CONCEPT: AVERAGE RATE OF REACTION

- **Average (General) Rate:** change in concentration (M) of a reactant or product over a period of time.
  - □ Change in concentrations: reactant is _____ while product is _____.
    - *Note:* As reaction proceeds, reactants are _____ and products are _____.

Average Rate of Reaction

$$\text{Average Rate} = -\frac{\Delta [\text{reactant}]}{a\ \Delta \text{ time}} = +\frac{\Delta [\text{product}]}{b\ \Delta \text{ time}}$$

- □ [ ] = concentration (M) of reactant & product
- □ a, b = stoichiometric coefficients
- □ Δ [ ] = [ ]$_{final}$ - [ ]$_{initial}$
- □ Δ time = $t_{final} - t_{initial}$

EXAMPLE: Provide the expressions for rate of disappearance of reactants and rate of appearance of products for the following reaction: $2\ C_3H_7OH\ (l) + 9\ O_2\ (g) \longrightarrow 6\ CO_2\ (g) + 8\ H_2O\ (g)$

Average Rate Calculations

- Knowing how to write expressions for the rate of reaction will help to perform calculations for various time intervals.

EXAMPLE: Calculate the average rate of change in concentration of NO in the first 5 seconds of the reaction if the concentration dropped from 1.3 M to 1.09 M.

$$2\ NO\ (g) + 2\ H_2\ (g) \longrightarrow N_2\ (g) + 2\ H_2O\ (g)$$

PRACTICE: Consider the following reaction: $2\ H_2O_2\ (aq) \longrightarrow 2\ H_2O\ (l) + O_2\ (g)$

Calculate the rate of the reaction between 25 sec and 65 sec.

Time (sec)	[H_2O] (M)
0.0	0.0
15	0.45
25	1.30
40	1.94
65	2.02