# 1 Basic Terms

Before we can begin giving notes, we need to learn some key terms that are necessary to know before solving problems in chemical kinetics.

- **Kinetics:** The rate at which chemical reactions happens. Kinetics deals with studying how fast a reaction occurs, and how much energy it takes to occur.
- **Order:** The amount of effect a substance has on the rate of a reaction.
- **Rate Law:** The mathematical relationship of the concentration of reactants against the concentration of products.
- **Activation Energy:** The energy necessary for a reaction to occur. For example, molecules will need to collide at a certain speed for them to react, which requires a certain amount of internal energy.
- **Rate Constant:** A factor found in rate laws, represented by $k$
- **Half-life** The time for a substance to decrease to 50% of its original concentration. Represented by $t_{1/2}$.

# 2 The General Rate Law

For a reaction

$$\mathrm{aA} + \mathrm{bB} \longrightarrow \mathrm{cC} + \mathrm{dD}$$

The general rate law says

$$-\frac{1}{\mathrm{a}}\left(\frac{d[\mathrm{A}]}{dt}\right) = -\frac{1}{\mathrm{b}}\left(\frac{d[\mathrm{B}]}{dt}\right) = \frac{1}{\mathrm{c}}\left(\frac{d[\mathrm{C}]}{dt}\right) = \frac{1}{\mathrm{d}}\left(\frac{d[\mathrm{D}]}{dt}\right) \tag{1}$$

Where the lowercase letters represent the stoichiometric coefficients of each substance. Note the negative before the rates for substance A and B. This is because they are consumed, while C and D are produced.