

# INDIAN SCHOOL MUSCAT

## CHAPTER-1

### MATTER IN OUR SURROUNDINGS

#### TOPICS TO BE COVERED

Three States of Matter

Properties of Solis State

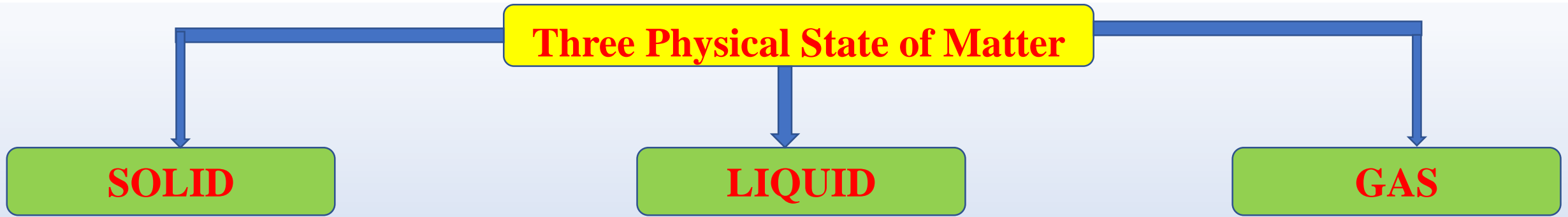
Properties of Liquid State

Properties of Gaseous State

Question and Answer Discussion

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# PHYSICAL STATES OF MATTER



- We can see that matter around us exists in three different states— solid, liquid and gas.
- These states of matter arise due to the variation in the characteristics of the particles of matter.

## Recall on Characteristics of Particles of Matter

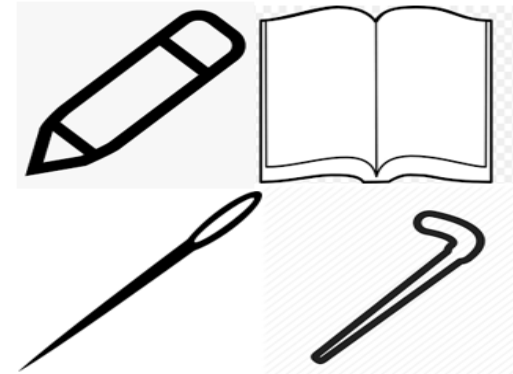
1. Particles of matter have space between them.
2. Particles of matter are continuously moving.
3. Particles of matter attract each other.

# THE SOLID STATE

## Activity

Collect the following articles— a pen, a book, a needle and a piece of wooden stick.

- Sketch the shape of the above articles in your notebook by moving a pencil around them.



- **Do all these have a definite shape, distinct boundaries and a fixed volume?**

**Answer:** All these have a *definite shape, distinct boundaries and fixed volumes*.

- **What happens if they are hammered, pulled or dropped?**

**Answer:** Solids have a tendency to *maintain their shape* when subjected to outside force. Solids may *break under force* but it is difficult to change their shape, so they are *rigid*.

- **Are these capable of diffusing into each other?**

**Answer:** No It cannot diffuse.

- **Try compressing them by applying force. Are you able to compress them?**

**Answer:** Have negligible compressibility.

**Properties  
of Solid**



# THE SOLID STATE CONTINUED.....

## Activity

### Consider the Following

(a) What about a rubber band, can it change its shape on stretching? Is it a solid?

**Answer:** A rubber band changes shape under force and regains the same shape when the force is removed. If excessive force is applied, it breaks.



(b) What about a sugar and salt? When kept in different jars these take the Shape of the jar. Are they Solid?

**Answer:** The shape of each individual sugar or salt crystal remains fixed, whether we take it in our hand, put it in a plate or in a jar.



(c) What about a sponge? It is a solid yet we are able to compress it. Why?

**Answer:** A sponge has minute holes, in which air is trapped, when we press it, the air is expelled out and we are able to compress it.

