


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2022			
Course: Physical Chemistry III Program: B.Sc. (H) Chemistry & Int. B.Sc.-M.Sc. Chemistry Course Code: CHEM 2003		Semester: III Time : 03 hrs. Max. Marks: 100	
Instructions:			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	The vapour pressure of dichloromethane at 24.1 °C is 53.3 kPa and its enthalpy of vaporization is 28.7 kJ mol ⁻¹ . Estimate the temperature at which its vapour pressure is 70.0 kPa.	4	CO1
Q 2	Suggest the possible maximum number of phases that can co-exist in the following systems: a. Lead and silver alloy system b. Potassium iodide-water system	4	CO1
Q 3	Calculate how long a hydrogen atom will remain on the surface of a solid at 298 K if its desorption activation energy is 15 kJ mol ⁻¹ . Assume that $\tau_0 = 10^{-13}$ s.	4	CO2
Q 4	Discuss in detail the graph of potentiometric titration for a strong acid-strong base titration.	4	CO3
Q 5	Distinguish between Eutectic point and Peritectic point.	4	CO1
SECTION B (4Qx10M= 40 Marks)			
Q 6	The melting point curve of ice in the water system has a negative slope. Explain it with the help of the phase diagram of water system.	10	CO1
Q 7	The specific volumes of ice and water at 0 °C are 1.0907 cm ³ and 1.0001 cm ³ , respectively. What would be the change in melting point of ice per atm increase of pressure? Heat of fusion of ice = 79.8 cal g ⁻¹ . <i>Or</i> State the phase rule. Explain the various terms used in it. Discuss the derivation of the phase rule from thermodynamic considerations.	10	CO1

Q 8	Discuss the salient features of phase diagram of Sulphur system. Why can four phases of heterogeneous system not exist at equilibrium?	10	CO1
Q 9	A cell uses Zn^{2+}/Zn and Ag^+/Ag electrodes. Write the cell representation, half-cell reactions and net cell reaction. Calculate the EMF of the cell. Given $E^0_{Zn^{2+}/Zn} = -0.76 V$ and $E^0_{Ag^+/Ag} = 0.8V$.	10	CO3
SECTION-C (2Qx20M=40 Marks)			
Q 10	(a) Distinguish between adsorption and absorption. Discuss the factors which affect the adsorption of a gas on a solid adsorbent. Discuss in brief the type of adsorption isotherms commonly observed for the adsorption of gases on a variety of adsorbents at different temperature. (b) Discuss in detail the various applications of adsorption in industry and in everyday life.	10 + 10	CO2
Q 11	(a) Define the term: ionic mobility. Derive the relation between ionic mobility and molar ionic conductance. How is ionic mobility determined experimentally? (b) EMF of the cell $Sn/SnCl_2 (0.5 M) // AgCl/ Ag$ is 0.430 V at 25 °C and 0.448 at 0 °C. Calculate the free energy (ΔG), enthalpy change (ΔH) and entropy (ΔS) of the cell reaction at 25 °C.	10 + 10	CO3