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# AB-233675

## M.Sc. (Semester-II) Examination, June-2025

## ( Backlog )

## CHEMISTRY

## ( Physical Chemistry-II )

***Time Allowed : Three Hours***

***Maximum Marks : 70***

**Note :** This question paper is divided into four sections. Attempt questions from all four sections as per given directions. Distribution of marks is given in each section.

### SECTION-A

### ( Objective Type Questions )

**Note:** Attempt **any ten** questions. Each question carries 1 mark. [10×1=10]



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1. (i) Maxwell Boltzmann statistics cannot be applied to :

(a) Atom

(b) Molecules

(c) Photons

(d) Lattice

(ii) Corrosion involves _____ reactions.

(a) Oxidation

(b) Reduction

(c) Displacement

(d) Both (a) and (b)

(iii) Which of the following parameters is not related to Butler-Volmer equation in the activation controlled mode?

(a) Electrode Potential

(b) Faradic current

(c) Exchange current density

(d) Turbulence in the electrolyte



(iv) Angular momentum is a _____ quantity.

(a) Scalar

(b) Vector

(c) Dimensionless

(d) None of the above

(v) Passivity is due to _____.

(a) Higher EMF

(b) Lower EMF

(c) Oxide Film

(d) All of the above

(vi) Bose-Einstein statistics is for the _____.

(a) Distinguishable particles

(b) Symmetrical particles

(c) Particles with half integral spin

(d) Particles with integral spin

(vii) In RRK theory, the collision that produce A* molecule is _____.



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(viii) The chemical formula of rust is _____.

(ix) Over voltage will decrease with _____ temperature.

(x) According to Lindermann Hypothesis at Low pressure the unimolecular reaction obeys _____ order kinetics.

(xi) In Bose-Einstein Statistics, one energy state can be occupied by more than one particle. [True/False]

(xii) The eigen value is the amount by which it is stretched or shrunk. [True/False]

## SECTION-B

### ( Very Short Answer Type Questions )

**Note :** Attempt **any five** questions. Each question carries **02** marks. (Word limit 25-30 words). [5×2=10]

2. (i) State Linear variation principle.

(ii) What is Probability?



(iii) What is Cyclic Voltammetry? Write its uses.

(iv) Define semiconductor interfaces. Give example.

(v) Explain over potentials and exchange current density.

(vi) Write the types of corrosion.

(vii) What is fast reaction? Give suitable example.

## SECTION-C

### ( Short Answer Type Questions )

**Note :** Attempt **any five** questions. Each question carries **04** marks. (Word limit : 250 words) [5×4=20]

3. (i) Discuss the application of perturbation theory to Helium atom.

(ii) Give the account of Relaxation and Flash Photolysis.

(iii) Discuss the Debye and Einstein models.

(iv) Explain kinetics of corrosion.



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(v) Discuss the Butler-Volmer equation and its application.

(vi) Describe the Fermi-Dirac and Bose-Einstein statistics.

(vii) Explain linear sweep voltammetry and cyclic voltammetry.

## SECTION-D

### ( Essay Type Questions )

**Note :** Attempt **any three** questions . Each question carries **10** marks. (Word limit : 500 words) [3×10=30]

4. (i) Describe Electrochemical theory of corrosion and corrosion prevention techniques.

(ii) (a) Discuss the Heat Capacity of solid.

(b) Describe the RRKM theory of unimolecular reaction.

(iii) Write short notes on the following :

(a) Gouy-Chapman-Stern model

(b) Angular momentum operator and Ladder Operators



(iv) (a) Explain theory of Double Layer at Semiconductor electrolyte.

(b) Discuss the Maxwell Boltzmann Distribution.

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