

## Unit 2

# States of Matter

### Learning Objectives

After learning this lesson, students will be able to

- ❖ know the matter surrounding us
- ❖ differentiate between solids, liquids and gases
- ❖ conduct simple experiments
- ❖ observe the properties of matter
- ❖ describe the nature of the material



### Matter

**Teacher :** Leela, look at the picture and list out the things you see in it.

**Leela :** Yes madam. Sun, river, boat, house, tree, car, birds, ...

**Teacher :** Very good. There are many things in this picture. Some of them are natural and some are man-made.



You can see a number of things around you. Everything you can see and touch is made up of matter. Anything that occupies space and has mass is called **matter**.

### Let us Do

List out some of the matters around you.

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_



## More to know

### What is mass?

Mass is a measure of how much matter is in an object.

- The air we breathe, the food we take, and the water we drink all have matter in them.

Do you know that even you are made up of matter?

The space occupied by an object is called its **volume**.

## 2.1 States and properties of Matter

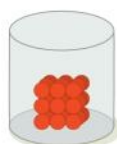
Matter can exist as solid, liquid or gas.



### Solid



- rigid
- fixed shape
- fixed volume



### Liquid



- not rigid
- no fixed shape
- fixed volume



### Gas



- not rigid
- no fixed shape
- no fixed volume



## SOLIDS

### Let us Try

Press a wooden pencil. Is the pencil hard? Yes / No.

Solids are things that have a **definite shape and volume**. They occupy a fixed space. The particles in solids are **packed very tightly**. So they **cannot move freely**. Their shape can be changed only when we break or cut them.

Some examples for solids are given below.





## LIQUIDS

### Let us Do

1. Place four 1L bottles of different shapes on the table.
2. Take a bucket with water.
3. Call one child to hold the empty bottles and the other to fill water into them using a paper cup.
4. Ask the other children to fill the table as given below.

	Bottle 1	Bottle 2	Bottle 3	Bottle 4
Number of cups used				
Shape of bottle (Draw)				



#### Think Zone






1. What is the shape of water in your bottle?
2. What happens if you pour water on the floor or table?

Did each bottle need the same number of cups to get filled?

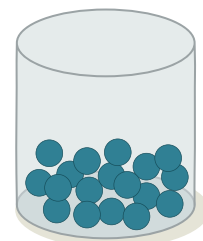
We can see that water takes up the same space in each bottle and the shape of the water is same as the shape of the bottle.

### Look at these pictures

Here we can see that the shape of the liquid is determined by the shape of the container.





kerosene in bottle	Oil in cane/ bottle	Milk in the jug	Juice in glass	Water in the glass
				

Liquids are the things that do not have a **definite shape** but **occupies space**. They have a **definite volume**. They take the **shape of the container** in which they are filled. The water moves from one place to another. This is because the matter in liquid are **loosely packed**. So, liquids can **flow freely**.



## Let us Touch and Feel

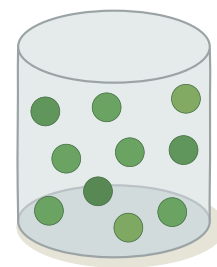
Different types of liquids are placed in separate containers. Students are allowed to touch and feel every type of liquid. They are asked to tell the type of the liquids on the basis of their stickiness/concentration.

Greasy liquid	Sticky liquid	Watery liquid	Thick liquid
			

## GASES

When a perfume is sprayed or an agarbatti is lighted, the fragrance spreads all around the room. How?

The matter in gases are **very loosely packed**. So they can **move around freely in all directions**. Hence, gases **do not** have a **definite shape** and **do not** occupy a **definite space or volume**.



Most of the gases are colourless. But when they are mixed with solid particles they show distinct colours.



### Think Zone

Cooking gas in gas-cylinder has a smell. Why?

