# Reaction Kinetics & Rate Laws

*INSTRUCTOR / SELF-STUDY ANSWER KEY*

Answers and reasoning appear in red. Use these to discuss why incorrect choices are incorrect.

## Part A — Concept checks

1. **For rate = k[A]², doubling [A] changes the rate by…**

   Answer: B. 4× — (2[A])² = 4[A]².

2. **The order of an overall reaction is determined from…**

   Answer: B. experimental data — Use measured kinetics or a justified mechanism.

3. **A catalyst usually…**

   Answer: B. lowers Ea for a pathway — Catalysts lower the effective activation-energy barrier.

4. **For a zero-order reaction in A, doubling [A] changes rate by…**

   Answer: B. 1× — Rate is independent of [A] in a zero-order rate law.

5. **Increasing temperature often increases reaction rate because…**

   Answer: B. more molecules exceed the activation barrier — Arrhenius behavior increases rate constants with temperature for positive Ea.

6. **Which quantity typically has units of concentration per time?**

   Answer: A. reaction rate — An introductory rate is Δconcentration/Δtime.

## Part B — Application and explanation

7. If a reaction is first order in A, what happens to the rate when [A] doubles?

   Model solution: rate = k[A]. Doubling [A] gives rate′ = k(2[A]) = 2 × original rate. Final answer: The rate doubles

8. Explain why this guideline matters, with an example of what could go wrong if you ignore it: Never assign overall reaction orders from the balanced chemical equation unless a valid elementary-step mechanism justifies it.

   Model explanation: Never assign overall reaction orders from the balanced chemical equation unless a valid elementary-step mechanism justifies it. Example/check: Reaction rate is the change of a concentration per unit time. Stoichiometric factors must be considered when comparing rates for different reactants/products.

### REFERENCE RELATIONSHIP

rate = k[A]^m[B]^n (orders determined experimentally)