Name: **Enrolment No:**	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Solution, Phase Equilibrium, Conductance, Electrochemistry & Functional Group Organic Chemistry- II **Semester: III**
Program: BSc (Mathematics), BSc (Geology) **Time: 03 hrs.**
Course Code: CHEM1009G **Max. Marks: 100**

Instructions: Read all the below mentioned instructions carefully and follow them strictly:

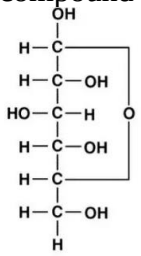
1) Mention Roll No. at the top of the question paper.
2) ATTEMPT ALL THE PARTS OF A QUESTION AT ONE PLACE ONLY.

SECTION A
(5Qx4M=20Marks)

S. No.		**Marks**	**CO**
Q 1	What is Raoult's law? Calculate the vapor pressure lowering caused by the addition of 100 g of sucrose (MW 342) to 1000 g of water if the vapor pressure of pure water at room temperature is 23.8mm Hg.	**4**	**CO1**
Q 2	Discuss the term 'component'. How many components are present in the following systems: a. Water in equilibrium with water vapor. b. KCl + H_2O in equilibrium with KCl hydrate.	**4**	**CO1**
Q 3	Differentiate specific and equivalent conductance. What is the relation between them? How will specific and equivalent conductance of a solution vary on changing the concentration from 0.2N to 0.5N?	**4**	**CO1**
Q 4	Calculate the EMF of following cell: $Mg(s) + 2Ag^{+}(aq.) \rightarrow Mg^{+2}(aq.) + 2Ag(s)$ Given: $[Mg^{+2}] = 0.130M$ and $[Ag^{+}] = 1.0x10^{-4}M$ $E°_{Ag+/Ag} = +0.80V$ and $E°_{Mg+2+/Mg} = -2.37V$.	**4**	**CO1**
Q 5	What do you understand by the term 'aldose'? Give 2 examples of aldoses with structures.	**4**	**CO3**

SECTION B
(4Qx10M= 40 Marks)

Q 1	A solution of $AgNO_3$ was electrolyzed between silver electrodes. Before electrolysis, 10g of the solution contained 0.01788g of $AgNO_3$. After the	**10**	**CO1**

	experiment, 20.09g of the anodic solution contained 0.06227g of $AgNO_3$. At the same time, 0.009479g of copper was deposited in the copper coulometer placed in series. Calculate the transport numbers of Ag^+ and NO_3^- ions.		
Q 2	An organic compound C_8H_7N (A) on hydrolysis in acidic medium produces another compound $C_8H_8O_2$ (B). 'B' on treatment with saturated solution of sodium bicarbonate produces effervescences, and on oxidation with potassium permanganate converts to $C_8H_6O_4$ (C), which on heating gives $C_8H_4O_3$ (D). 'D' can be converted back to 'C' on treatment with water. Analyze the compounds 'A', 'B', 'C', and 'D'. Write all the reactions associated with it.	**10**	**CO2**
Q 3	Differentiate primary, secondary, and tertiary structure of proteins. Explain the strategy for synthesizing glycylalanine in a step-wise manner.	**10**	**CO2**
Q 4	a. What happens when glucose is treated with acetic anhydride? Give required reaction also. b. Write the configuration of following compound. Also specify if the compound is α- or β-.  c. Draw the structure of sucrose and label it systematically.	**3+2+5**	**CO3**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 1	a. State Nernst distribution law with its conditions to be followed. How does it change when the solute undergoes association in one of the solvents? Experiments in the study of distribution of phenol between water and chloroform gave the following results: Concentration in aqueous solution (c_1): 0.094, 0.163, 0.254, 0.436 Concentration in chloroform solution (c_2): 0.254, 0.761, 1.850, 5.430 What information can be drawn about the molecular state of phenol in chloroform solution from these results? b. Determine degree of freedom in the following systems:	**10+5+5**	**CO1**

	i. $Na_2SO_4.10H_2O(s)$ in equilibrium with $Na_2SO_4(s) + 10H_2O(g)$ ii. $NH_4Cl(s)$ in equilibrium with $NH_3(g) + HCl(g)$ c. Discuss the titration of HCl vs NaOH potentiometrically. **'OR'** a. State the significance of solvent extraction. Prove that a greater amount of solute can be separated when extraction is carried out in multiple attempts instead of single attempt. An aqueous solution contains 10 g of solute per litre. When 1 litre of the solution is treated with 100 ml of ether, 6 g of solute is extracted. How much more amount of solute can be extracted out from the aqueous solution by a further usage of 100 ml ether? Assume that the molecular state of the solute is same in ether and water. b. What is Gibb's phase rule? Derive it with the help of a representative system. c. Discuss the titration of ferric chloride solution against ceric nitrate potentiometrically.		
Q 2	a. Explain one method for the purification of non-miscible liquids on the basis of their boiling points. b. What do you understand by eutectic point? Discuss with the help of lead-silver system. c. The heat of combustion of ethylene at 17°C and at constant volume is -332.19 kcal. Calculate the heat of combustion at constant pressure considering water to be in liquid state.	**5+10+5**	**CO1**