

(6 pages)

S.No. 6253

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(For candidates admitted from 2022–2023 onwards)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2023.

Chemistry

PHYSICAL CHEMISTRY – III

Time : Three hours

Maximum : 75 marks

PART A — (20 marks)

Answer ALL questions.

I. (A) Multiple choice questions: (5 × 1 = 5)

1. The variation of conductance with frequency of alternating current (at high frequency) is called

- (a) Debye – Falkenhagen effect
- (b) Wien effect
- (c) Asymmetric effect
- (d) Electrophoretic effect

2. The equation which relates the cathodic and anodic currents with over voltage is known as

- (a) Taft equation
- (b) Yukawa – Tsuno equation
- (c) Swain – scott equation
- (d) Tafel equation

3. The volume of activation for fast reactions in solution is

- (a) Positive
- (b) negative
- (c) Zero
- (d) Cannot be predicted

4. Which of the following is an example of homogeneous catalysis?

- (a) Haber's process
- (b) Hardening of vegetable oils
- (c) Enzyme catalysis
- (d) Cracking of heavy oils

5. The unit of fugacity is
- Same unit as pressure
 - Same unit as temperature
 - Same unit as mass
 - Same unit as volume
- (B) Fill in the blanks: (5 × 1 = 5)

6. The ionic strength of 0.0001 M Na_2SO_4 solution is _____.

7. _____ are galvanic cells in which chemical energy of fuels is directly converted into electrical energy.

8. The Hammett equation is _____

9. The conversion of para H into an equilibrium mixture of ortho and para forms follow _____ mechanism.

10. Reduced phase rule for a three component system is _____

II. Answer the following questions: (5 × 2 = 10)

11. State Fick's first law of diffusion.

12. What is polarization?

13. What is secondary salt effect?
14. What are the limitations of Langmuir isotherm?
15. State Nernst heat theorem.

PART B — (5 × 5 = 25)

Answer ALL questions, choosing either (a) or (b).

16. (a) How is Debye Huckel Onsager equation verified?

Or

(b) Discuss the multilayer theory proposed by Stern reactions.

17. (a) Write briefly on Marcus theory of electron transfer reactions.

Or

(b) Derive Butler – Volmer equation.

18. (a) Discuss the application of transition state theory to solution kinetics.

Or

(b) What is the significance of volume of activation?

19. (a) Write short notes on acidity functions.

Or

(b) Arrive at Gibbs adsorption isotherm.

20. (a) How are three component systems studied with the help of phase rule?

Or

(b) State Planck's statement of third law. What are the exceptions to third law?

PART C — ($3 \times 10 = 30$)

Answer any THREE questions.

21. Derive Debye Huckel Onsager equation.

22. What is corrosion? What are the various methods of protecting metal from corrosion? (3+7)

23. Write briefly on the effect of solvent on reaction between ions in solution.

24. Explain:

(a) Langmuir – Hinshelwood mechanism

(b) Rideal – Eley mechanism (7+3)

25. How will you determine the activity and activity co-efficient of electrolyte by

(a) Vapour pressure method

(b) Freezing point method (5+5)