## **Question Paper**

Exam Date & Time: 23-Apr-2018 (09:30 AM - 12:30 PM)



## **MANIPAL ACADEMY OF HIGHER EDUCATION**

## INTERNATIONAL CENTRE FOR APPLIED SCIENCES SECOND SEMESTER B.S. (ENGG) END-SEMESTER THEORY EXAMINATIONS APRIL - 2018 DATE: 23 APRIL 2018 TIME: 9:30AM TO 12:30PM Chemistry [CH 121A]

Marks: 100

Duration: 180 mins.

## Answer 5 out of 8 questions.

1) A)	<ul> <li>i) Derive an expression for the electrode potential of a glass electrode.</li> <li>ii) How is hydrogen bonding classified? Explain with suitable examples.</li> </ul>	(8)
B)	i) Write the IUPAC name of the following compounds.	(8)



ii) If 10% of a substance decomposes in 5 minutes in a first order reaction, calculate how much would remain undecomposed after 30 minutes.

- C) How does band theory explain the conductivity of metals. <sup>(4)</sup>
   Why does conductance of a semiconductor increase with increase in temperature.
- i)Define law of mass action. Obtain the mathematical (8) expression for equilibrium constant.
  - ii) Ionization constant of acetic acid and ionic product of water at  $25^{\circ}$ c are  $1.75 \times 10^{-5}$  and  $1\times 10^{-14}$  respectively. Calculate the hydrolysis constant of sodium acetate and its degree of hydrolysis in 0.1 molar solution at  $25^{\circ}$  C.

(8)

2)

	C)	i) Draw the molecular orbital diagram for N2 <sup>+</sup> and comment on its magnetic behaviour and stability. ii) Define standard emf of a cell. What are the limitations of standard hydrogen electrode. Derive the expression $\Delta G = \Delta H + T [\partial(\Delta G)/\partial T]$	(4)
-			(0)
3)	A)	Justify the following statements: a) In a galvanic cell anode is negative and cathode is positive b) Electron withdrawing groups stabilize a carbanion but destabilize a carbonium ion. c) Boiling point of H <sub>2</sub> O is higher than that of H <sub>2</sub> S.	(8)
		d) $BeF_2$ molecule is linear while $BeF_3$ is triangular.	
	B)	i) Explain the term solubility product with an example? List its applications.	(8)
		ii) Calculate the entropy change in calories as well as in SI units for the following processes:	
		a) melting of 1 gram of ice at $0A^{\circ}C$ . Heat of fusion of ice =	
		b) evaporation of 1 mol of water at $100^{\circ}$ C. Heat of vaporisation = 540 cal/g	
	C)	What is hybridization? Discuss the structures of $CH_4$ and $H_2O$ molecules in terms of VSEPR theory. Explain the decrease in bond angle from $CH_4$ to $H_2O$ .	(4)
4)	۵)	i) Why does the stability of carbon free radicals increase in the order, tertiary > secondary > primary. Illustrate the	(8)
	<b>A</b> )	resonance stabilization of benzyl carbanion and allyl carbonium ion.	
		ii) Discuss the factors which govern the formation of an ionic bond.	
	B)	<ul> <li>i) Explain the construction and working of Calomel electrode.</li> </ul>	(8)
		ii) Phosphorus pentachloride is 25% dissociated at 1	
		atmosphere and 25 <sup>0</sup> C. Calculate the equilibrium constant Kp.	
	C)	Write the molecular orbital configuration and calculate the bond orders of the following atoms/ions.	(4)
		i) $O_2^-$ ii) $F_2$ iii) $B_2^+$ iv) $C_2$	
5)	A)	i) Derive an expression for the relationship between degree of hydrolysis and hydrolysis constant for the salt of a weak acid and strong base.	(8)

		ii) Describe Born-Haber cycle for the formation solid Sodium Fluoride.	
	B)	<ul> <li>i) Discuss the mechanism of free radical substitution reaction.</li> </ul>	(8)
		ii) Define resonance. Draw the resonance structures of i) $CO_2$ ii) $N_2O$	
	C)	Explain the function of salt bridge. Why is ammonium nitrate or potassium chloride used for preparing salt bridge.	(4)
6)		i)For an ideal gas, show that $C_p-C_V = R$ .	(8)
	A)	ii) Explain sp <sup>2</sup> and sp <sup>3</sup> d hybridizations with suitable examples.	
	В)	i) 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 value of unknown buffer solution. Given $E_{SCE}$ = 0.2422 V	(8)
		ii)Write short notes on: i) Alkaline error ii) Liquid junction potential	
	C)	State and explain Le Chateliers principle. Consider the reaction, $N_2+O_2 \leftrightarrow 2NO$ ; $\Delta H=43.2$ kcals. In which direction	(4)
		will the equilibrium shift when,	
		ii) O <sub>2</sub> is removed from the reaction mixture	
		iii) pressure is increased	
7)		iv) NO is added to the reaction mixture	(8)
,,	A)	capacity and molar heat capacity.Write their units. ii) Discuss collision theory of reaction rates.	(0)
	В)	i) Explain cationic and anionic hydrolysis with examples. ii) State and explain Hess's law. Calculate the enthalpy of formation of carbon monoxide from the following data: $C(s)+O_2(g) \rightarrow CO_2(g)  \Delta H= -393.5 \text{kJ}$	(8)
		$2CO(g) + O_2(g) \rightarrow 2CO_2(g) \triangle H = -569 \text{ kJ}$	
0)	C)	Explain geometrical isomersm in alkenes.	(4)
8)	A)	<ul><li>i) What are the various types of thermodynamic processes?</li><li>Explain.</li><li>ii) Write the half cell reactions and the net cell reaction for the cell</li></ul>	(8)
		$Zn(s)   Zn^{2+} (0.001M)     Cu^{2+} (0.1M)   Cu(s).Calculate the emf of the cell, given E0 Zn^{2+} / Zn = -0.76V and E0 Cu2+ /$	

Cu = 0.34V.

- <sup>B)</sup> What are second order reactions? Give two examples. <sup>(8)</sup> Derive the expressions for the rate constant of second order reaction
  - a) having only one reactant
  - b) having two different reactants.
  - Draw the structure of each of the following compounds. <sup>(4)</sup>
    - i) 2-bromo-4-iodophenol
    - ii) 3-pentanone

C)

- iii) 1-ethyl-2-fluorocyclobutane
- iv) Benzenesulphonic acid

-----End-----