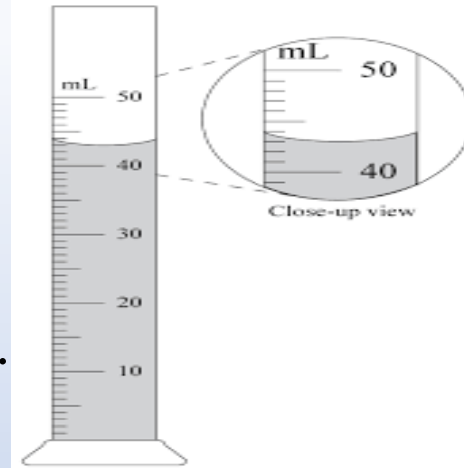


# THE LIQUID STATE

## Activity

### Consider the Following

- (a) water, cooking oil, milk, juice, a cold drink. (b) containers of different shapes.
- Put a 50 mL mark on these containers using a measuring cylinder from the laboratory.
  - Measure 50 mL of any one liquid and transfer it into different containers one by one.



**What will happen if these liquids are spilt on the floor?**

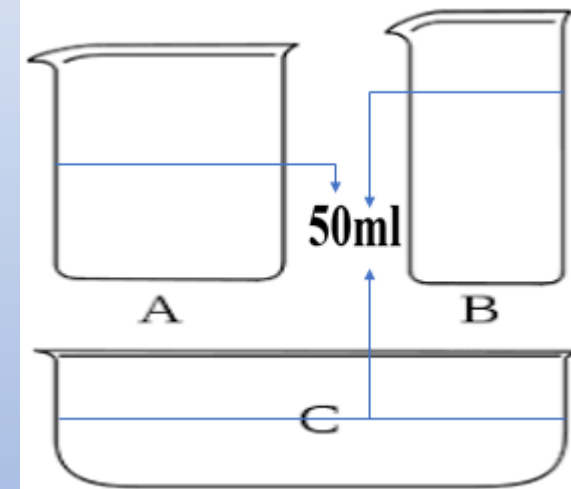
**Answer:** Liquids flow and change shape, so they are not rigid but can be called fluid.

**Does the volume remain the same? Does the shape of the liquid remain the same ?**

**Answer:** Liquids have no fixed shape but have a fixed volume. They take up the shape of the container in which they are kept.

**When you pour the liquid from one container into another, does it flow easily?**

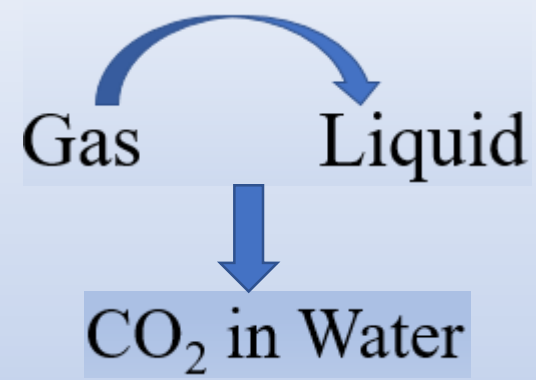
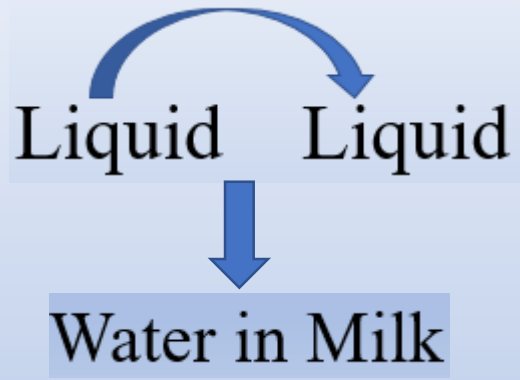
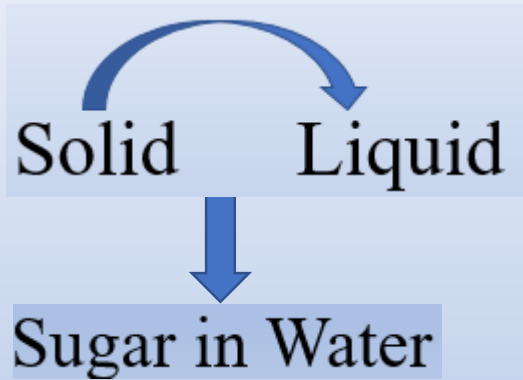
**Answer:** Generally flow easily. But viscous liquid flow slowly due to its viscosity factor(Resistance to flow) Example: Oil



