Class 10 Science: Chapter 1 – Chemical Reactions and Equations (Revision Notes)

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1. Chemical Reactions

- **Definition**: A chemical reaction involves the transformation of one or more substances into new substances.
- **Characteristics**:
  - Change in color
  - Change in temperature
  - Formation of a precipitate
  - Gas evolution
  - Change in state

Example: When magnesium is burned in air, it reacts with oxygen to form magnesium oxide:
$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

Practice Question:

- Write the observation when iron reacts with sulfuric acid. Identify the type of reaction.

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2. Chemical Equations

- **Definition**: A representation of a chemical reaction using symbols and formulas.
- **Types of Chemical Reactions**:
  - **Combination Reaction**: Two or more reactants combine to form a single product.
    - **Example**: $\mathrm{CaO} + \mathrm{H_2O} \rightarrow \mathrm{Ca(OH)_2}$
  - **Decomposition Reaction**: A single compound breaks down into two or more products.
    - **Example**: $2\mathrm{HgO} \rightarrow 2\mathrm{Hg} + \mathrm{O_2}$
  - **Displacement Reaction**: One element displaces another in a compound.
    - **Example**: $\mathrm{Zn} + \mathrm{CuSO_4} \rightarrow \mathrm{ZnSO_4} + \mathrm{Cu}$
  - **Double Displacement Reaction**: Exchange of ions between two compounds.
    - **Example**: $\mathrm{Na_2SO_4} + \mathrm{BaCl_2} \rightarrow \mathrm{BaSO_4} + 2\mathrm{NaCl}$

Practice Question:

- Classify the following reactions:
  $\mathrm{Fe} + \mathrm{CuSO_4} \rightarrow \mathrm{FeSO_4} + \mathrm{Cu}$

3. Balancing Chemical Equations

- **Law of Conservation of Mass**: Mass can neither be created nor destroyed in a chemical reaction. Therefore, the number of atoms of each element must be the same on both sides of the equation.

Steps to Balance:

1. Write the unbalanced equation.
2. Balance atoms of each element.
3. Balance oxygen and hydrogen last.
4. Ensure equal number of atoms on both sides.

Example: Unbalanced: $\mathrm{Fe} + \mathrm{O_2} \rightarrow \mathrm{Fe_2O_3}$
Balanced: $4\mathrm{Fe} + 3\mathrm{O_2} \rightarrow 2\mathrm{Fe_2O_3}$

Practice Question:

- Balance the equation:
  $\mathrm{Al} + \mathrm{O_2} \rightarrow \mathrm{Al_2O_3}$

4. Types of Chemical Reactions

- **Oxidation**: Addition of oxygen or removal of hydrogen.
  - **Example**: $\mathrm{Cu} + \mathrm{O_2} \rightarrow \mathrm{CuO}$
- **Reduction**: Removal of oxygen or addition of hydrogen.
  - **Example**: $\mathrm{CuO} + \mathrm{H_2} \rightarrow \mathrm{Cu} + \mathrm{H_2O}$

Oxidation-Reduction (Redox) Reactions:

- **Example**:
  $\mathrm{ZnO} + \mathrm{C} \rightarrow \mathrm{Zn} + \mathrm{CO}$
  Here, ZnO is reduced, and carbon is oxidized.

Practice Question:

- Identify the oxidizing and reducing agents in the reaction:
  $\mathrm{MnO_2} + 4\mathrm{HCl} \rightarrow \mathrm{MnCl_2} + \mathrm{Cl_2} + 2\mathrm{H_2O}$

5. Effects of Oxidation

- **Corrosion**: The slow destruction of metals due to oxidation, e.g., rusting of iron.
- **Rancidity**: Oxidation of fats and oils, making food smell and taste bad.

Practice Question:

- Explain how corrosion can be prevented.