8 Some Properties of Water

We'll cover the following key points:

- Physical properties of water.
- Water and water solutions.
- Conditions essential for making a solution.
- The common soluble and insoluble substances.
- The objects that float and sink in water.

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Learning Outcomes

By the end of this chapter, students will be able to:

- Understand the physical properties of water, such as its color, taste, and state of matter under different conditions.
- Learn about water solutions and the role of water as a universal solvent.
- Identify the conditions essential for making a solution, including the solute, solvent, and proper mixing.
- Explore common examples of soluble substances (e.g., sugar, salt) and insoluble substances (e.g., sand, oil) in water.

Guidelines for Teachers

The teacher can start the chapter by introducing the importance of water in our daily lives, emphasizing its unique physical properties. Discussions can include how water forms solutions and the factors that influence solubility. The teacher can engage students with hands-on activities, such as observing substances dissolving in water or experimenting with objects to determine whether they float or sink. Learning can become more interesting and relatable when these qualities are highlighted in real-world situations.

Warm Up

Write the states of water.

_____ _____ _____

Only 3.5% of all the water on Earth is fresh. That's the kind of water with minimal salts, essential for life as we know it. But here's the twist: the majority of this precious freshwater—over 68%—is frozen solid, locked away in glaciers and ice caps. Another 30% hides beneath our feet as groundwater. What's left? A tiny fraction flows in our lakes, rivers, and streams—the lifelines of the planet. Isn't it incredible how such a small percentage sustains all life on Earth?

Water is one of the most important substances on earth. It is found in water bodies such as oceans, seas, rivers, streams, lakes, ponds and even underground. All plants and animals need water to survive. The human body is more than three-fourths water. If there were no water there would be no life on earth.

Take a Task Watch Remedial

Physical Properties of Water

Water has a fixed volume

Water has no fixed shape. It takes the shape of the container where it is poured into. But it has a fixed volume. Suppose you buy a 1-litre mineral water bottle from the market and pour it into a 1-litre separate bottle back home; it will still remain 1-litre. This is because there is no change in the volume of water when it is poured in different containers of the same capacity.

Water occupies space

Water is a matter and has mass and occupies space. If you fill a balloon with water you will notice that the balloon starts inflating. This is because water occupies space.

Water flows easily

Water flows from a higher level to a lower level. It flows and takes the shape of the container and once the container is full it flows out of it.

Water can change from one form to another easily

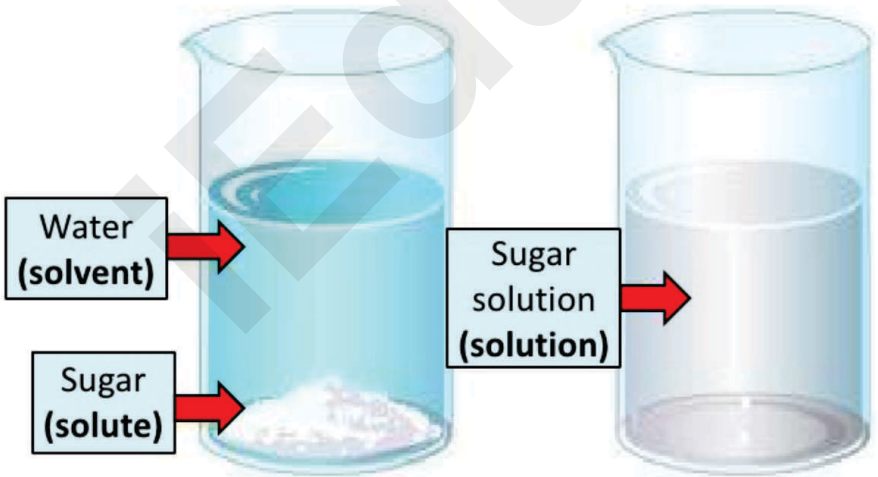
Water changes its form from solid (ice) to liquid (water) and to gas (water vapour).This happens when water is heated or cooled.

Water Solution

A solution is formed when two or more substances evenly mix together. **Solvent** is the substance in which **solute** dissolves such as water whereas solute is the substance which **dissolves** in a solvent such as salt, sugar etc. Solute substances are usually present in lesser quantity while solvent forms the largest component of a solution.

