

Class 12 Chemistry - Chemical Kinetics

NEET track | Short Notes + 5 CBSE-based questions + 5 NEET PYQ-based questions with solutions

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Format: Quick revision + solved practice	Chapter scope: Class 12 Chemistry

1. Quick Short Notes

- Rate of reaction is the change in concentration of reactant or product per unit time.
- For a reaction $aA + bB \rightarrow \text{products}$, rate law may be written as $r = k[A]^m[B]^n$.
- Order of reaction = $m + n$. It is obtained experimentally and may differ from stoichiometric coefficients.
- Molecularity is the number of reacting species colliding in an elementary step.
- Zero-order integrated law: $[A] = [A]_0 - kt$ and $t_{1/2} = [A]_0 / 2k$.
- First-order integrated law: $\ln[A] = \ln[A]_0 - kt$ and $t_{1/2} = 0.693/k$.
- Second-order integrated law for $2A \rightarrow \text{products}$: $1/[A] = 1/[A]_0 + kt$.
- Arrhenius equation: $k = A e^{(-E_a/RT)}$. Higher temperature generally increases k .
- A catalyst speeds up reaction by lowering activation energy; it does not change equilibrium constant.
- Board tip: always write correct units of rate constant because they identify order.

2. CBSE-based Board Practice

Q1. Differentiate between order and molecularity of a reaction.

Solution: Order is the sum of powers of concentration terms in the experimentally determined rate law. Molecularity is the number of species colliding in an elementary step and is always a whole number.

Q2. The rate constant of a first-order reaction is 0.231 min^{-1} . Find its half-life.

Solution: For first order, $t_{1/2} = 0.693/k = 0.693/0.231 = 3.0 \text{ min}$.

Q3. For a zero-order reaction with $[A]_0 = 0.60 \text{ M}$ and $k = 0.02 \text{ M min}^{-1}$, find concentration after 10 min.

Solution: For zero order, $[A] = [A]_0 - kt = 0.60 - 0.02 \times 10 = 0.40 \text{ M}$.

Q4. Why is half-life independent of initial concentration in a first-order reaction?

Solution: Because for first-order kinetics $t_{1/2} = 0.693/k$, which contains no concentration term.

Q5. If the unit of rate constant is s^{-1} , identify the order of the reaction.

Solution: A rate constant with unit s^{-1} corresponds to a first-order reaction.

3. NEET PYQ-based Practice

Q1. What is the effect of a catalyst on equilibrium position?

Solution: A catalyst changes only the rate at which equilibrium is reached. It does not shift the equilibrium position.

Q2. Which graph is a straight line for a zero-order reaction?

Solution: A plot of concentration [A] versus time is a straight line with negative slope.

Q3. How does half-life of a first-order reaction depend on initial concentration?

Solution: It is independent of initial concentration.

Q4. State the unit of rate constant for a second-order reaction.

Solution: The unit is $\text{L mol}^{-1} \text{s}^{-1}$ or $\text{M}^{-1} \text{s}^{-1}$.

Q5. At the same temperature, which reaction is generally slower: one with higher activation energy or lower activation energy?

Solution: The reaction with higher activation energy is slower because fewer molecules can cross the energy barrier.

Practice tip: First revise the short notes, then attempt CBSE board questions in written format, and finally solve the exam-specific section in timed mode.