9Th Class

Solution:

- A solution is a homogeneous mixture composed of two or more substances. The substance present in the largest amount is called the solvent, and the others are called solutes.

2. **Solute and Solvent:**

- **Solute:** The substance that is dissolved in a solution.
- **Solvent:** The substance in which the solute is dissolved to form a solution.

❖ Types of Solutions:

1. **Based on State of Matter:**

- **Solid Solutions (Alloys):** Homogeneous mixtures of metals, e.g., brass (copper and zinc).
- **Liquid Solutions:** Common examples include saltwater (salt dissolved in water).
- **Gaseous Solutions:** Air is an example, with various gases like nitrogen, oxygen, and carbon dioxide.

2. **Based on Concentration:**

- **Dilute Solution:** Contains a relatively small amount of solute.
- **Concentrated Solution:** Contains a large amount of solute.

❖ Solubility:

1. **Definition:**
   - Solubility is the maximum amount of solute that can dissolve in a specific amount of solvent at a given temperature.

2. **Factors Affecting Solubility:**
   - **Temperature:** In general, solubility increases with temperature for solid solutes in liquid solvents, but it can decrease for some gases in liquid solvents.

- **Pressure:** The effect of pressure is significant for gases but less so for solids and liquids.

❖ Expressing Concentration:

1. **Mass Percent:**
   - Mass %=Mass of Solute / Total Mass of Solution ×100%

   - **Molarity (M):**
   - M = Volume of solution in liters / Number of moles of solute

2. **Molality (m):**

   - *m* = Number of moles of solute / Mass of solvent in kg

❖ Colligative Properties:

1. **Definition:**

   - Colligative properties depend on the number of solute particles, not the nature of the solute particles.

2. **Examples:**

   - **Lowering of Vapor Pressure**
   - **Elevation of Boiling Point**
   - **Depression of Freezing Point**
   - **Osmotic Pressure**

❖ Solubility Rules:

1. **Ionic Compounds:**

   - Generally, salts of alkali metals and ammonium are soluble.
   - Most nitrates, acetates, and perchlorates are soluble.
   - Most chlorides, bromides, and iodides are soluble, except for those containing $Ag+$, $Pb2+$, and $Hg2^{2}+$.
2. **Common Ion Effect:**

- The presence of a common ion in a solution can reduce the solubility of a salt.

❖ Saturation and Supersaturation:

1. **Saturation:**
    - A solution is saturated when it contains the maximum amount of solute that can dissolve at a particular temperature.
2. **Supersaturation:**
    - A solution can become supersaturated when it holds more solute than it should be able to dissolve at that temperature.