Class 8 Physical Science
Running Notes
Chapter: SOLUTIONS

1. Introduction to Solutions:

We use many mixtures in our daily life. For example:

a) ORS (Oral Rehydration Solution) b)Salt water c) Sugar water d) Air e) Alloy f) ORS

ORS is used to help in dehydration. It contains water, salt and sugar in suitable proportions.

When salt or sugar is mixed with water and gets distributed uniformly throughout the water, a solution is formed.

Important point: A solution is a uniform (homogeneous) mixture.

2. What Are Solute, Solvent and Solution?

Solution: A **solution** is a uniform mixture of two or more substances.

A solution consists mainly of: **Solute + Solvent → Solution**

Solute: The substance that **dissolves** in a solvent is called the **solute**.

Solvent: The substance in which the solute **dissolves** is called the **solvent**.

Example: Salt water

Substance	Role
Salt	Solute
Water	Solvent
Salt + Water	Solution

Solute	Solvent	Solution
Zinc	Copper	Brass
Salt	Water	Salt water
Air components	Air	Gaseous solution

When a solid is mixed with a liquid and dissolves completely, the **solid is usually the solute** and the **liquid is the solvent**.

3. Uniform and Non-Uniform Mixtures

Uniform mixture: A mixture having **uniform composition throughout** is called a **uniform mixture** or **homogeneous mixture**.

Examples: Salt water**,** Sugar solution**,** Air**,** Alloy

Non-uniform mixture: A mixture in which the components are not uniformly distributed is called a non-uniform mixture or heterogeneous mixture.

Examples: Sand and water**,** Sawdust and water

Difference

Uniform mixture	Non-uniform mixture
Composition is uniform	Composition is not uniform
Components are evenly distributed	Components are unevenly distributed
Example: salt water	Example: sand and water

4. How Much Solute Can a Fixed Amount of Solvent Dissolve?

Imagine adding salt continuously to a glass of water.

Initially, the salt dissolves completely.

If more and more salt is added, eventually a stage is reached when some salt does not dissolve and settles at the bottom. This leads to the concepts of unsaturated solution and saturated solution.

5. Unsaturated Solution:

A solution in which **more solute can still dissolve at a given temperature** is called an **unsaturated solution**.

Example: If a little salt is added to water and it dissolves completely, the solution is unsaturated.

6. Saturated Solution:

A solution in which **no more solute can dissolve at a given temperature** is called a **saturated solution**.

If additional solute is added to a saturated solution, it remains **undissolved** and settles at the bottom.

7. Concentration of a Solution:
The amount of solute present in a given amount of solution or solvent indicates the concentration of the solution.

Dilute solution: A solution containing a small amount of solute is called a dilute solution.

Concentrated solution: A solution containing a large amount of solute is called a concentrated solution.

Example

1. One spoon of salt in a glass of water → comparatively **dilute**
2. Four spoons of salt in the same amount of water → comparatively **concentrated**

8. Solubility:
The maximum amount of solute that can dissolve in a fixed quantity of solvent at a particular temperature is called its solubility.

Example: If a particular amount of water can dissolve only a certain maximum quantity of salt at a given temperature, that maximum quantity represents the solubility of salt in water at that temperature.

9. Effect of Temperature on Solubility

Temperature can affect the solubility of substances.

Activity: Baking Soda and Water

The chapter describes an experiment in which baking soda is added to water at different temperatures such as:

- 25°C 50°C 70°C

The observations show that more baking soda dissolves at higher temperature in this experiment.

Conclusion: For many solid substances:

Increase in temperature → Increase in solubility

However, the effect of temperature is not necessarily the same for every substance.

10. Solubility of Gases:
Gases can also dissolve in liquids.

Examples of gases that dissolve in water: Oxygen, Carbon dioxide, Ammonia, Chlorine, Nitrogen

Important point: The solubility of gases in liquids generally decreases when temperature increases.

Example

1. Aquatic organisms depend on dissolved oxygen in water. When water becomes warmer, less oxygen can dissolve in it. This can affect aquatic life.

11. Why Do Objects Float or Sink in Water?

We observe that:

- Some objects float on water.
- Some objects sink in water.

Examples: A wooden stick generally floats, while an iron nail sinks.

12. What Is Density?

Dense forest: Many trees are packed closely together.

Less dense forest: Trees are more widely separated.

Similarly, in a substance, the amount of mass packed into a given volume represents its density.

Definition: Density is the mass of a substance present in unit volume of the substance.

