

(7 pages)

Reg. No. :

Code No. : 7822

Sub. Code : WCHE 13/
VCHE 13

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2024.

First Semester

Chemistry

Elective II – ELECTROCHEMISTRY

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (15 × 1 = 15 marks)

Answer ALL questions.

Choose the correct answer :

1. Van't Hoff factor $i < 1$ represents

- (a) Association
- (b) Dissociation
- (c) Neither association nor dissociation
- (d) None of the above

2. The ionic strength of 0.01 M K_2SO_4 is

- (a) 0.025
- (b) 0.050
- (c) 0.03
- (d) 0.02

3. Identify the strong electrolyte

- (a) KCl
- (b) Acetic acid
- (c) Formic acid
- (d) Benzoic acid

4. The double layer is formed as a results of

- (a) Attractive force of negative and positive ion only
- (b) Repulsive force between like positive ion only
- (c) Both repulsive and attractive force between ions
- (d) None of the above

5. It is the potential observed at shear plane is

- (a) Tight bound layer
- (b) Diffuse double layer
- (c) Nernst potential
- (d) Zeta potential

Page 2

Code No. : 7822



6. Movement of a liquid relative to fixed solid under the influence of electric field is called as
- Electro-osmosis
 - Electrophoresis
 - Streaming potentials
 - Sedimentation potentials
7. Calomel electrode can behave as which of the following component
- Anode only
 - Cathode only
 - Anode or cathode
 - Salt bridge
8. Saturated solution of KNO_3 is used to make a salt bridge, because of
- Velocity of K^+ is greater than that of NO_3^-
 - Velocity of NO_3^- greater than that of K^+
 - Velocity of K^+ and NO_3^- are nearly the same
 - KNO_3 is highly soluble in water
9. Which of the following mentioned is the types of polarization?
- Activation polarization
 - Concentration polarization
 - Resistance polarization
 - Activation, concentration and resistance polarization

Page 3

Code No. : 7822

10. _____ can catalyze the reduction of I_3^- ions to I^- ions.
- Reduced graphene oxide
 - Silica
 - Alumina
 - All the above
11. What is the symbol of overvoltage?
- α
 - β
 - η
 - Δ
12. Which of the following diagrams shows the stability of metals over a range of pH and potential of a system?
- Phase diagram
 - Pourbaix diagram
 - Both (a) and (b)
 - Cooling curve
13. The background in voltammetry and polarography is attributable to _____ effects at the electrode.
- charging
 - electronic
 - kinetic
 - photonic

Page 4

Code No. : 7822

[P.T.O]



14. Alternate current voltammetry technique the linear potential is modulated by a _____ voltage of a small amplitude.

(a) sine wave (b) cosine wave
(c) tan wave (d) none of the above

15. The electrolyte used in alkaline fuel cell is

(a) KOH (b) SiO_2
(c) Na_2CO_3 (d) None of the above

PART B — ($5 \times 4 = 20$ marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

16. (a) Write short note on arrhenius theory of electrolysis.

Or

(b) Define Van't Hoff factors and solvent cage.

17. (a) Express the interfacial phenomena.

Or

(b) Discuss about the sedimentation potential.

18. (a) Derive the relationship between standard electrode potential and equilibrium potential.

Or

(b) Illustrate the features of three electrode system.

Page 5

Code No. : 7822

19. (a) Explain Evans diagram.

Or

(b) Discuss the mechanism of oxygen evolution at different pH.

20. (a) Explain the following (i) diffusion (ii) migration.

Or

(b) Describe briefly about the alkaline fuel cells.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

21. (a) Compare ideal and non-ideal solution.

Or

(b) How Debye Huckel equation is verified?

22. (a) Derive Lippmann equation.

Or

(b) Discuss the following.

(i) Electro osmosis
(ii) Electro capillary curve.

Page 6

Code No. : 7822



23. (a) Derive Butler – Volmer equation for multistep electron transfer electrode reactions.

Or

- (b) List out the significance of exchange current density and net current density.
24. (a) Elaborate the concept of overvoltage.

Or

- (b) Derive an expression for high field approximation factors.
25. (a) Analyze the principle and function of Redox flow batteries.

Or

- (b) Describe the principles and application of anodic and cathodic stripping voltammetry.
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