# DIFFUSION?

## Diffusion:

Intermixing of particles of one kind of matter in to another.

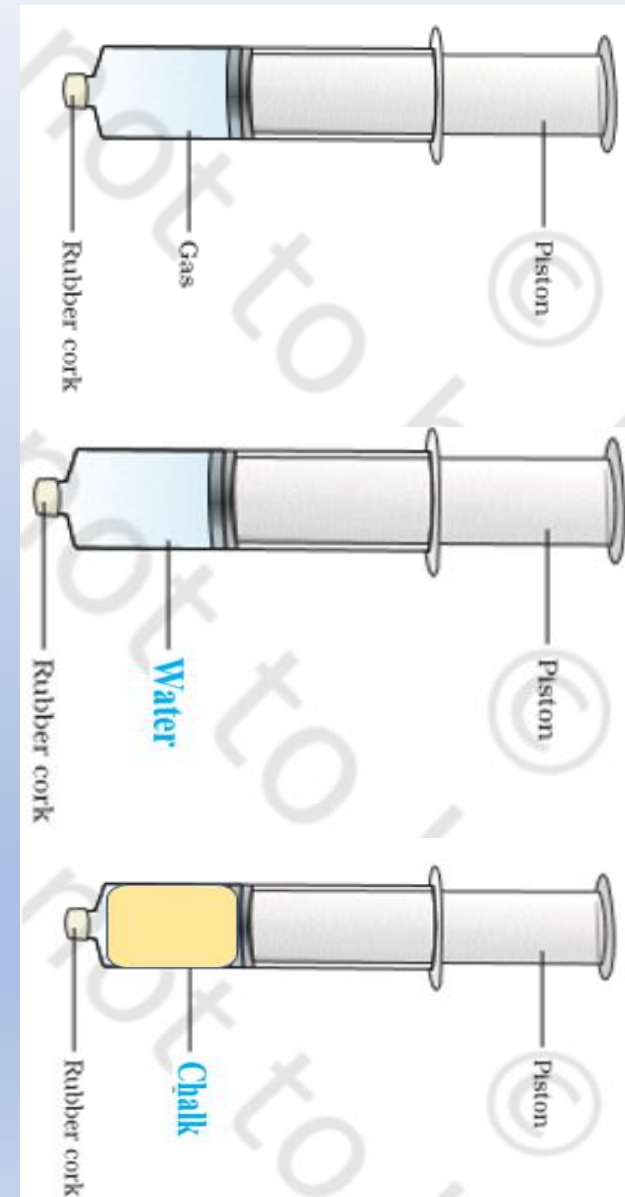


- All living creatures need to breathe for survival.
- The aquatic animals can breathe under water due to the presence of dissolved oxygen in water.
- Thus, we may conclude that solids, liquids and gases can diffuse into liquids.
- The rate of diffusion of liquids is higher than that of solids.
- This is due to the fact that in the liquid state, particles move freely and have greater space between each other as compared to particles in the solid state.

# GASEOUS STATE

## Activity

- Take three 100 mL syringes and close their nozzles by rubber corks, as shown in Figure
- Leaving one syringe untouched, fill water in the second and pieces of chalk in the third.
- Insert the pistons back into the syringes. You may apply some vaseline on the pistons before inserting them into the syringes for their smooth movement.
- Now, try to compress the content by pushing the piston in each syringe.



