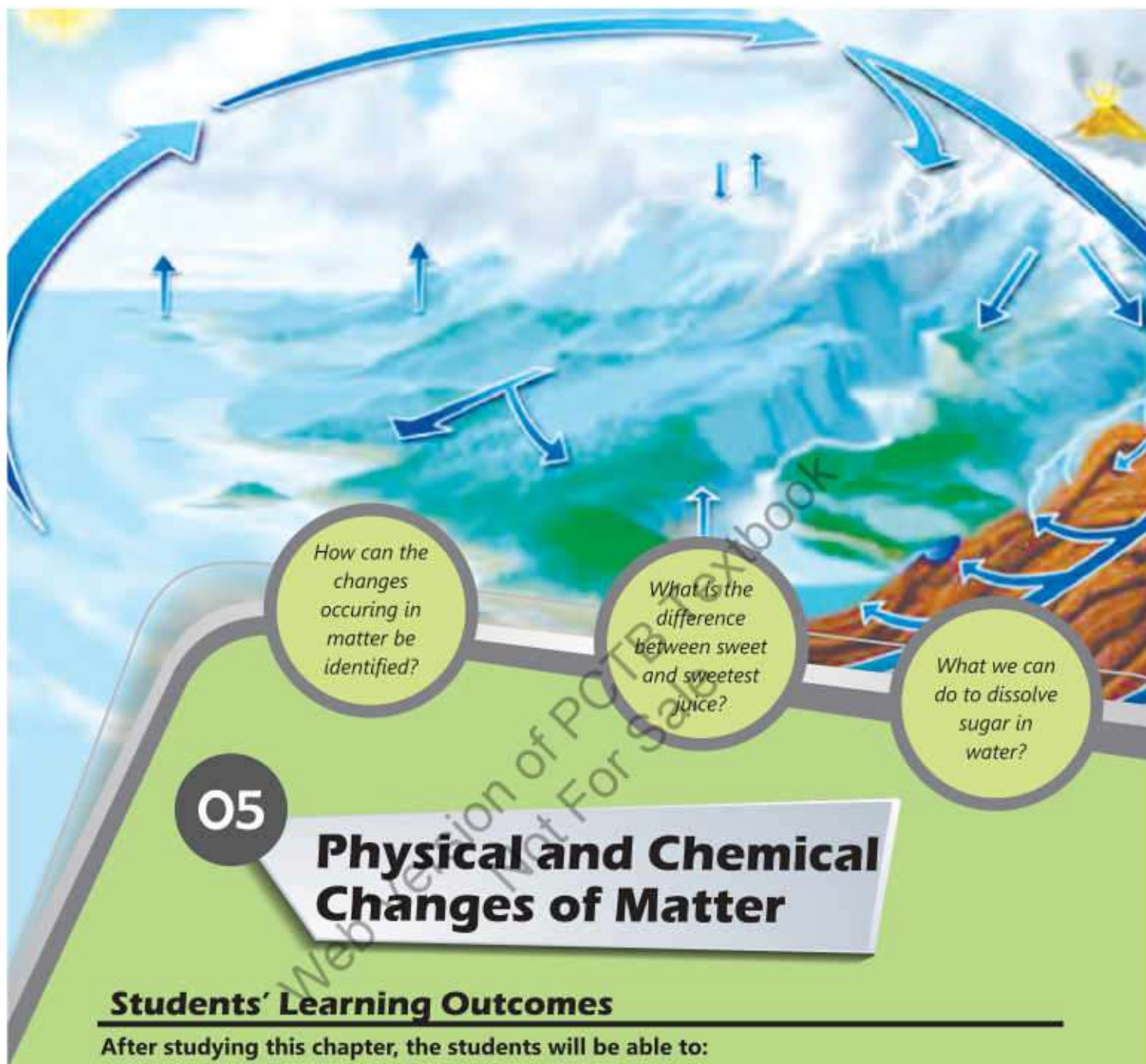




Students' Learning Outcomes

After studying this chapter, the students will be able to:

1. Identify observable changes in materials that do not result in new materials with different properties (e.g., dissolving, crushing aluminium can).
2. Recognize that matter can be changed from one state to another by heating or cooling (candle wax).
3. Describe and demonstrate the process of melting, freezing, boiling, evaporation and condensation.
4. Identify ways of accelerating the process of dissolving materials in given amount of water and provide reasoning (i.e., increasing the temperature, stirring and breaking the solid into smaller pieces increases the process of dissolving).
5. Distinguish between strong and weak concentrations of simple solutions.
6. Identify observable changes in materials that make new materials with different properties (e.g., decaying, burning, rusting).
7. Differentiate between physical and chemical changes with examples.

