

Sr. No. 2389

Exam Code: 210403

Subject Code: 3823

M.Sc. Chemistry - 3rd Sem.

(2118)

Paper: Course-XIX

Electrochemistry &amp; Chemical Dynamics

Time allowed: 3 hrs.

Max. Marks: 50

- Note:** 1) Attempt All the questions of Part-A. The Maximum length of each answer can be about 1/3 of a page.  
2) Attempt any Eight questions of Part-B. Maximum length of each answer can be upto 2 pages.  
3) Attempt any Two questions of Part-C. Maximum length of each answer can be upto 5 pages.

## PART-A

(Each question carries 1 mark)

1. What is the relevance of exchange current density?
2. Write mathematical expression of Debye-Hückel-Onsager equation.
3. Write limitations of Diffuse Charge Model of the Double Layer proposed by Guoy and Chapman.
4. Plot the dependence of rate constant on temperature according to Arrhenius equation.
5. Plot the effect of presence of catalyst on the threshold energy of a bimolecular reaction.
6. What is Flash Photolysis?
7. Differentiate between unimolecular and bimolecular reactions.
8. Name and explain two applications of polarography.
9. What are Amperometric Titrations?
10. How do you define limiting current density ( $j_d$ ) in the technique of Polarography? (10×1=10)

## PART-B

(Each question carries 3 marks)

11. Starting with the Butler-Volmer equation, derive the mathematical expression for Tafel equation and draw the Tafel plot.
12. Write a short note on Bjerrum's theory of ion association in electrolyte solutions.
13. Write the mathematical expression of Lippmann equation. Also plot the dependence of Surface Tension on Potential difference as dictated by Lippmann equation.
14. Write a short note on homogenous catalysis.
15. Compare Arrhenius theory and Activated Complex Theory.

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16. Discuss the postulates and outcomes of collision theory of Bimolecular Gaseous reactions.
17. By providing a suitable example, explain the chemistry behind kinetics of chain reactions.
18. Write a note on Kinetics of Fast reactions.
19. Draw and explain the nature of polarographic wave obtained when more than one reducible species (e.g.  $\text{Cu}^{2+}$ ,  $\text{Pb}^{2+}$ , and  $\text{Zn}^{2+}$ ) are present in a solution.
20. Differentiate between anodic and cathodic polarographic waves.
21. Write mathematical expression for half wave potential.
22. Draw and explain various features of a typical Cyclic Voltagram.

(8×3=24)

**PART-C**

(Each question carries 8 marks)

23. Write a note on three structural models of electrified interfaces.
24. Write a note on the electrochemistry of the process of corrosion. Suggest methods to prevent corrosion on the basis of these electrochemical processes involved in corrosion.
25. Describe three methods used for determining the order of a reaction.
26. Derive the Ilkovic equation from Fick's Laws of Diffusion.

(2×8=16)

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