## GASEOUS STATE CONTINUED.....

What do you observe? In which case was the piston easily pushed in?

What do you infer from your observations?

**Answer:** In first case we can able push the piston easily. We have observed that gases are highly compressible as compared to solids and liquids.

Due to its high compressibility, large volumes of a gas can be compressed into a small cylinder and transported easily.



For Cooking



Automobile Fuel



For Hospitals



# GASEOUS STATE CONTINUED.....

## Diffusion of Gases



- We come to know of what is being cooked in the kitchen without even entering there, by the smell that reaches our nostrils.

### How does this smell reach us?

- The particles of the aroma of food mix with the particles of air spread from the kitchen, reach us and even farther away.
- The smell of hot cooked food reaches us in seconds
- compare this with the rate of diffusion of solids and liquids.

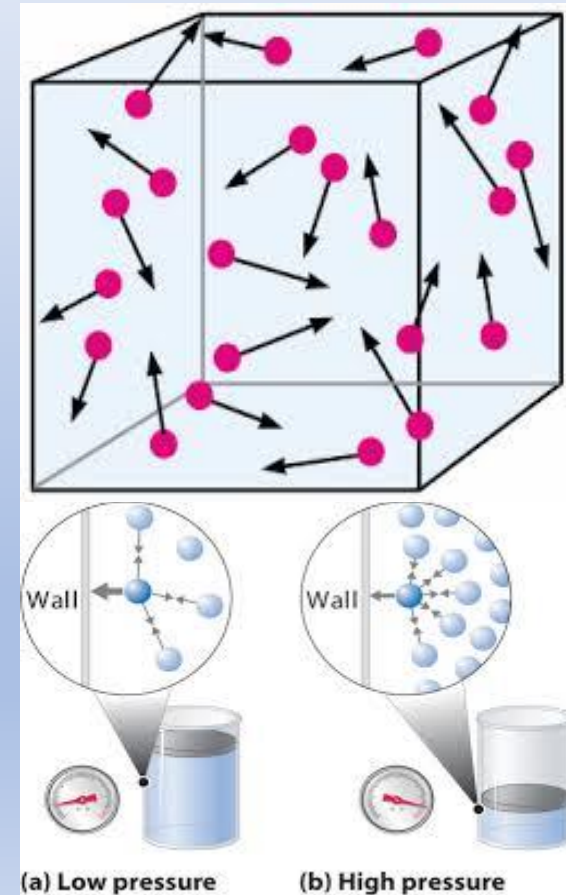
# GASEOUS STATE CONTINUED.....

## CONCLUSION

- Due to high speed of particles and large space between them, gases show the property of diffusing very fast into other gases.

