Question Paper

Exam Date & Time: 06-Jul-2022 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
II SEMESTER B.Sc.(Applied Sciences) in Engg.
END SEMESTER THEORY EXAMINATION-MAY/JUNE 2022

CHEMISTRY [ICH 121 - S2]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Missing data if any suitably assumed.

1)	A)	Explain the construction and working of the Calomel electrode. Give the advantages and disadvantages.	(5)
	B)	Derive the relationship between the equilibrium constant with respect to molar concentrations (K_c) and the equilibrium constant with respect to partial pressure (K_p). Calculate the value of Kc for the equilibrium reaction with a concentration in units of moles per liter for the reaction $PCl_{5\,(g)} \rightleftharpoons PCl_{3\,(g)} + Cl_{2\,(g)}$ at 523 °C under 1 atm pressure, the value of K_p is 1.778 atm. Given = R is 0.0820 liter atm K^{-1} mol^{-1}.	(3)
	C)	Give Reason for the following: i) O2 is paramagnetic ii) Density in the solid-state (ice) is less than that in the liquid state	(2)
2)		Explain covalency and expansion of octet for PCl_5 and SF_4 compounds.	(5)
	A)		
	B)	Discuss Arrhenius's theory of electrolytic dissociation (Ionic Theory). Mention its limitations.	(3)
	C)	A galvanic cell consists of a copper plate immersed in 10 M solution of $CuSO_4$ and iron plate immersed in 1M $FeSO_4$ at 298K. If E^0_{cell} = 0.78 V, write the cell reaction and calculate E.M.F. of the cell.	(2)
3)	A)	Define the heat capacity of a system. Obtain the expression for heat capacities at constant volume and constant pressure for one mole of an ideal gas. Show that for an ideal gas Cp-Cv = R.	(5)
	B)	Derive an expression for the rate constant of a first order reaction. Explain factors influencing the rate of chemical reaction	(3)

	C)	Draw the structure of the following molecules i) 3-Oxopentenal ii) 5-Methyl-2-nitohexane	(2)
4)		Discuss the Born-Haber cycle for the formation of NaCl crystal. Explain two factors governing ionc bond formation.	(5)
	A)		
	B)	Discuss the following types of organic reactions with a suitable example i) Substitution reactions ii) Addition reactions iii) Elimination reactions	(3)
	C)	Write a short note on the transition state of molecules in accordance with chemical kinetics.	(2)
5)		Explain the following types of isomerism with a suitable example	(5)
	A)	i) Chain isomerism ii) Position isomerism iii) Functional isomerism iv) Metamerism v) Tautomerism	
	B)	Draw the MO diagram of the oxygen molecule and calculate the bond order and magnetic behavior.	(3)
	C)	Discuss with a suitable example any two types of salt hydrolysis.	(2)

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