Physical Changes Observed in Everyday Life

In the previous grade, we have already read that all the substances are made of matter. Matter has mass and occupies space. The three physical states of matter are solid, liquid and gas, in which the arrangement of particles is different. Here we will study the physical and chemical changes in matter.

Physical Changes in Matter

In physical change only appearance of a substance / matter changes but chemical composition remains the same.

Activity 5.1

1. Take two to three spoons of salt in a clean beaker or in any dish.
2. Pour half cup of warm water into the dish and keep it stirring till all the salt dissolved. Can you see the salt?
3. Heat the beaker or dish till all the water evaporates as vapours.
4. You will observe that salt is present in the dish.



Dissolving salt in water



Boil water



Leftover salt

The dissolving of salt in water is a physical change. It only changes the state of matter. But matter having new properties is not formed. Physical state can be reversed. You saw in the activity that after the evaporation of water as vapours, salt remained there.

Activity 5.2

Take a soft drink aluminium can. Then crush it with a hammer. Have you observed any change? It has only squeezed. Its shape has changed. In your opinion, what type of change is this? Has the aluminum changed into new matter?



Changes in States of Matter

Activity 5.3

Heat solid wax in a beaker or dish. What do you observe? The wax melted and became liquid. Pour the melted wax in a dish and let it cool. What change do you see? The wax freezes on cooling and changes to solid again. The changes that occurred in wax is related to the physical state of matter.

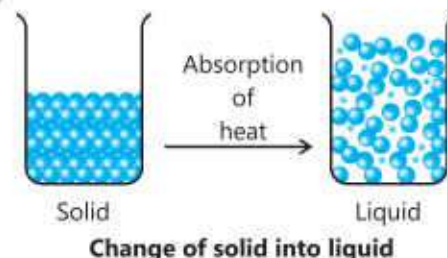


Processes Involved in Changes in States of Matter

You have seen in Activity 5.3 that the physical states of matter changes on heating or cooling. During the changes in the states of matter following processes occur:

Melting

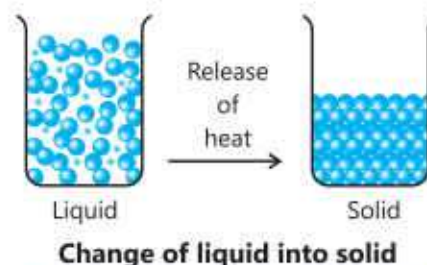
The process of change of solid state into liquid state by absorption of heat is called melting. You have observed that when solid wax was heated, it changed into liquid state. Similarly, when solid piece of ice absorbs heat, it becomes water by melting.



You know in solid the particles keep on vibrating but remain at fixed positions. When a solid gets heat, its particles start vibrating faster and do not remain at their position. The forces of attraction between them become weaker and they move away from each other. Thus, a solid is changed into its liquid state.

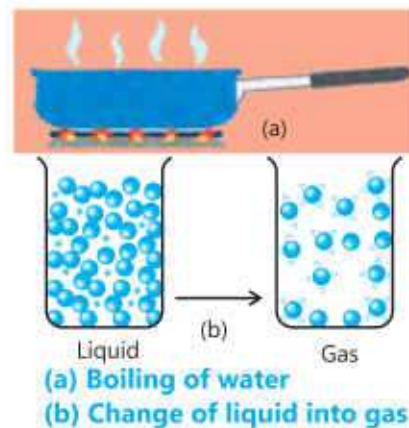
Freezing

What happens, when water is kept in a freezer? During this process, heat is lost from water. As a result, the movement of its particles become slower and they come closer to each other. The force of attraction between particles becomes stronger. Thus the liquid is changed into solid. This process is called freezing.



Boiling

When a liquid is heated continuously, the movement of its particles becomes faster. The space between the particles increases. Due to this the liquid is changed to vapours or gas. This process is called boiling.