Here are some examples for gases



Cloud



Smoke



Gas cylinder (LPG)



Spray



Water vapour



Wind

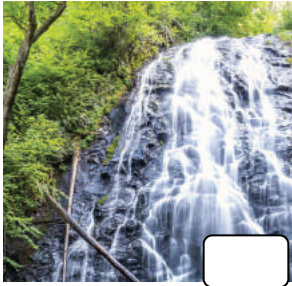


## Let us Do



Say whether it is Solid or Liquid or Gas (Put 'S' for Solid, 'L' for Liquid and 'G' for Gas).

Falls



Chair



Air filled balloon



Cake



Juice



Jar with pebbles



Ice cube



Steam from soup in bowl



Pencil



Chocolates



Water filled in a bucket



Water in a glass



Milk



Bricks



Biscuits



Fire



## Let us Read and Complete the table

Here are some properties of matter:

Fixed shape

No fixed shape

Fixed volume

No fixed volume

Flow all sides

Rigid

Copy the following table. Write each property in the correct column of the table. Some properties may belong to more than one column.

Properties of solids	Properties of liquids	Properties of gases

## 2.2. Change in States of Matter

Matters change their state as the temperature changes. Solid changes into liquid and liquid changes into gas on heating. Gas becomes liquid and liquid becomes solid on cooling.

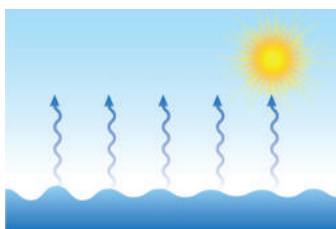
### Melting

Change of solid into liquid on heating is called **melting**. For example, if ice (solid) is heated, it will change into water (liquid).



### Let us Do

- Take some ice cubes in a container. Heat the container and observe the changes.
- Take some cheese in a container. Heat the container and observe the changes.
- Take some jaggery in a pan. Heat the pan and observe the changes.



### Evaporation

Change of liquid into vapour on heating is called **Evaporation**. For example, if water is heated, it will change into steam.



## Freezing

Change of liquid into solid on cooling is known as **freezing**. For example, water (liquid) poured in ice-tray and placed in the freezer (fridge), gets cooled and becomes ice (solid).



## Condensation

Changes of gas into liquid on cooling is called **condensation**. For example; clouds (gas) on cooling condense and fall as rain (liquid)



### Let us think

What makes the coconut oil freeze in winter season?



## Complete the table

State of matter	Add	New state	Process
ice	+ heat		melting
water	+ heat	steam	
clouds	+ cool	liquid	
	+ cool		freezing



### Think and answer

One of these cans was in the fridge and the other was not.

- Which can was taken from the fridge?
- How do you know?
- How did water droplets appear on the can A?
- Why are there no water droplets on can B?



## Let us Observe



Take a balance. Keep an air filled football in one plate and an empty football in another plate . What happens?

Air filled ball goes down. It is because air has mass.

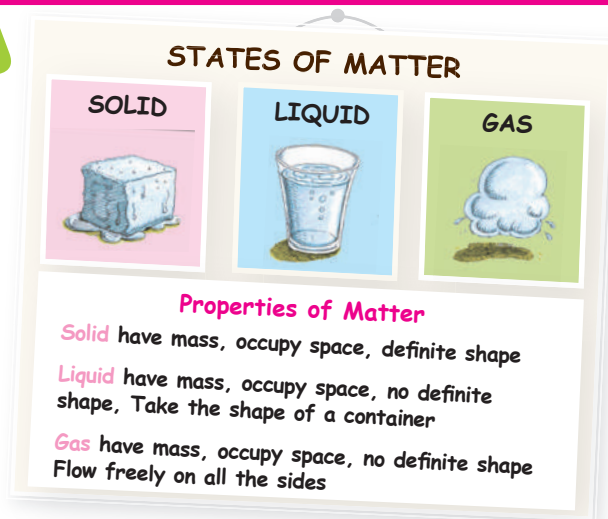


Air is a mixture of gases. You can feel the presence of air when the wind blows.