Solute + Solvent → Solution

A solution is a mixture formed when one or more solutes dissolve in a solvent.



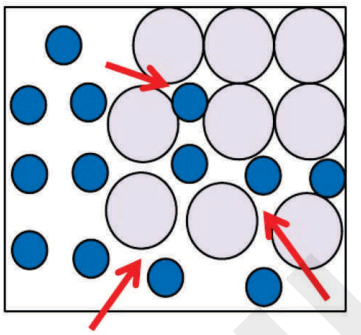
Did you know ?

Water dissolves more types of materials than any other liquid.

Water is such a good solvent that it can dissolve almost every solute and it is known as the **universal solvent**. This property of water is very helpful in performing our day to day activities. We use water for washing, cooking and making drinks like lemonade.

Conditions necessary for making a solution

- Heating the solvent.
- Stirring the solution.
- Increasing the amount of solvent.
- Decreasing the amount of the solute.
- Grinding the solute materials.



When a solute dissolves in solvent, the solvent breaks down the solutes into smaller particles

Activity

Creative Learning

Dissolving Sugar at Different Temperatures

Learn about solutions as you add more and more sugar cubes to the water of different temperatures. This easy experiment shows that you can only dissolve a certain amount and than this changes as the water gets hotter.

What you'll need:

- Sugar cubes
- Cold water in a clear glass
- Hot water in a clear glass (be careful with the hot water)
- Spoon for stirring

Instructions:

1. Make sure the glasses have an equal amount of water (one hot and another cold)
2. Put a sugar cube into the cold water and stir with the spoon until the sugar disappears.
3. Repeat this process (remembering to count the amount of sugar cubes you put into the water) until the sugar stops dissolving, and starts collecting at the bottom. Such a solution is now called a saturated solution.

4. Write down how many sugar cubes you could dissolve in the cold water.
5. Repeat the same process for the hot water; compare the number of sugar cubes dissolved in each liquid, which dissolved more?

Observation:

The cold water isn't able to dissolve as much sugar as the hot water, but why? The reason is that the molecules of hot water move faster than the cold water creating bigger space between the molecules in the hot water. More sugar molecules can fit in between.

Soluble and Insoluble Substances

Soluble substances are those substances that get easily dissolved in a solvent. For example: salt, sugar, coffee etc. gets completely dissolved in water.

Insoluble substances are substances that which cannot be dissolved in a solvent. **For example:** sand, chalk powder, sawdust etc. do not dissolve in water.

Activity

Creative Learning

Aim: To find out whether the given substances dissolve in water.

Method: Take equal quantity of water in separate test tubes and mix a teaspoonful of each substance into each and stir well. If it does not dissolve warm it gently.

Results:

Substance	Observation	Soluble/Insoluble
Salt		
Sugar		
Flour		
Coffee		
Tea leaves		
Sand		
Chalk powder		
Milk powder		

Objects that Float and Sink in Water

Whether an object sinks or floats depends on its density. Everything is made of molecules. Molecules are tiny particles that can only be seen with a microscope. Some objects have molecules that are packed closely together. Others have molecules that are packed more loosely. This is density. Objects with tightly packed molecules are denser and sink. A paper clip or a coin is dense. Objects with more loosely packed molecules are less dense and float. Wood, cork or sponge float.

Did you know ?

Ice is less dense than water allowing giant icebergs to float on top of the ocean.

CHECK 'N' MATE

Critical Thinking

Write 'T' for true and 'F' for false statements.

1. Water is a matter and has mass and occupies space. ☐
2. Solute substances are usually present in lesser quantity. ☐
3. Salt, sugar, coffee are soluble substances. ☐
4. Wood, cork or sponges are denser and sink. ☐

In a Nutshell

- Water is the most important substance on the Earth.
- Water has a fixed volume, occupies space, flows easily and can change from one state to another easily.
- A solution is formed when two or more substances evenly mix together.
- If the solute is stirred in the solvent, the solution is formed quickly.
- Insoluble substances do not form solutions when mixed with water.