Evaporation

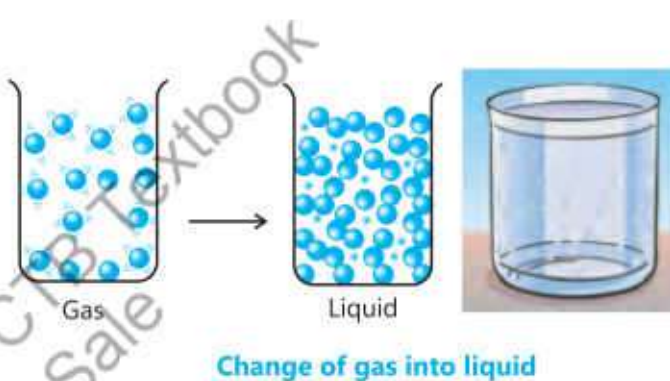
You must have observed that if water falls on the floor, after some time the floor becomes dry. Why does it happen? From wet surfaces, water continuously moves into the surrounding air. This process occurs continuously from the surfaces of canals, lakes, rivers and oceans, etc. The change of water into water vapours is called evaporation. This process also takes place from the snow surface and from the leaves of plants.



Evaporation

Condensation

When you drink cold water or cold drink in a glass, you see water drops at the external surface of the glass. From where these drops of water have come? When water vapours present in air touch the cold external surface of glass, they lose heat. As a result, these water vapours change into liquid and stick with the external surface of the glass. This process is called condensation.



Do you know?

1. Wet clothes are dried due to evaporation.
2. Boiling a liquid requires high temperature.
3. The process of evaporation can take place at any temperature and at high temperature, the process of evaporation becomes rapid.
4. When our sweat dries, we feel cold owing to the process of condensation.

Dissolving Substances in Water

You have observed in Activity 5.1 that salt dissolves in water. When a solid or liquid thing is placed in water, its particles dissolve uniformly in water and form a mixture called solution. There are two important components of a solution.

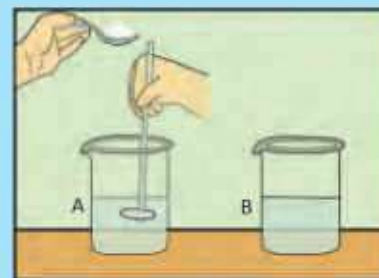
- 1. Solute:** The substance that dissolves in water and is in less quantity is called solute e.g., sugar, salt.
- 2. Solvent:** The substance that dissolves a solute and is in more quantity is called solvent i.e. water, milk.

Many things can dissolve in water and form a solution. The rate of dissolving of salt in water can be increased by the following ways:

Stirring

Activity 5.4

1. Take two beakers or glasses. Mark them as A and B.
2. Add a spoon of sugar (solute) in both the beakers.
3. Then pour a cup of water (solvent) in both beakers.
4. Stir sugar in beaker A with a glass rod. Do not stir sugar in beaker B.
5. What have you observed?



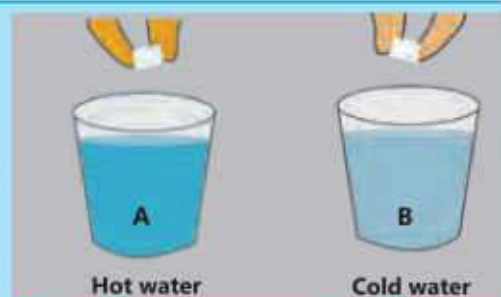
Dissolving sugar in water

In the above activity, the dissolving of sugar in such a manner is called stirring. When you stir sugar in beaker A it dissolved faster, whereas the sugar in beaker B dissolved slowly. If the sugar is not stirred even then it will dissolve but it will take more time.

Increasing Temperature

Activity 5.5

1. Take two beakers or glasses.
2. Mark them as A and B.
3. Pour one cup of hot water (solvent) in beaker A and pour a cup of cold water (solvent) in beaker B.
4. Put a spoon of sugar or sugar cube in both the beakers simultaneously.
5. Observe in which beaker the sugar dissolved quickly.

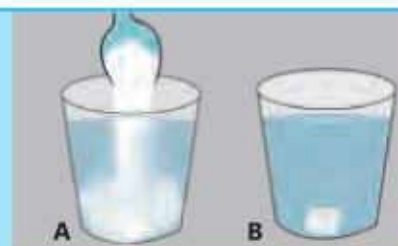


Effect of temperature on dissolving sugar

Decreasing the Size of Particles

Activity 5.6

1. Take two beakers or glasses.
2. Mark them as A and B.
3. Put a spoon of powder sugar or grains of sugar in glass A.
4. Put a sugar cube in glass B.
5. Now pour a cup of water in both the glasses.
6. Now observe in which glass the sugar will dissolve soon.



