Question Paper

Exam Date & Time: 14-Jun-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATION - MAY 2023
II SEMESTER B.Sc (Applied Sciences) in Engg.
CHEMISTRY [ICH 121 - S2]

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

Answer all the questions.

Missing data, if any, may be suitably assumed

1)			Explain the origin of potential at the electrodes of a galvanic cell.	(3)
	A)	I		
		II	The equilibrium constant for the reaction is 4.0. $CH_3COOH + C_2H_5OH \longleftrightarrow CH_3COOC_2H_5 + H_2O$ What will be the composition of the equilibrium mixture, if 1 moles of acid is taken along with 8 moles of alcohol.	(2)
	B)	I	What are vander Waals forces? Explain the Following i) Dipole-dipole interactions ii) Ion-dipole interactions iii) London forces	(3)
		II	Explain the following with a suitable example a) Homolytic fission b) Heterolytic fission	(2)
2)			One mole of an ideal gas in 22.4 litres is expanded isothermally reversible at 300 K to a volume of 22.4 litres and 1/10 atm. Calculate (a) w (b) q (c) ΔH (d) ΔG (e) ΔS	(3)
	A)	I		
		II	What is a first-order reaction? Derive an expression for rate constant of first order reaction.	(2)
	B)	I	Discuss the following types of organic reactions with a suitable example. (a) Substitution reaction (b) Elimination reaction (c) Rearrangement	(3)
		II	Describe the formation of σ molecular orbitals resulting from the overlapping p-orbitals along the internuclear axis.	(2)
3)			Describe the construction and working of a calomel electrode.Mention any two advantages.	(3)

A) I

II A first order reaction is 40% complete in 50 minutes. Calculate the value of the rate constant. In what time will the reaction be 80% complete? (2)

B) I What is Born-Haber cycle? How can we obtain lattice energy of a NaCl with its help? (3)

II Discuss collision theory (Lindemann's theory) of reaction rates. (2)

4) Derive Gibb's-Helmholtz equation. (3)

A) I

II Consider the following cell: (2)
$Ni/Ni^{2+}(0.01M)//Cu^{2+}(0.5M)/Cu$. The standard reduction potential of Ni and Cu are -0.25 and 0.34 V respectively. Write the electrode reactions and calculate the EMF of the cell at 298 K.

B) I What is sp hybridization? Discuss the shape of beryllium fluoride based on this hybridization. (3)

II In k versus 1/T graph was plotted to calculate the activation energy of a reaction using arrhenius equation for the effect of temperature on reaction rate. The slope of the straight line was found to be -2.55×10^4. Calculate the activation energy of the reaction. (2)

5) What are the necessary conditions required for a molecule to exhibit optical isomerism? Explain the optical isomerism in tartaric acid. (3)

A) I

II 25 mL of 0.01 $AgNO_3$ is mixed with 25 mL of 0.0005 M aqueous NaCl solution. Determine whether the precipitate of AgCl will be formed or ot? Given K_{sp} (AgCl) = 1.7×10^{-10} M^2. (2)

B) I Describe the formation of ∏ orbitals by the lateral overlap of p- atomic orbitals and also draw molecular orbital energy level diagram for oxygen molecule. (3)

II The cell SCE// (0.1M) HCl/AgCl(s)/Ag gave emf of 0.24 V and 0.26 V with 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) (2)

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