



K19P 1480

Reg. No. : .....

Name : .....

I Semester M.Sc. Degree (CBSS-Reg./Supple./Imp.)  
Examination, October - 2019  
(2014 Admission Onwards)  
**CHEMISTRY**  
**CHE 1C.04 : PHYSICAL CHEMISTRY-I**

Time : 3 Hours

Max. Marks : 60

**SECTION-A**

Answer **All** questions in one word or one sentence. Each question carries 1 mark. **(8×1=8)**

1. State third law of thermodynamics.
2. Distinguish between forces and fluxes with reference to irreversible thermodynamics.
3. Define ionic mobility.
4. Explain the term 'asymmetry effect'
5. What is electrode polarization?
6. Define half wave potential.
7. Write electrode reactions under acidic condition.
8. Explain the term 'impedance'.

**SECTION-B**

Answer **Eight** questions. Answer may be in one or two sentences. Each question carries 2 marks. **(8×2=16)**

9. Derive thermodynamic equation of state.
10. State and explain onsager reciprocal relation.
11. State criteria for equilibrium between phases.
12. Write Debye Huckel Onsager equation. How is it verified?
13. Predict the effect of the following on the thickness of the ion atmosphere.
  - a) Concentration of electrolyte.
  - b) Dielectric constant of the medium.

P.T.O.



14. The solubility product of a sparingly soluble salt at 25°C is  $8 \times 10^{-15}$ . Find the solubility of the salt.
15. What are the models of electrical double layer at electrode-electrolyte interface? Explain.
16. What are the advantages of dropping mercury electrode?
17. Explain concentration polarization.
18. Find the EMF of the cell

$Zn / Zn^{2+} // Cu^{2+} / Cu$  the standard electrode potentials of Zn and Cu are -0.767 and +0.334v respectively.

19. Explain 'Passivation'
20. Explain terms
  - a) Corrosion current
  - b) Corrosion potential.

#### SECTION-C

Answer **Four** questions. Each question carries **3** marks. (4×3=12)

21. Derive an equation for the rate of entropy production for one component system with heat and matter transport.
22. Define partial molal volume. How would you find partial molal volume of NaCl in water at room temperature. Discuss.
23. Define mean ionic activity coefficient. Find the activity of the following electrolytes in terms of molal concentration and mean ionic activity coefficient.
  - a)  $MX_3$
  - b)  $M_3X_2$
24. Write Debye Huckel limiting law. How would you test the validity of the law? Discuss.
25. Derive Loppmann equation.
26. Discuss one of the theories of hydrogen overvoltage.
27. Draw Pourbaix diagram for Fe. Discuss.
28. Discuss the applications of electrochemical Impedance Spectroscopy.



#### SECTION-D

Answer 'a' or 'b' of each question. Each question carries 6 marks. (4×6=24)

29. a) i) How would you determine third law entropy of a gas? Discuss.  
ii) Define phenomenological coefficients. Show that direct coefficients always dominate indirect coefficients.  
(OR)  
b) Draw phase diagram for a ternary solution with common ion hydrate formation. Discuss.
30. a) Derive Debye Huckel Onsager equation.  
(OR)  
b) Discuss briefly.
  - i) Osmotic coefficient
  - ii) Applications of conductance measurements.
31. a) What is meant by liquid junction potential. How is it measured? Discuss  
(OR)  
b) Define overvoltage. What are the contribution factors for overvoltage? Discuss
32. a) Discuss kinetics of corrosion.  
(OR)  
b) Discuss the applications of Electrochemical Impedance spectroscopy in corrosion science.