Dissolution of sugar grains and sugar cube

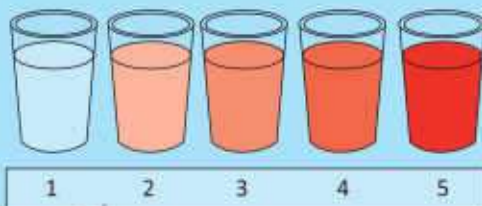
You observed that the powder sugar dissolved quickly whereas the cube of sugar dissolved slowly.

The dissolution of any solute depends on the size of its particles. The solutes which are made of small particles (e.g., powder sugar), dissolve in solvent faster as compared to the solutes made of large particles (e.g., sugar cube).

Dilute and Concentrated Solution

Activity 5.7

1. Pour equal quantity of water in five glasses.
2. Do not pour anything in the glass 1. Pour one spoon of coloured drink in glass 2, two spoons in glass 3, three spoons in glass 4 and four spoons in glass 5.
3. Observe and tell in which glass the colour of solution (drink) will be lightest and in which glass darkest?



Drinks such as milk, tea and soft drinks are all solutions. A solution having minor quantity of solute is called dilute solution. A solution having more quantity of solute is called concentrated solution.

Chemical Changes in Everyday Life

If you look around, you will see leaves of plants, branches, vegetables, fruits, papers and pieces of wood. These are being decomposed gradually. You must have seen rusted iron gates, doors, windows and other things. Have you ever thought why this happens?

Chemical Changes in Matter

In chemical change both appearance and composition of substance / matter changes.

Decaying

The remains of dead organisms and waste matter disappear gradually through decomposition. How does this happen? You have read about bacteria and fungi. They obtain their food by decomposing the dead bodies into simple components. This process is called decaying.



Decaying

Burning

The fuel is burnt in the stove to cook food. When the fuel burns then you can see the flame. The flame develops during combustion reaction. This is called burning e.g., the burning of coal, wood, paper, match stick, etc.

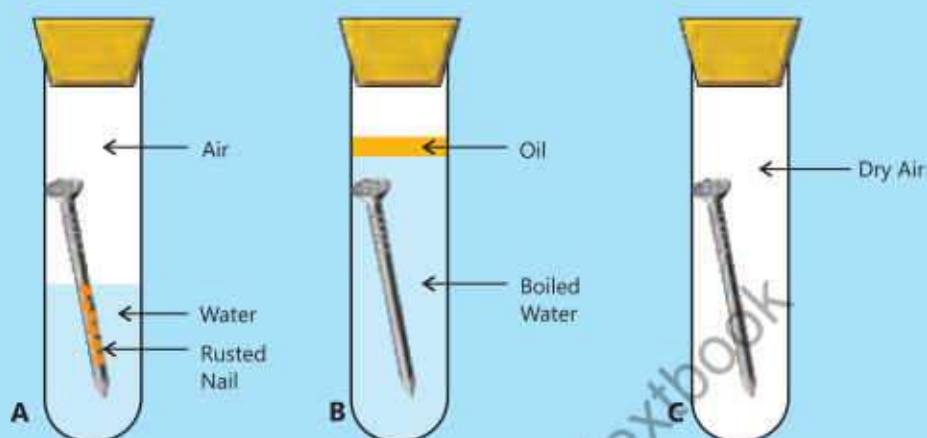


Burning

Rusting

Activity 5.8

1. Take three test tubes and mark them as A, B and C.



2. Take water in test tube A and put a nail in it.
3. Take boiled water in test tube B and put a nail in it. Then put few drops of oil on it.
4. Dry test tube C properly and put a nail in it.
5. Seal the mouth of the three test tubes with a cork and leave them for a few days in similar conditions.
 - (i) In which test tube did the iron nail become brown in colour?
 - (ii) Why were boiled water and oil drops added in test tube B?
 - (iii) In which test tube was the change in the colour of the nail was not possible? Why?

In this activity, you have observed that in one of the test tubes the colour of the nail changed. In this test tube, oxygen was present which reacted with iron. Due to this reaction, the colour of the iron changed.

The change that occurred on the iron due to the action of oxygen and water is called rusting.

Iron + Oxygen + Water = Rusting



Rusted iron lock

Do you know?

To prevent iron from rusting, its surface is coated with paint, oil or chromium.