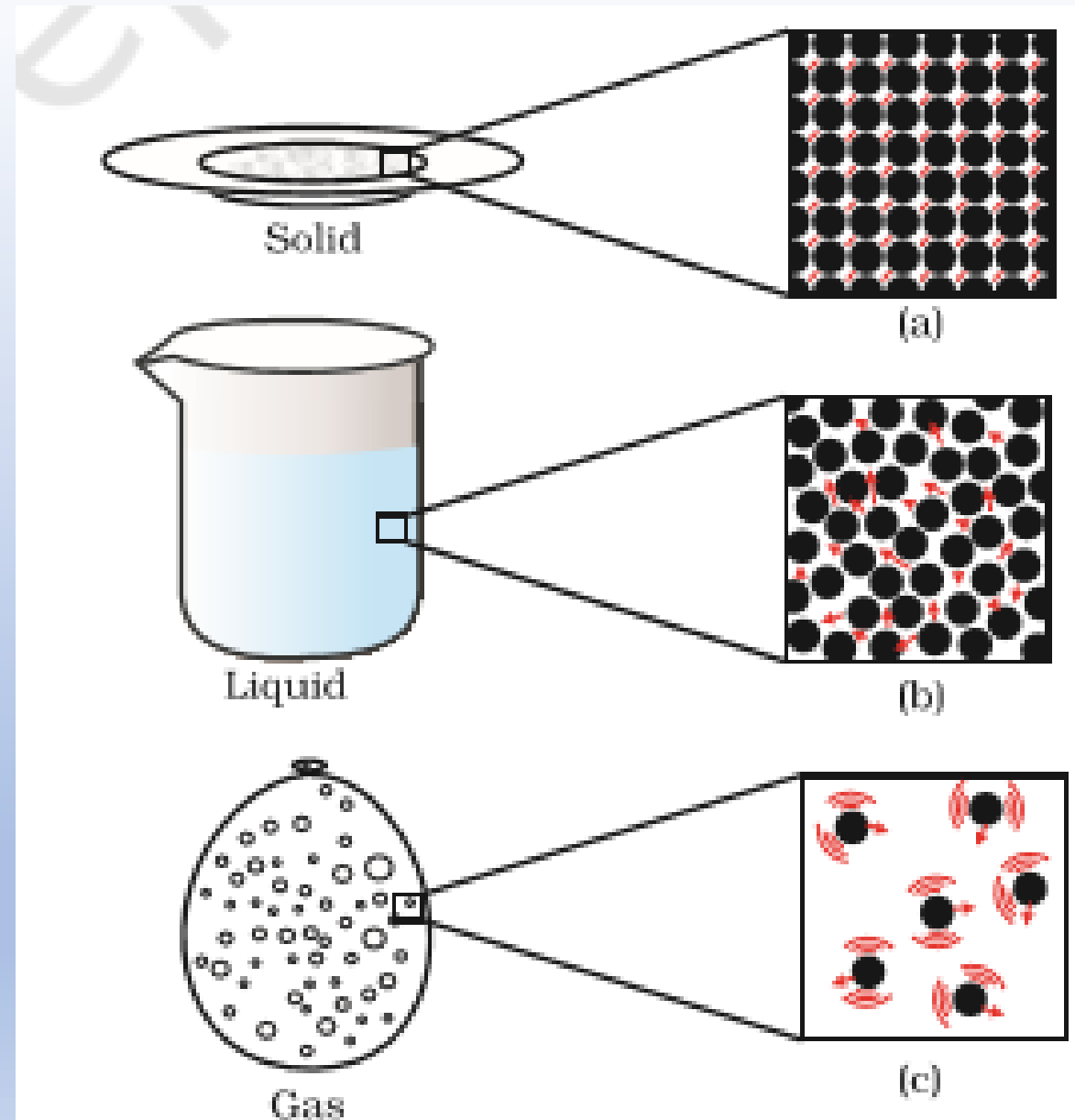
## Pressure of The Gas

- In the gaseous state, the particles move about randomly at high speed.
- Due to this random movement, the particles hit each other and also the walls of the container.
- The pressure exerted by the gas is because of this force exerted by gas particles per unit area on the walls of the container.



# GASEOUS STATE CONTINUED.....

- a, b and c show the magnified schematic pictures of the three states of matter.
- The motion of the particles can be seen and compared in the three states of matter.



# QUESTIONS AND ANSWERS DISCUSSION

**1. Which of the following are matter? *Chair, air, love, smell, hate, almonds, thought, cold, lemon water, smell of perfume.***

**Answer:** Chair, Air, Almond Lemon Water and Smell of Perfume. Love, Smell, Hate, Thoughts, Cold all are feelings that does not occupy an space and has mass.

**2. Give reasons for the following observation: The smell of hot sizzling food reaches you several metres away, but to get the smell from cold food you have to go close.**

**Answer:** At higher temperatures the particles of gas moves faster as the kinetic energy increases with increase in temperature . So the smell (vapour particles) of hot cooked food reach several meters within seconds.

**3. A diver is able to cut through water in a swimming pool. Which property of matter does this observation show?**

**Answer:** The particles of matter have attractive force between them.

**4. What are the characteristics of the particles of matter?**

**Answer:**

1. Particles of matter have space between them.
2. Particles of matter are continuously moving.
3. Particles of matter attract each other.

