

Name: Enrolment No:			
UPES End Semester Examination, December 2025			
Instructions: Program Name : B.Sc. Chemistry Course Name : Phase Equilibria & Electrochemistry Course Code : CHEM2028 Nos. of page(s) : 02 Calculator allowed: Yes			
Instructions: a) Answer the following questions. Mention properly the question number for each of your answers. b) Schematic representations are highly encouraged during answering the questions.			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	1. Determine the degrees of freedom for a two-component system existing in a single liquid phase. 2. Condition under which the slope of the Clausius–Clapeyron equation $\frac{dP}{dT} = \frac{\Delta H}{T\Delta V}$ becomes infinite — identify the correct thermodynamic constraint. 3. Specify the correct description to define the characteristic of a eutectic mixture in phase equilibria. 4. Select the correct formulation for expressing for the limiting molar conductance of KCl according to Kohlrausch’s law.	4 x 1	CO1
Q 2	Derive Gibbs phase rule for non-reactive system.	4	CO 1
Q 3	Construct and interpret water–chloroform–acetic acid ternary phase diagram.	4	CO2
Q 4	Define ionic mobility. Explain why H ⁺ and OH [–] ions have unusually high mobility.	4	CO1
Q 5	Derive Nernst equation for a hydrogen electrode.	4	CO2
SECTION B (4Qx10M= 40 Marks)			
Q 6	Discuss the concept of azeotropes and their industrial significance. OR	10	CO1

	Derive Clausius–Clapeyron equation for solid–liquid equilibrium.		
Q 7	Explain Kohlrausch’s law of independent migration of ions.	10	CO1
Q 8	Explain applications of conductivity measurements in determining (i) purity (ii) ionic product of water.	5 + 5	CO3
Q 9	A silver-silver ion electrode formed by dipping a silver rod in a saturated solution of AgCl showed a potential of 0.50 V when combined with a standard hydrogen electrode. Calculate the solubility product of AgCl. (Given: $E_{Ag^+/Ag}^0 = 0.80V$)	10	CO2
SECTION-C (2Qx20M=40 Marks)			
Q 10	Derive generalized Clausius–Clapeyron equation and apply it to liquid–vapor equilibrium of water. OR Explain ionic mobilities, Kohlrausch’s law, and derive expression for limiting conductance.	10 + 10	CO2
Q 11	Develop electrodes and electrochemical set up towards utilizing your concept of electrochemistry for Hydrogen energy, Battery, Supercapacitor,	8 + 6 + 6	CO3