Key Words

Improving Vocabulary

Volume : Capacity

Dissolve : When a substance mixes with a liquid.

Solute : The substance that dissolves in a liquid to make a solution.

Solvent : The liquid in which a substance is dissolved.

Time to Recall

Remembering and Analysing

Recall and complete the concept map given below.

Properties of Water

Conditions necessary for making solution

1. _____
2. _____
3. _____
4. _____
5. _____

Time to Apply

Applying and Creating

There are 3 beakers half filled with water. Now add 3 spoons of sugar in the first beaker, 5 spoons of sugar in the second beaker and 7 spoons of sugar in the third beaker. Stir the solution of all three beakers. Which solution is more saturated?

Time to Discuss

Pondering and Communicating

1. Greater amount of salt can be dissolved in a bucket of water than in a glass of water. Why?
2. What happens when a tray with water is kept inside the freezer?

Gap Analyzer™
Take a Test

EXERCISE

That turn curiosity into confidence—let's begin!

A. Objective Type Questions:

1. 1 litre of water when poured into different containers of the same capacity remains 1 litre. This shows that water has:

   (A) Fixed Shape (B) Fixed Volume

   (C) Occupies Space (D) Flows Easily

2. A solute dissolves faster in a solvent when:

   (A) The solute is broken into smaller pieces (grinded)

   (B) When the solvent is cold

   (C) When the quantity of solute is more

   (D) When the quantity of solvent is less

3. Which of these substances is not soluble in water?

   (A) Salt (B) Sugar

   (C) Sand (D) Coffee Powder

4. Which of these will sink in water?

   (A) Paper Pin (B) Feather

   (C) Thermocol (D) Paper Boat

5. Water in this form has a particular shape.

   (A) Water Vapour (B) Ice

   (C) Liquid (D) None of these

B. Write 'T' for true and 'F' for false statements:

1. Water can dissolve sugar.
2. Water evaporates when exposed to high temperature.
3. Water freezes when exposed to very low temperature.
4. Water flows from lower level to higher level.
5. A solution is formed in less time if the solvent is warmed.
6. A feather can sink in water.

C. Fill in the blanks:

1. Water is called _____ as it can dissolve most substances.
2. Solute and solvent together form the _____ .
3. An object that weighs less than water, _____ in water.
4. The _____ forms the largest component of a solution.
5. Icebergs float in the ocean as it is less _____ than water.

D. Very Short Answer Questions:

1. It is known as universal solvent.
2. These substance a get easily dissolved in a solvent.
3. These substance cannot be dissolved in a solvent.
4. These are tiny particles that can only be seen with a microscope.

E. Short Answer Questions:

1. What are the three forms of water?
2. Mention the physical properties of water.
3. Define: (A) Solute (B) Solvent (C) Solution (D) Density
4. Why water is called a universal solvent?

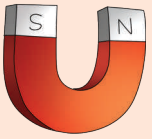
F. Answer the Following Questions:

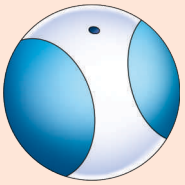
1. What are the conditions necessary for making a solution?
2. Differentiate between soluble and insoluble substances with examples.
3. What is a saturated solution?
4. Why does an object float or sink in water? Explain.

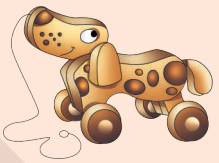
Time to Observe

Observing, Critical Thinking, Analysing

Circle the objects that can float and draw a square around the objects that would sink.



Time to Create

Creating and Collaborating

When we think of a refreshing summer's drink, lemonade is usually one of the first drinks that springs to our mind.

WHAT YOU WILL NEED:

- 1 cup of freshly squeezed lemon (approx. 3 medium lemons)
- 8 cups water
- 1 cup cold water
- 1/4 cups sugar
- A pinch of salt
- Slices of lemon

Instructions

- Take water in a jar.
- Remove and squeeze juice from lemons.
- Add sugar and salt and stir carefully until all dissolved.
- Add cold water and lemon juice to the sugary water mixture.
- Refrigerate until cool.
- Add slices of lemon and ice.
- Our lemonade is ready to serve.