JEE Main 2026 Chemical Kinetics Numericals

1. The half-life of a zero-order reaction is 30 minutes. Find the rate constant kkk.

2. For a reaction 2A+B→Products2A + B \to Products2A+B→Products, rate law is given as r=k[A]2[B]1r = k[A]^2[B]^1r=k[A]2[B]1. Calculate the overall order of the reaction.

3. Calculate the concentration of reactant remaining after 1 hour for a first-order reaction with rate constant k=0.1 min-1 = 0.1\, \text{min}^{-1}k=0.1min−1 and initial concentration 0.5 M.

4. In a reaction, the time taken for the reactant concentration to fall to one-fourth is 40 minutes. Calculate the half-life of the reaction assuming it is first order.

5. Given rate constants at two temperatures as k1=2×10−3k_1 = 2 \times 10^{-3}k1=2×10−3 s−1^{-1}−1 at 300 K and k2=5×10−3k_2 = 5 \times 10^{-3}k2=5×10−3 s−1^{-1}−1 at 310 K, calculate Ea using the Arrhenius equation.

6. For a reaction following first order kinetics, show how the rate constant can be determined graphically.

7. Calculate the half-life of a reaction whose rate constant is 4.62×10−44.62 \times 10^{-4}4.62×10−4 s−1^{-1}−1.

8. If the rate of a reaction is expressed as r=k[A]m[B]nr = k[A]^m[B]^nr=k[A]m[B]n, find the order of reaction with respect to A and B given the following data: When [A][A][A] doubles and [B][B][B] remains constant, the rate increases by 4 times.

9. Derive the integrated rate law for a second-order reaction.

10. Calculate the rate constant kkk if the concentration of a reactant decreases from 0.8 M to 0.2 M in 30 minutes for a first-order reaction.

11. Discuss the effect of temperature on the rate constant using the Arrhenius equation with an example.

12. For a parallel reaction A→BA \to BA→B and A→CA \to CA→C, find the expression of total rate and how the concentration of A varies with time.