Chemistry Formula Sheet

Chapter by chapter, topic by topic. Written by the PadhoNa team for quick revision.

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CHAPTER 19

Chemical Kinetics

Rate law

$$\text{rate} = k[A]^x[B]^y, \qquad \text{order} = x + y; \qquad \text{units of } k: \ (\text{mol L}^{-1})^{1-n}\,\text{s}^{-1}$$

$$-\frac{1}{a}\frac{d[A]}{dt} = \frac{1}{c}\frac{d[C]}{dt} \ \text{ for } aA \to cC$$

Integrated rate equations

ZERO ORDER

$$[A] = [A]_0 - kt, \qquad t_{1/2} = \frac{[A]_0}{2k}$$

FIRST ORDER

$$k = \frac{2.303}{t}\log\frac{[A]_0}{[A]}, \qquad t_{1/2} = \frac{0.693}{k}$$

$$t_{99.9\%} \approx 10\,t_{1/2}; \qquad n\text{th order: } t_{1/2} \propto [A]_0^{1-n}$$

Temperature dependence

ARRHENIUS

$$k = Ae^{-E_a/RT}; \qquad \log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

$$\text{a catalyst lowers } E_a; \ \text{rate roughly doubles for every 10 K rise}$$

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