## Let us Prepare - Anchor chart

1. Cut a chart into three pieces each of 15cm x 10 cm.
2. Write the properties of solid, liquid and gas in separate sheets.
3. Draw pictures related to the points.
4. Design the sheets with colourful borders.
5. Paste all the sheets in a large chart paper. Your anchor chart is ready. Hang it on the wall.



## Let us Understand



- ◆ Keep a stone on the floor. Does it move by itself?
- ◆ Pour a mug of water on the floor. Does the water flow? Does it flow in one direction?
- ◆ Take an air filled balloon. Prick it with a needle. Does the air rush out?
- ◆ Fill an open vessel with water. Press the surface of the water with your hands. How do you feel?

## 2.4. Materials Used / Not Used For Heating



Look at the pictures. Write down what you see.

(Wood, Leaves, Paper)



\_\_\_\_\_ burns



\_\_\_\_\_ burns



\_\_\_\_\_ burns



## Fuels

- Paper, firewood, dried leaves and charcoal can be burnt.
- Liquids like kerosene, petrol and diesel also burn on heating.
- Domestic gas burns and helps in cooking.

Substances when burnt give out heat. But in some substances, the heat released is very low. Thus, these are not used for heating purpose.

Substances that give out more heat while burning are used for heating purpose. These substances are called **fuels**.

### Solid fuels



### Gaseous fuels



### Liquid fuels



Electrical energy is also used as fuel for cooking and transporting.

Match the following.

Liquid Fuel

Gas Fuel

Solid Fuel





## EVALUATION



### I. Indicate whether the following statements are true or false.

1. Solids have a definite volume.
2. Liquids can not flow.
3. We can melt any substance by cooling it.
4. Liquids can take the shape of the container.
5. Gases have a definite shape or volume.
6. Matter changes its state when heat is added or removed.
7. A fuel is a substance which gives heat energy on burning.



### II. Fill in the blanks. (Evaporation, Mass, Water, Solid, Stone, Freezing)

1. The measure of matter in an object is called \_\_\_\_\_.
2. Change of liquid into vapour on heating is called \_\_\_\_\_.
3. An example for liquid is \_\_\_\_\_.
4. The change of liquid into solid on cooling is known as \_\_\_\_\_.
5. An example for solid is \_\_\_\_\_.

### III. Draw a line to match the objects and their state of matter.



Solid



Liquid



Gas





#### IV. Answer in a word or two.

1. Which of these is a solid: wood or juice? \_\_\_\_\_.
2. Which of these is hard : a sponge or a glass or a cloth? \_\_\_\_\_.
3. What are three states of matter? \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.
4. Name three substances which can change to liquid when they are heated?
5. In which state of matter the particles are very close to each other?
6. What state of matter is rain?
7. Which among the state of matter has definite volume but no definite shape?
8. What would cause a liquid to turn into a solid?  
a) Pouring it into a container    b) Heating it until it boils  
c) Cooling it until it freezes    d) Keeping its temperature the same
9. What are some properties of pencil?

#### V. Find me. ( Liquid, Water, Wood)

1. I am a five letter word. I am an essential need for your life. I remain in all the three states of matter. Who am I ?
2. I am a solid. I am obtained from the trees. I am useful for heating. Who am I?
3. I am one among the three states. I have loosely arranged particles. I become vapour on heating. Who am I ?

#### VI. Describe the word in one sentence.

1. Solid: \_\_\_\_\_
2. Liquid: \_\_\_\_\_
3. Melting: \_\_\_\_\_
4. Evaporation: \_\_\_\_\_
5. Freezing: \_\_\_\_\_

#### VII. Which change of state is taking place in each description below? Use these words.

Freezing

Evaporation

Condensation

Melting

- a) An ice cube turning to water \_\_\_\_\_
- b) Water turning to ice in a freezer \_\_\_\_\_
- c) Change of liquid into vapour on heating \_\_\_\_\_
- d) A bathroom mirror misting up \_\_\_\_\_