

CHEMISTRY

CLASS XII

COMPETENCY BASED EXAM – SEPTEMBER 2025

Chemical Kinetics MCQs

Q1. The rate of a reaction doubles when the concentration of reactant is doubled. The order of reaction is:

- A. Zero
- B. One
- C. Two
- D. Fractional

Answer: B. One

Reasoning: $\text{Rate} \propto [A]^1$, so doubling $[A]$ doubles rate \rightarrow first order.

Q2. The unit of rate constant for a second-order reaction is:

- A. s^{-1}
- B. $\text{mol L}^{-1} \text{s}^{-1}$
- C. $\text{L mol}^{-1} \text{s}^{-1}$
- D. $\text{mol}^2 \text{L}^{-2} \text{s}^{-1}$

Answer: C. $\text{L mol}^{-1} \text{s}^{-1}$

Reasoning: For second order, $k = \text{Rate}/[A]^2 \rightarrow \text{units} = (\text{mol L}^{-1} \text{s}^{-1})/(\text{mol}^2 \text{L}^{-2}) = \text{L mol}^{-1} \text{s}^{-1}$.

Q3. Assertion-Reason

Assertion (A): Half-life of a first-order reaction is independent of initial concentration.

Reason (R): For first-order, $(t_{1/2}) = 0.693/k$.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A. Both A and R are true, and R is the correct explanation of A

Q4. The activation energy of a reaction is 50 kJ/mol. If temperature increases, the rate constant will:

- A. Decrease
- B. Increase
- C. Remain constant
- D. Become zero

Answer: B. Increase

Reasoning: Arrhenius equation: $(k = Ae^{-E_a/RT})$. Higher $T \rightarrow$ larger k .

Q5. The slope of a straight line in a plot of $\log k$ vs $1/T$ gives:

- A. Activation energy
- B. $-E_a/2.303R$
- C. Frequency factor
- D. Order of reaction

Answer: B. $-E_a/2.303R$

Reasoning: From Arrhenius equation in logarithmic form.

Q6. For a zero-order reaction, the rate constant has units:

- A. $\text{mol L}^{-1} \text{s}^{-1}$
- B. s^{-1}
- C. $\text{L mol}^{-1} \text{s}^{-1}$
- D. $\text{mol}^2 \text{L}^{-2} \text{s}^{-1}$

Answer: A. $\text{mol L}^{-1} \text{s}^{-1}$

Reasoning: Rate = k , independent of concentration.

Q7. Assertion-Reason

Assertion (A): Catalyst increases the rate of reaction.

Reason (R): Catalyst lowers the activation energy by providing an alternative pathway.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A. Both A and R are true, and R is the correct explanation of A

Q8. The decomposition of N_2O_5 is a:

- A. Zero-order reaction

- B. First-order reaction
- C. Second-order reaction
- D. Third-order reaction

Answer: B. First-order reaction

Reasoning: Rate $\propto [N_2O_5]$.

Q9. The rate law for a reaction is Rate = $k[A]^2[B]$. The overall order of reaction is:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C. 3

Reasoning: Order = sum of powers = 2 + 1 = 3.

Q10. Assertion-Reason

Assertion (A): In a first-order reaction, the time required for 75% completion is twice the half-life.

Reason (R): For first-order, $(t = \frac{2.303}{k} \log \frac{[A]_0}{[A]})$.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

Answer: A. Both A and R are true, and R is the correct explanation of A

Reasoning: For 75% completion, $[A] = \frac{1}{4} [A]_0 \rightarrow t = 2 \times t_{1/2}$.