

2023

Time - 3 hours

Full Marks - 60

Answer all groups as per instructions.

Figures in the right hand margin indicate marks.

GROUP - A

1. Fill in the blanks. (all) [1 × 8
- (a) The incongruent melting point is called _____ temperature.
- (b) The number of components for the equilibrium
$$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$$
 is _____.
- (c) On adding NaCl to phenol water system, the critical solution temperature (CST) _____.
- (d) A mixture solution of ethanol and water with 95.6% ethanol is an _____.
- (e) The unit of rate constant for zero order reaction is _____.
- (f) Half life of a 1st order reaction is _____ of initial concentration.
- (g) The Freundlich isotherm fails in case the concentrate of the adsorbate is _____.

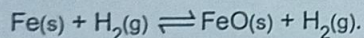
[2]

- (h) _____ enzyme is used as a catalyst for the conversion of starch to glucose.

GROUP – B

2. Answer any eight of the following questions within two to three sentences each. [1½ × 8]

- (a) Write down the number of components and number of phases and degrees of freedom for :



- (b) How is the phase diagram of water helpful in explaining ice skating ?
- (c) Define eutectic point.
- (d) What do you mean by maximum boiling azeotropes ?
- (e) What is the effect of pressure on a system having UCST as well as LCST ?
- (f) The rate constant of a certain reaction was found to be doubled on raising the temperature from 25^o C to 35^o C. Calculate its activation energy.
- (g) How graphical method helps to determine the order of a reaction ?
- (h) What is meant by positive and negative adsorption ?

[3]

- (i) What activated charcoal is a better adsorbent than ordinary charcoal ?
- (j) What do you mean by selectivity of a catalyst ?

GROUP – C

3. Answer any eight of the following questions within 75 words each. [2 × 8]

- (a) What is the significance of triple point in the phase diagram of water ? Why does it not occur at 0^o C ?
- (b) What do you understand by triple point in case of sulphur system ?
- (c) What do you mean by congruent and incongruent melting points ? Give one example of each.
- (d) What are ideal and non-ideal solutions ? Give examples.
- (e) Write the practical application of distribution law.
- (f) $\frac{3}{4}$ th of a reaction of first order was completed in 10 minutes. Calculate half life period of this reaction.
- (g) Describe some characteristics of second order reaction.
- (h) Distinguish physical adsorption and chemical adsorption.
- (i) Explain the absorption theory of catalysis.
- (j) Write a note on heterogeneous catalysis.

[4]

GROUP – D

Answer all questions within 500 words each.

4. State phase rule and derive it thermodynamically. How is phase rule applied in the preparation of freezing mixture ? [6]

OR

Draw and discuss the phase diagram of water system.

5. Describe Nernst distribution law. [6]

OR

Write notes on within 250 words each. [3 × 2]

(i) Phenol-water binary system

(ii) Water-Nicotine system

6. Derive an expression for the kinetics of first order reaction and write some of the characteristics of it. [6]

OR

Describe in detail about the collision theory of reaction.

7. Derive Michaelis-Menten equation in enzyme catalysis and show the result graphically illustrating the change in order of kinetics involved. [6]

OR

Give a brief account of Langmuir adsorption isotherm.