

AC-233611

**M.Sc. (Semester-I)
Examination, Dec.-Jan. (2025-26)**

CHEMISTRY

(Physical Chemistry)

Time Allowed : Three Hours

Maximum Marks : 70

Note : This question paper is divided into four sections. All section are compulsory. Attempt questions as per instructions given in each section. 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)

[P.T.O.]

1.(A) Multiple choice Questions :

- (i) The Schrodinger wave equation is a :
- (a) Non Linear differential equation
 - (b) Linear differential equation
 - (c) Second Order equation in time
 - (d) First order Reaction in space
- (ii) The wave function ψ represents :
- (a) Potential Energy
 - (b) Kinetic Energy
 - (c) Probability amplitude
 - (d) Total Energy
- (iii) For the classical ideal gas which of the following is correct :
- (a) $\left(\frac{\partial U}{\partial T}\right)_v = 0$
 - (b) $\left(\frac{\partial U}{\partial V}\right)_T = 0$
 - (c) $\left(\frac{\partial T}{\partial V}\right)_p = 0$
 - (d) $\left(\frac{\partial P}{\partial V}\right)_p = 0$

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(2)

- (iv) What is the value of the vant's Hoff factor for solutes that dissociate in water ?

- (a) >1
- (b) <1
- (c) $=0$
- (d) Not defined

- (v) Threshold energy is equal to :

- (a) Activation Energy
- (b) Normal energy of the reactant
- (c) Activation energy + Energy of reactant
- (d) Activation energy - Energy of reactant

- (vi) Which of the following is not a type of electrochemical cell ?

- (a) Voltaic Cell
- (b) Photovoltaic Cell
- (c) Electrolytic Cell
- (d) Fuel Cell

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(3)

[P.T.O.]



(B) Fill in the blanks :-

- (vii) Sublimation temperature of dry ice (Solid CO_2) is _____ $^{\circ}\text{C}$.
- (viii) Tyndall effect is related to the _____ of light.
- (ix) An emulsion consists of _____.
- (x) What will be the resultant of $A \times O$ (O is zero) _____.
- (xi) The state of a Quantum mechanical system is completely specified by _____.
- (xii) What is the direction of flow of electrons in an electrolytic cell _____ externally.

SECTION-B

(Very Short Answer Type Questions)

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

2. (i) What is Activity ?

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- (ii) Define the steric factor.
- (iii) What is partial molar enthalpy ?
- (iv) What is mean by Debye length ?
- (v) What is Hamiltonian operator ?
- (vi) Define the Fugacity.
- (vii) What is complex Number ?

SECTION-C

(Short Answer Type Questions)

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

3. (i) What is Vector Quantity ?
- (ii) Discuss Vant's Hoff hypothesis.
- (iii) Write the methods of determining rate laws.
- (iv) Discuss the Belousov-Zhabotinsky (BZ) reaction (Oscillatory Reaction).

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(5)

[P.T.O.]



- (v) Discuss the Chemisorption and Desorption Rates.
- (vi) Explain Debye-Huckel Onsager treatment and extension.
- (vii) Derive the Lippmann Equation.

SECTION-D

(Long Answer Type Questions)

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

4. (i) Explain the Collision theory of reaction rates and limitation of Collision theory.

OR

Explain the Dynamic chain reaction (Hydrogen - Bromine and Hydrogen Chlorine Reaction).

- (ii) Explain Biomolecular Surface reaction. Reaction between a gas molecular an adsorbed molecule.

OR

Explain the following :

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- (a) Comparison of Homogenous and Heterogenous Reaction Rates.
- (b) Surface Heterogeneity.
- (iii) Derive the derivation of Electrocapillarity.

OR

Discuss the Debye-Huckel Limiting law and Debye Huckel theory for activity coefficient of electrolytic solution.

- (iv) What is meant by Chemical-Potential? How does chemical potential vary with temperature and pressure?

OR

Explain the partial molar volume and partial molar heat content.

—x—

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