISTRY (CH 121)

Saturday, 18 November 2017

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

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

1A. i) Derive Gibbs- Helmholtz equation and mention its significance.

ii) Define degree of hydrolysis. Derive an expression relating K_h , K_w and K_b

1B. i) Explain the transition state theory of bimolecular reactions.

ii) The solubility of silver chloride in water at 25°C is 0.00179 g /L. Calculate its solubility product at 25° C. List two applications of solubility product principle.

1C. Give reasons for the following :

i) Deposition of extraneous matter on a metal surface is undesirable.

ii) Small anodic area results in intense corrosion.

(8+8+4)

2A. i) Calculate the degree of hydrolysis of 0.10 M solution of sodium acetate at 25°C. Ka =1.75 x 10^{-5} and K_w = 1.008 x 10^{-14}

ii) Describe the steps involved in the formation of a metal chloride from the metal and chlorine gas in terms of energy changes.

2B. i) Discuss any two methods employed in the purification of sols.

ii) On the basis of band theory, differentiate between insulators, conductors and semi-conductors. Why does conductance of a semiconductor increase with increase in temperature?

2C. Account for the following:

i) Glass electrode cannot be used for solution of pH above 9.

ii) The standard electrode potentials of Zn/Zn^{2+} and Cu/Cu^{2+} electrodes are opposite in sign.

(8+8+4)

3A. Write short notes on:

a) Cathodic inhibitors

b) Applications of colloids.

3B. i) Draw a neat labelled phase diagram of water system and explain areas, curves and triple point in it.

ii) Define half-life of a reaction. The half-life of the reaction $SO_2Cl_2 \rightarrow SO_2 + Cl_2$ which obeys first-order kinetics, is 8.0 minutes. How long will it take for the concentration of SO_2Cl_2 to be reduced to 1% of the initial value?

3C. Explain rusting of iron with the help of electrochemical theory of corrosion.

(8+8+4)

4A. i) What is resonance? Draw the resonance structures of NCO^- ion.

ii) Calculate the bond order and arrange F_2, F_2^{2-}, F_2^+ in the increasing order of bond energy.

4B.i) Derive Nernst equation for electrode potential.

ii) With a neat diagram explain electrophoresis.

4C.i) Calculate the entropy increase in the evaporation of one mole of water at 100°C.Heat of vaporization of water at 100°C = 2259.4 J/g

ii) What are the conditions for an electrochemical cell to act as a standard cell?

(8+8+4)

5A. i) Draw the molecular orbital diagram for O_2^+

ii) List any four differences between lyophobic and lyophilic sols.

5B.i) Discuss the factors which influence the rate of a reaction.

ii) List two advantages and two limitations of glass electrode.

5C. Write the representation of saturated calomel electrode. The cell SCE // HCl (0.1M) / AgCl(s) / Ag gave an EMF of 0.24 V and 0.26 V with a buffer having pH value 2.8 and unknown pH value respectively. Calculate the pH of unknown buffer solution.
Given E_{SCE}= 0.2422 V

(8+8+4)

6A. i) What are the limitations of first law of thermodynamics? Derive the relation between heat capacity at constant volume and heat capacity at constant pressure for one mole of an ideal gas.

ii) Illustrate the mechanism of action of acid-base indicators taking suitable examples.

6B. i) Derive an expression for rate constant of a first order reaction.

ii) Write the half-cell reactions and the net cell reaction for the cell,

Zn(s) | Zn2+ (0.001M) | | Cu2+(0.1M) | Cu(s).Calculate the EMF of the cell. The standard potential of cell is 1.2 volts.

6C. Write a note on Vander-Waals forces

(8+8+4)

7A. i) Explain sp^2 hybridization with suitable example.

ii) For the reaction, $4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g)$. Calculate ΔH^0_{rxn} from ΔH^0_f values.

Given : ΔH^0_f NO(g)= 90.3 kJ/mol, ΔH^0_f $H_2O(g)$= -241.8 kJ/mol, ΔH^0_f NH3(g)= -45.9 kJ/mol

7B. Give reasons for the following:

a) BeF_2 molecule is linear while BeF_3 is triangular.

b) P-nitrophenol is more soluble than o-nitrophenol in water.

c) O_2 is paramagnetic while F_2 is diamagnetic.

d) CCl_4 has no dipole moment whereas $CHCl_3$ has.

7C. Explain the dispersion methods used in the preparation of colloidal solutions.

(8+8+4)

8A. i) The equilibrium concentrations for the reaction CO (g) + Cl_2 (g) ↔ $COCl_2$ (g) at 74ºC are [CO] = 0.012 M, [Cl_2] = 0.054 M, and [$COCl_2$] = 0.14 M. Calculate the equilibrium constants K_c and K_p.

ii) Discuss in detail the effect of any two primary factors on corrosion rate.

8B.i) Explain the terms : a)Buffers b)Common ion effect

ii) What is VSEPR theory of molecular model? Explain with suitable examples.

8C. Consider the following equilibrium: $X_2(g) + Y_2(g) <==> 2XY(g)$ + heat.

What will be the effect of the following changes on the equilibrium.

a) Increasing the temperature of the system?

b) Decreasing the concentration of $X_2(g)$ in the system

c) Increasing the volume of the container

d) Decreasing the concentration of XY (g) in the system

(8+8+4)