

CHEMICAL KINETICS

Study the rate (velocity) at which a chemical reaction proceeds.

Study the factors that affect the rate of a reaction.

REACTION RATES

Reaction rate is expressed as the change in concentration of a species over time.

This may be written as a differential, $\text{rate} = \frac{d[A]}{dt}$

or as an average change over time. $\text{rate} = \frac{\Delta[A]}{\Delta t}$

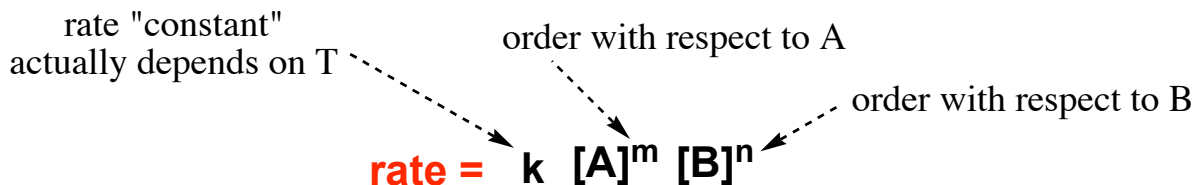
The expression for the rate of one reaction in terms of any one of the reactants or products, must take into account stoichiometry.



$$-\frac{1}{a} \frac{d[A]}{dt} = -\frac{1}{b} \frac{d[B]}{dt} = \frac{1}{y} \frac{d[Y]}{dt} = \frac{1}{z} \frac{d[Z]}{dt}$$

RATE LAWS

Rate laws express how the rate of reaction depends on concentrations of reactants and products.



SIMPLE RATE LAWS

ZERO ORDER

$$\text{rate} = k [A]^0 = k$$

$$[A]_t = [A]_0 - akt$$

FIRST ORDER

$$\text{rate} = k [A]^1$$

$$[A]_t = [A]_0 e^{-akt}$$

SECOND ORDER

$$\text{rate} = k [A]^2$$

$$\frac{1}{[A]_t} = \frac{1}{[A]_0} + akt$$