Formula: Density=Mass/Volume

or

d=m/V

Where: d = density m = mass V = volume

13. SI Unit of Density

SI unit of density = kg/m3

Another commonly used unit is g/cm3

$1\ kg/m^3 = 1\ g/L$ and $1\ g/cm^3 = 1000\ kg/m^3$

14. Example on Density

Suppose: Mass of an aluminium block = 27 g Volume = $10\ cm^3$

Then, Density=27/10=2.7 g/cm^3

15. Relative Density: Relative density compares the density of a substance with the density of water.
Formula: Relative density=Density of substance/ Density of water at that temperature
Relative density is a ratio, so it has no unit.
Example: If density of aluminium = 2.7 g/cm^3 and density of water = 1 g/cm^3:
RD=2.7/1=2.7

16. Measuring Mass: Mass can be measured using a balance.
The chapter demonstrates the use of a digital weighing balance.
Steps
1. Switch ON the digital weighing balance.
2. Check whether the display shows zero.
3. Place a clean watch glass or butter paper on the balance.
4. Press the tare/reset button to make the reading zero.
5. Place the substance on the watch glass.
6. Read and record the mass.

The activity in the chapter demonstrates measuring the mass of a solid object using a digital weighing balance.

17. Mass and Weight – Difference
Mass: Mass is the **quantity of matter present in an object**.
SI unit: kg
Weight: Weight is the **force with which Earth attracts an object towards itself**.
SI unit: Newton (N)

18. Measuring Volume
Volume: Volume is the **space occupied by a substance or object**.
For liquids, volume can be measured using a **measuring cylinder**.
Common measuring cylinders have capacities such as: 5 mL, 10 mL, 25 mL, 50 mL, 100 mL, 250 mL, 500 mL

19. Least Count of a Measuring Cylinder
Least count: The **smallest volume that can be measured by an instrument** is called its least count.
For example, if the difference between two consecutive major marks is 10 mL and there are 10 equal divisions:
Least count=10/10= 1 mL
Always determine the **least count** before taking a measurement.

20. Reading a Measuring Cylinder
When measuring a liquid:
1. Keep the measuring cylinder on a flat surface.
2. Pour the liquid carefully.
3. Keep your eye at the level of the liquid.
4. Read the scale correctly.
5. For liquids forming a concave meniscus, read the bottom of the meniscus.

Meniscus: The curved surface of a liquid in a measuring cylinder is called the meniscus.

21. Measuring Volume of Regular Solids
For a cuboid: Volume=$l \times b \times h$
Where: l = length b = breadth/width h = height
Example: Length = 25 cm, Width = 18 cm, Height = 2 cm
V=25×18×2 = 900 cm^3

22. Measuring Volume of Irregular Solids
Objects such as: Stone, Metal key, Pebble
may not have regular shapes. Their volume can be measured by the water displacement method.
Procedure
1. Take a measuring cylinder.
2. Pour water into it.
3. Record the initial water level.

4. Tie the object with a thread.
5. Slowly immerse the object completely in water.
6. Record the final water level.
7. Calculate the difference.

Formula: Volume of object=Final volume−Initial volume

Example: Initial water volume = 30 mL Final water volume = 55 mL

V=55−30 =25 mL

For a solid, this is equivalent to 25 cm^3

23. Calculating Density of an Object

Once we know: Mass and Volume
we can calculate density.

Formula: Density=Mass/Volume

Example: Mass = 16.4 g Volume = 5 cm^3

Density=16.4/5 =3.28 g/cm^3

24. Effect of Temperature on Density

On heating: Particles move farther apart.
Therefore: Volume generally increases. Density generally decreases.
On cooling: Particles generally come closer together.
Therefore: Volume generally decreases. Density generally increases.

25. Density and Different States of Matter: The effect of pressure on density differs according to the state of matter.

Gases: Increasing pressure pushes gas particles closer together.

Liquids: Pressure has a relatively small effect on the density of liquids because their particles are already relatively close together.

Solids: Particles in solids are very close together, so ordinary pressure produces a very small change in their density.
The chapter discusses these differences in its section on the effect of pressure on density.

26. Why Does Ice Float on Water?

Ice floats on water because ice is less dense than liquid water.
Water has an unusual property: its density is highest at approximately 4°C.
When water cools below 4°C, its structure changes and it occupies more space. As a result, its density decreases.
Therefore: Density of ice<Density of water

Hence, ice floats on water.

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