2026

CHEMISTRY

(Major)

Paper : CHE4200204MJ

(Reaction Dynamics)

Full Marks : 45

Time : 2 hours

Anandaram Dhekial Phookan College Library * Nagaon : Assam *
Acc. No.
Date

The figures in the margin indicate the full marks for the questions.

1. **Answer the following questions :** 1×5

(a) The solvation of products has no effect on the rate of reaction. Justify.

(b) How do you define rate of reaction?

(c) Define temperature coefficient of a reaction.

(d) What is instantaneous reaction?

(e) Give an example where the steady state approximation is commonly used.

2. **Answer *any five* of the following questions :** 2×5

(a) Distinguish with an example each, a slow reaction and a reaction of moderate rate.

(b) What are the factors that influence the rate of reaction according to collision theory?

(c) Write a short note on "Energy of Activation".

(d) How temperatures affect the rate of opposing reactions?

(e) How does the Lindemann mechanism explain the apparent order of unimolecular reactions?

(f) What is a limiting reagent, and why is it important in chemical reactions?

(g) Define opposing reactions. Give an example.

(h) Even an exothermic reaction has activation energy. Why?

(i) What is the significance of the activated complex in transition state theory?

(j) What role is played by enzyme inhibitors in enzyme catalysis?

3. **Answer *any four* of the following questions :** 4×5

(a) Discuss the kinetics of diffusion controlled reactions in solutions.

(b) Discuss the mechanism and kinetics of enzyme-catalyzed reaction.

(c) What are consecutive reactions? Give an example and discuss the concentration of intermediates. What are the factors that influence the rate of consecutive reactions? 1+2+2

(d) Discuss Ostwald dilution method to determine the order of reaction.

(e) Differentiate between diffusion-controlled and activation-controlled reactions.

(f) If activation energy of a reaction is 80.9 kJ/mol then calculate the fraction of molecules at 400 °C. Which have enough energy to form products?

(g) Write a short note on Primary and Secondary Salt effect.

(h) Discuss Hinshelwood Theory.

4. **Answer *any one* of the following questions :** 10×1

(a) Explain the difference between equilibrium and steady state. Provide examples of each. What are factors that influence the attainment of equilibrium in a chemical reaction? How does this differ from a system at steady state?

(b) (i) What is half life of a reaction? Derive expression for half life of a zero order and first order reactions. 1+4

(ii) Derive an expression for the rate constant of a second order reaction. 5

(c) (i) 90% of a substance decomposed through a first order reaction in one hour. Calculate the rate constant for the reaction in min^{-1}. 1+4

(ii) State and explain the term: temperature coefficient of a reaction. What is meant by energy of activation? Explain how energy of activation is determined with the help of Arrhenius equation. 2+1+2

(d) (i) What is meant by "order of a reaction"? What would be the order of reaction $A + 3B \rightarrow product$ when only B is rate determining? Discuss any one method for the determination of order of reaction. 1+2+3

(ii) For the first-order isomerization of an organic compound at 130 °C, the activation energy is 108.4 kJ mol^{-1} and the rate constant is 9.12×10^{-4} s^{-1}. Calculate the standard entropy of activation for the reaction. 4

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