K21P 4178

Reg. No. : .....

Name : .....

I Semester M.Sc. Degree (C.B.S.S. – Reg./Supple./Imp.)
Examination, October 2021
(2018 Admission Onwards)
CHEMISTRY
CHE 1C.04 : Physical Chemistry – 1

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **all** questions in **one word** or **sentence**. **Each** question carries **1** mark.

1. State Nernst heat theorem.
2. What is meant by chemical potential ?
3. Define thermomolecular pressure difference.
4. Give an example for a ternary system with one pair of partially miscible liquids.
5. Give one example each for polarisable and non-polarisable electrode.
6. What do you understand by the term polarization ?
7. Define corrosion.
8. How is IR drop related to current density ? **(8×1=8)**

SECTION – B

Answer **any eight** questions. Answer in **one** or **two** sentences. **Each** question carries **2** marks.

9. What is meant by residual entropy ? Explain with any one example.
10. State and explain Onsager's reciprocal relation.

P.T.O.

11. Draw the general phase diagram of a ternary system with three pairs of partially miscible liquids.
12. Why H^+ ions show abnormal ionic mobility in aqueous solution ?
13. Define hydrogen overvoltage and oxygen overvoltage.
14. What is meant by transfer coefficient or symmetry factor ?
15. Draw polarographic cell assembly.
16. Calculate the mean ionic activity coefficient of 0.01 molal $CaCl_2$ in water at 25°C. A = 0.509.
17. What do you mean by exchange current density ?
18. Explain passivation of metals.
19. Draw the polarization diagram for corroding metal when anode area equals one-half of cathode area.
20. Write any two limitations of Pourbaix diagrams. **(8×2=16)**

SECTION – C

Answer **any four** questions. **Each** question carries **3** marks.

21. Derive an expression for the rate of entropy production for a system with matter and heat transport.
22. Write a note on liquid junction potential.
23. Write Butler-Volmer equation and explain the terms.
24. Draw electrode-electrolyte interface and show inner and outer Helmholtz plane.
25. Write the equation for thickness of ionic atmosphere and explain the terms.
26. What are the advantages of dropping mercury electrode ?
27. How will you establish polarization diagram of corroding metals ?
28. Write a note on Pilling – Bedworth ratio. **(4×3=12)**

SECTION – D

Answer '**a**' or '**b**' of **each** question. **Each** question carries **6** marks.

29. a) State third law of thermodynamics. How can you determine the absolute entropy of a gas using third law of thermodynamics ?

OR

b) Discuss phase rule for three component system. Draw and discuss the general phase diagram of a 3-component system with two pairs of partially miscible liquids.

30. a) Explain the principle and working of polarography.

OR

b) Derive Debye Huckel limiting law and write Debye-Huckel equation for appreciable concentration.

31. a) Derive Debye Huckel Onsager equation.

OR

b) Derive Tafel equation. Explain the significance of slope and intercept.

32. a) Write an essay on various types of damages due to corrosion.

OR

b) Write notes on :

i) Electrochemical impedance spectroscopy

ii) Cathodic protection. **(4×6=24)**