Chemistry Class VIII – Chapter 3

The Amazing World of Solutes, Solvents and Solutions

1. Very Short Answers (2 Marks)

1. What is a mixture?

A mixture is formed when two or more substances are mixed physically in any proportion without undergoing a chemical change.

2. What is a homogeneous mixture?

A homogeneous mixture has a uniform composition throughout. Example: salt solution.

3. Give one example of a heterogeneous mixture.

Oil and water.

4. What is a solution?

A solution is a homogeneous mixture of two or more substances.

5. Define solute.

A solute is the substance that dissolves in a solvent. Example: salt in salt water.

6. Define solvent.

A solvent is the substance that dissolves the solute. Example: water in salt water.

7. Give one uniform mixture from daily life.

Sugar dissolved in water.

8. Give one non-uniform mixture from daily life.

Sand mixed with water.

9. What is meant by concentration of a solution?

Concentration is the amount of solute present in a given amount of solution.

10. What is dilution?

Dilution is the process of decreasing the concentration of a solution by adding more solvent.

11. What is buoyant force?

Buoyant force is the upward force exerted by a fluid on an object immersed in it.

12. Why is dissolved oxygen (DO) important?

Dissolved oxygen is essential for aquatic organisms such as fish to breathe and survive.

2. Short Answers (3 Marks)

1. What happens if extra solute is added to a saturated solution?

A saturated solution cannot dissolve any more solute at a given temperature. If extra solute is added, it remains undissolved at the bottom of the container.

2. Differentiate between homogeneous and heterogeneous mixtures with one example.

Homogeneous mixture	Heterogeneous mixture
Composition is uniform throughout.	Composition is not uniform throughout.
Components are not visibly distinguishable.	Components may be visibly distinguishable.
Example: salt solution.	Example: oil and water.

3. Define solute and solvent with a solid–liquid example.

• **Solute:** The substance that dissolves in a solvent. Example: sugar.
• **Solvent:** The substance that dissolves the solute. Example: water.
When sugar dissolves in water, sugar is the solute and water is the solvent.

4. Why does ORS taste the same in every sip?

ORS tastes the same in every sip because it forms a homogeneous solution. Its ingredients are uniformly distributed throughout the water.

5. State two observations that show "chalk in water" is a heterogeneous mixture.

1. Chalk particles can be seen in water.
2. Chalk particles settle at the bottom when the mixture is left undisturbed.

6. What is meant by saturated, unsaturated, and supersaturated solutions?

• **Unsaturated solution:** Can dissolve more solute at a given temperature.
• **Saturated solution:** Cannot dissolve any more solute at a given temperature.
• **Supersaturated solution:** Contains more dissolved solute than a saturated solution normally can hold at the same temperature. It is generally unstable.

7. How does temperature affect the solubility of (a) most solids in water and (b) gases in water?

(a) The solubility of most solids in water increases with an increase in temperature.
(b) The solubility of gases in water generally decreases with an increase in temperature.

8. List two factors that affect how fast a solid dissolves, without changing the final solubility.

1. Stirring the solution.
2. Crushing the solid into smaller particles.

9. What is meant by dilution and how is it done?

Dilution is the process of decreasing the concentration of a solution by adding more solvent. For example, adding water to concentrated fruit juice makes it more dilute.

10. State two ways to increase the concentration of a solution.

1. Add more solute.
2. Remove some solvent by evaporation.

3. Long Answers (5 Marks)

1. What are saturated, unsaturated, and supersaturated solutions?

Unsaturated solution: A solution that can dissolve more solute at a given temperature.
Example: A small amount of sugar dissolved in water.

Saturated solution: A solution that cannot dissolve any more solute at a given temperature.
Example: Water in which the maximum amount of sugar has dissolved.

Supersaturated solution: A solution that contains more dissolved solute than a saturated solution normally holds at the same temperature. It is unstable and may form crystals easily.
Example: A carefully prepared, cooled supersaturated sugar solution.

2. Define density and relative density. Describe two laboratory methods to determine density.

Density: Density is the mass per unit volume of a substance.
Density = Mass ÷ Volume
SI unit: kg/m³.

Relative density: It is the ratio of the density of a substance to the density of water at the same temperature. It has no unit.
Relative density = Density of substance ÷ Density of water

(i) Density of a liquid
1. Measure the mass of an empty measuring cylinder using a balance.
2. Pour a known volume of liquid into it and measure the total mass.
3. Subtract the empty cylinder's mass to obtain the liquid's mass.
4. Calculate density using mass divided by volume.
Precautions: Read the measuring cylinder at eye level and ensure the cylinder is dry before measuring its empty mass.

(ii) Density of an irregular solid
1. Measure the mass of the solid using a balance.
2. Note the initial water level in a measuring cylinder.
3. Immerse the solid completely in water and note the final water level.
4. Find the volume of the solid by subtracting the initial volume from the final volume.
5. Calculate density using mass divided by volume.
Precautions: Ensure the solid is fully immersed, remove air bubbles, and avoid spilling water.
Common errors: Incorrect balance readings, reading the water level from an angle, and air bubbles attached to the solid.

3. Explain dilution and concentration through two real-life cases. Include one situation where excessive dilution is harmful and another where concentrating is useful.

Dilution decreases the concentration of a solution by adding more solvent. **Concentration** increases the amount of solute relative to the amount of solution.

Case 1 — Dilution: Concentrated fruit juice is diluted by adding water to make it suitable for drinking. However, excessive dilution of ORS can reduce the concentration of its essential salts and sugar, making it unsuitable for proper rehydration. ORS should always be prepared using the exact amount of water specified on the packet.

Case 2 — Concentration: Sugar syrup is concentrated by heating it to evaporate some water. This produces a thicker syrup useful in making sweets.

Thus, dilution and concentration are useful when the correct strength of a solution is needed.

4. A 120 g metal piece is dropped into a measuring cylinder containing water at 40.0 mL. The level rises to 55.0 mL.

(a) Find the density of the metal.
Given:
• Mass of metal = 120 g
• Initial water level = 40.0 mL
• Final water level = 55.0 mL

Volume of metal = 55.0 – 40.0 = 15.0 mL

Density = Mass ÷ Volume = 120 ÷ 15.0 = **8 g/cm³**
Answer: The density of the metal is 8 g/cm³.

(b) Will it float in water? Justify.
No, the metal will sink in water because its density (8 g/cm³) is greater than the density of water (approximately 1 g/cm³).

5. Write short notes on:

(a) Intensive nature of density

Density is an intensive property because it does not depend on the amount of substance. For example, a small piece and a large piece of pure iron have the same density under the same conditions.

(b) Effect of pressure on density across states

• **Solids:** Density changes very little when pressure increases because solids are difficult to compress.
• **Liquids:** Density also changes very little because liquids are nearly incompressible.
• **Gases:** Density increases significantly when pressure increases at constant temperature because gases can be compressed easily.

(c) Practical uses of density differences

1. Ships float because their overall average density is less than that of water.
2. Oil floats on water because oil is less dense than water.
3. Density differences help separate substances, such as separating cream from milk using a centrifuge.