Difference between Physical and Chemical Changes

We have already read that there are two types of changes: Physical changes and Chemical changes. If during a change of any material, if no new material is formed with different properties, then such change is called a physical change. Physical change can be reversed, such as on heating, the solid wax becomes liquid but remains a wax. On cooling the liquid wax becomes solid but remains a wax.

A change in which a new material (with different properties) is formed, is called chemical change. The burning of paper is a chemical change as ash is formed in the process. The chemical change cannot be reversed.

Activity 5.9

To perform this activity, you will form four groups. Each group will write their observations on the worksheet.

	Work in group	Observation
Group 1:	Burn steel wool or dishwashing net over spirit lamp.	
Group 2:	Dip blue litmus paper in vinegar. Take it out and let it dry. Dip litmus paper in limewater.	
Group 3:	Burn paper.	
Group 4:	Take lukewarm milk and mix a spoon of yogurt to make yogurt.	

Key Points

1. A material does not change into a new material having different properties due to physical change.
2. The process during which solid becomes liquid on absorption of heat is called melting.
3. The process during which heat is released from the liquid changing it into solid is called freezing.
4. On heating the change of liquid into gas is called boiling.

6. The change of gas into liquid is called condensation.
7. Solution is formed when a solid or liquid mixes with other liquid uniformly forming a mixture.
8. The minor component which is dissolved in a solution is called solute whereas the major component which dissolves the solute is called solvent.
9. A dilute solution is one that has a relatively small amount of dissolved solute. A concentrated solution is one that has a relatively large amount of dissolved solute.
10. The change that occurs on the surface of iron due to action of oxygen and water is called rusting.
11. In chemical change, a material combines with another one to form new material having new properties.



Weblinks: Use the following weblinks to enhance your knowledge about the topics in this chapter.

Dissolution factors	1. https://www.youtube.com/watch?v=qL5-lce_TfY
Conservation of matter	2. https://www.nationalgeographic.org/article/conservation-matter-during-physical-and-chemical-changes/7th-grade/

Exercise

1. Tick (✓) the correct answer.

i. The change of milk into yogurt is:

- | | |
|---------------------|----------------------|
| (a) Physical change | (b) Climate change |
| (c) Chemical change | (d) Change of colour |

ii. Why did a person paint his iron gate?

- | | |
|-------------------------|--------------------------|
| 1. To save from rusting | 2. To save from sunlight |
| 3. To make it beautiful | 4. To save from water |

Out of these which answer is correct?

- | | |
|-------------|-------------|
| (a) 1 and 2 | (b) 1 and 3 |
| (c) 2 and 3 | (d) 1 and 4 |

iii. Which factor will not affect the dissolving of sugar in water?

- | | |
|-----------------------------|--------------------------------------|
| (a) Adding salt in water. | (b) Making sugar powder by grinding. |
| (c) Heating water and sugar | (d) Stirring water and sugar |

iv. Which one is not a chemical change?

- | | |
|----------------------|-----------------------|
| (a) Seed germination | (b) Making paper boat |
| (c) Burning of wood | (d) Cooking food |

v. What type of change is it when metal expands on heating?

- | | |
|---------------|---------------|
| (a) Permanent | (b) Chemical |
| (c) Physical | (d) Temporary |

2. Write short answers.

- Explain evaporation giving examples from everyday life.
- Define condensation.
- What is rusting and which type of change is this?
- Give an example of chemical change in which carbon dioxide is produced?
- Explain the three states of matter and their interconversion.

3. Constructed Response Questions:

- i. Weigh one fourth glass of vinegar and teaspoon of baking soda. Then mix them together. As a result, bubbles will be formed. Weigh this compound again. Now its weight will become less than the previous one. How will you explain the loss of the weight?



- ii. On mixing vinegar and boiling water, bubbles are produced. Out of the two, one is chemical change and the other one is physical change. Explain.



- iii. A student weighs a piece of ice and then allows it to melt. In your opinion what will be the weight of water and why?



4. Investigate:

- i. Why is the formation of fertilizers from leaves a chemical change?

5. Project:**Removal of Eggshell by Chemical Process****Material Required:**

- i. Egg ii. Vinegar iii. Vessel to keep egg

Procedure:

- i. Take an egg in a vessel or jar. Pour vinegar on it so that the egg is immersed into it. Bubbles will be formed on the egg's surface.
- ii. Leave it for 12 hours. Carefully take out the egg from the vessel, then wash it gently and observe the egg.
- iii. You will observe that the shell of the egg has disappeared.
- iv. What have you come to know from this observation?