## QUESTIONS AND ANSWERS DISCUSSION

1. The mass per unit volume of a substance is called density. (density = mass/volume). Arrange the following in order of increasing density – air, exhaust from chimneys, honey, water, chalk, cotton and iron.

**Answer:** The order is- Gas < Liquid < Solid

Air < Exhaust From Chimney < Water < Honey < Cotton < Chalk < Iron

2. (a) Tabulate the differences in the Characteristics of states of matter.

| S. No. | Solids  | Liquids   | Gases   |
|--------|---|---|---|
| 1      | Definite shape and volume.                              | No definite shape. Liquids attain the shape of the vessel in which they are kept. | Gases have neither a definite shape nor a definite volume.  |
| 2      | Incompressible  | Compressible to a small extent.   | Highly compressible   |
| 3      | There is little space between the particles of a solid. | These particles have a greater space between them.                                | The space between gas particles is the greatest.            |
| 4      | These particles attract each other very strongly.       | The force of attraction between liquid particles is less than solid particles.    | The force of attraction is least between gaseous particles. |
| 5      | Particles of solid cannot move freely.                  | These particles move freely.  | Gaseous particles are in a continuous, random motion.       |

## QUESTIONS AND ANSWERS DISCUSSION

2. (b) Comment upon the following: rigidity, compressibility, fluidity, filling a gas container, shape, kinetic energy and density.

**Answer:**

**Rigidity:**

The property due to which an object retains its shape and size is known as rigidity. Solids are Rigid whereas liquids and gases are not.

**Compressibility**

Compressibility is the property due to which a substance can be compressed. i.e., volume can be decreased. Gases are highly compressible.

**Fluidity**

The property due to which a substance tend to flow is called fluidity. Gas and Water are Fluids.

**Filling a Gas Container**

A gas can be filled in a container by compressing it under high pressure. The property of the compressibility(of gases) helps them in this regard.

**Shape**

Matters having definite geometry is called shape. Solid has definite shape.

**Kinetic Energy**

The energy possessed by an object increases when there is an increase in temperature.

**Density**

The energy possessed by an object increases when there is a increase in temperature.

## QUESTIONS AND ANSWERS DISCUSSION

**3. Give reasons (a) A gas fills completely the vessel in which it is kept. (b) A gas exerts pressure on the walls of the container. (c) A wooden table should be called a solid. (d) We can easily move our hand in air but to do the same through a solid block of wood we need a karate expert.**

**a) A gas fills completely the vessel in which it is kept.**

There is little attraction between particles of gas. Thus gas particles move freely in all directions. Therefore, gas completely fills the vessel in which it is kept.

**b) A gas exerts pressure on the walls of the container.**

Particles of gas move randomly in all directions at high speed. As a result the particles hit each other and also hit the walls of the container with a force. Therefore, gas exerts pressure on the walls of the container.

**c) A wooden table should be called a solid.**

A wooden table has a definite shape and volume. It is very rigid and cannot be compressed i.e. it has the characteristics of a solid. Hence, a wooden table should be called a solid.

**c) We can easily move our hand in air but to do the same through solid block of wood we need a karate expert.**

Particles of air have large space between them than Wood which is rigid and becomes difficult to move our hand in solid wood rather than Air.

## QUESTIONS AND ANSWERS DISCUSSION

**4. Liquids generally have lower density as compared to solids. But you must have observed that ice floats on water. Find out why.**

**Answer:** The mass per unit volume of a substance is called density (density=mass/volume). As the volume of a substance increases, its density decreases. Though ice is a solid, it has large number of empty spaces between its particles. These spaces are larger as compared to the spaces present between the particles of water. Thus, the volume of ice is greater than that of water. Hence, the density of ice is less than that of water. A substance with lower density than water can float on water. Therefore, ice floats on water.



END OF THE SESSION

THANK YOU