Chemical Reactions

Physical vs. Chemical Changes

- **Physical changes:** Alter the state or appearance of a substance without changing its chemical composition (e.g.,melting, freezing, boiling).
- **Chemical changes:** Involve the rearrangement of atoms to form new substances with different properties (e.g.,burning, rusting, decomposition).

Collision Theory

- **Chemical reactions:** Occur when particles collide with sufficient energy and the correct orientation.
- **Factors affecting reaction rate:**
  - **Collision frequency:** Increased concentration, pressure, or temperature.
  - **Particle energy:** Increased temperature.
  - **Particle size:** Smaller particles have a larger surface area for collisions.

Factors Affecting Rate of Reaction

- **Concentration:** Higher concentration leads to more collisions.
- **Pressure:** Affects gas-phase reactions, higher pressure increases collision frequency.
- **Temperature:** Higher temperature increases both collision frequency and particle energy.
- **Particle size:** Smaller particles have a larger surface area for collisions.
- **Catalysts:** Increase reaction rate without being consumed.

Experimental Methods

- Design experiments to investigate the effect of various factors on reaction rates.

- Common techniques include measuring gas production, mass loss, or color change.

Photochemical Reactions

- **Photosynthesis:** Plants convert light energy into chemical energy to produce glucose.
- **Reduction of silver halide:** Used in photography, light causes silver ions to be reduced to silver metal.

Reversible Reactions

- **Reactions that can proceed in both directions.**
- **Equilibrium:** Reached when the forward and reverse reaction rates are equal.
- **Factors affecting equilibrium:**
  - **Concentration:** Shifting the equilibrium towards the side with fewer moles of gas.
  - **Temperature:** Favors the endothermic reaction at higher temperatures.
  - **Pressure:** Affects gas-phase reactions, shifting equilibrium towards the side with fewer moles of gas.
  - **Catalysts:** Do not affect the position of equilibrium, only the rate of reaction.

Redox Reactions

- **Oxidation:** Gain of oxygen or loss of electrons.
- **Reduction:** Loss of oxygen or gain of electrons.
- **Redox reactions:** Involve both oxidation and reduction.

Remember:

- Practice balancing chemical equations and predicting reaction products.
- Understand the factors affecting reaction rates and equilibrium.
- Apply your knowledge to real-world examples.