

## Variables that Effect Reaction Rates

### Aim

- to describe the influences on reaction rates

### Notes

#### Nature of reactants

- ★ chemical reactions occur by breaking and rearranging existing bonds
- ★ the less electrons need to be rearranged, the faster the reaction is
  - ☆ Reactions between ionic substances in aqueous solution are rapid
    - ★ double replacement reactions
  - ☆ Reactions in which covalent bonds are broken occur slowly at room temperature
    - ★ decomposition of hydrogen peroxide

**Concentration of reactants** - an increase in concentration results in an increase in the frequency of collisions

- ★ usually as the concentration increases, the reaction rate increases
  - ☆ if the concentration of only the reactants that are NOT involved in the rate determining step are increased, the number of collisions are increased without effecting the reaction rate
- ★ gas and liquid - increasing pressure increases the concentration of the gas

**Surface area** - increasing the surface area of reactants increases the opportunity for collisions

**Temperature** - as temperature increases so does the reaction rate

- ★ Increasing temperature increases kinetic energy of the particles increasing both the frequency and effectiveness of collisions
- ★ An increase in temperature of 10°C approximately doubles the speed of many reactions

**Catalysts** - speed up reactions without being permanently altered

- ★ Change the reaction mechanism so less activation energy is required

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**Answer the questions below by circling the number of the correct response**

- The net effect of a catalyst is to change the
  - potential energy of the reactants
  - potential energy of the products
  - heat of reaction
  - rates of both the forward and reverse reactions
- An increase in temperature increases the rate of a chemical reaction because the
  - activation energy increases
  - activation energy decreases
  - number of molecular collisions increases
  - number of molecular collisions decreases
- Which change may occur in a reaction system when a catalyst is added?
  - The equilibrium point is reached more rapidly.
  - The potential energy of the reactants increases.
  - The potential energy of the products decreases.
  - The heat of reaction becomes smaller.
- As the concentration of a reactant in a chemical reaction increases, the rate of the reaction generally
  - decreases
  - increases
  - remains the same
- As the rate of a given reaction increases due to an increase in the concentration of the reactants, the activation energy for that reaction
  - decreases
  - increases
  - remains the same
- An increase in the rate of all chemical reactions results from
  - an increase in pressure
  - a decrease in pressure
  - an increase in temperature
  - a decrease in temperature
- If the pressure on a gaseous system is increased, the rate of reaction increases because
  - the activation energy is increased
  - the temperature is decreased
  - the concentration is increased
  - the volume is increased
- The rate of a reaction may be increased by
  - an increase in concentration
  - a catalyst
  - an increase in temperature
  - all of the above.