UNIT-V

9. (a) Write short notes on micelle formation and structure of micelles. (4)

(b) Write a short note on the kinetics of micelle formation. (5)

(c) Explain the factors affecting the critical micelle concentration and micellar size. (5)

10. (a) Explain the effect of temperature and pressure on solubility and critical micelleconcentration. (2+2=4)

(b) Write short note on the thermodynamics of micelle formation considering phase-separation model. (5)

(c) Discuss the following terms: (2+3=5)

(i) Reverse micelle

(ii) Microemulsion.

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PG (CBCS) ODD SEMESTER EXAMINATION, 2022

CHEMISTRY

1st Semester

Course No. : CHMCC - 104

(Physical Chemistry - II)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

(Answer any five questions, taking one from each unit)

UNIT - I

1. (a) Discuss the postulates of the Debye-Huckel theory. Derive an expression between the mean activity coefficient of an electrolyte whose ions have valances of z^+ and z^- with the ionic strength of the solution. (3 + 7= 10)

(b) Discuss briefly about the liquid junction potential. How you eliminate the liquid junction potential of a cell? (3+1=4)

2. (a) Discuss the ion-solvent interactions. Write the assumptions of the Born model for the ion solvent interaction. Explain the process for the calculation of free energy ($\Delta G_{I\text{-}S}$) for ion solvent interaction. (2+ 2+ 7 = 11)

(b) Find the expression for the E.M.F. of a concentration cell with transference. (3)

UNIT-II

3. (a) What is an electrical double layer? Explain the different models which explain the electrical double layer of the electrode-solution interface? (1+ 6 = 7)

(b) Explain the rusting of iron with the help of electrochemical theory of corrosion. (3)

(c) What is a fuel cell? Discuss the design and working principle of the H_2-O_2 fuel cell. (1+3= 4)

4. (a) Derive the Butler-Volmer equation in the kinetics of the electrode reaction. Discuss the consequences of the low and high overpotential limits on the net current density (j) obtained from the Butler Volmer equation. (6+4=10)

(b) The exchange current density of $Pt(s)|H_2(g)|H^+(aq)$ electrode at 298 K is 0.79 $mAcm^{-2}$. Therefore, the current density when overpotential is + 5.0 mV. Calculate the current passing through an electrode with a total area of 5.0 cm^2. (4)

UNIT-III

5. (a) What is extrinsic semiconductor? Discuss the band theory of extrinsic semiconductor. (1+4=5)

(b) What is superconductivity? How do you explain superconductivity of metals? (1+3=4)

(c) Discuss the Wagner reaction mechanisms in solid-state reactions. (5)

6. (a) What are color centers? How do they arise? (2+2=4)

(b) Discuss briefly (i) Schottky defects and (ii) Frenkel defects (3+3=6)

(c) What are substitutional solid solutions? Explain taking one specific example. (2+2=4)

UNIT-IV

7. (a) With the help of orbital energy level diagram, distinguish among three basic processes of photoelectron spectroscopy. (6)

(b) Obtain an expression for Gibbs adsorption isotherm. (5)

(c) Explain X-ray photoelectron spectrum of Pd metal. (3)

8. (a) Derive BET isotherm for multilayer coverage. Explain how BET isotherm changes with the magnitude of the constant 'c' taking one specific example. (4+2=6)

(b) Explain Auger electron spectrum for $S_2O_3^{2-}$. (3)

(c) Explain the KL_IL_{II} Auger process with diagram. (5)