



Date: 11-11-2024

Dept. No.

Max. : 100 Marks

Time: 09:00 am-12:00 pm

SECTION A

Answer ANY FOUR of the following

4 x 10 = 40 Marks

1. Draw the labelled phase diagram of water system and explain the various points, lines and areas.
2. (a) Derive Clausius-Clapeyron equation. (6)
(b) Determine the number of components, number of phases and degrees of freedom in the following system. (4)
$$\text{CaCO}_{3(s)} \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$$
3. State Raoult's law. Explain the positive and negative deviation from this law with an example.
4. Explain the following: (i) Steam distillation (ii) Azeotropic distillation
5. Derive the rate equation for the first-order reaction and show that half-life is independent of initial concentration
6. Discuss the various factors affecting rate of chemical reactions.
7. (a) The rate constant of a reaction at 400 and 200 K are 0.04 and 0.02 s⁻¹ respectively. Calculate the value of activation energy. (5)
(b) Discuss the Lindeman hypothesis of unimolecular reactions. (5)
8. Illustrate any two types of enzyme inhibition reactions with mechanism.

SECTION B

Answer ANY THREE of the following

3 x 20 = 60 Marks

9. (a) Explain the phase diagram of lead-silver system and discuss its application in the desilverization of lead. (10)
(b) Draw and explain the phase diagram of a three-component system consisting of the acetic acid-chloroform-water system. (10)
10. (a) Derive thermodynamically the relation connecting depression in freezing point of a solution and its molality. (10)
(b) Define critical solution temperature. Explain the CST of phenol-water system. (10)
11. (a) State Nernst distribution law. How does it vary when the solute undergoes association and dissociation in the solvent? (10)
(b) Write the postulates of transition state theory. (10)
12. (a) Derive an expression for the rate constant of a second-order reaction of the type,
$$2A \rightarrow \text{Product}.$$
 (10)
(b) Write the different methods to determine the order of a reaction. (10)
13. (a) Explain the mechanism of the following reactions: (10)
(i) Thermal decomposition of acetaldehyde (ii) Hydrogen-bromine chain reaction.
(b) Discuss the collision theory of bimolecular reactions. (10)
14. (a) Derive Michaelis-Menten equation and explain the kinetics of enzyme catalysis. (10)
(b) Discuss the adsorption theory of catalysis. (10)

