

CHAPTER-1 MATTER IN OUR SURROUNDINGS

MATTER AND ITS PHYSICAL STATE

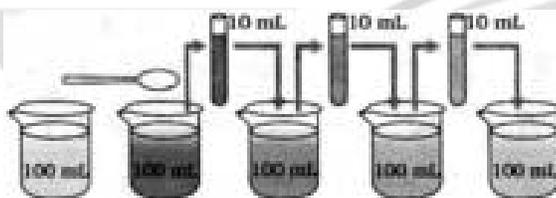
ACTIVITY-1

- Take a 100 mL beaker.
- Fill half the beaker with water and mark the level of water.
- Dissolve some salt/sugar with the help of a glass rod.
- Observe any change in water level.
- What do you think has happened to the salt?
- Where does it disappear?
- Does the level of water change?

CONCLUSION: *Matter is made up of tiny particles and intermolecular space are present in between them.*

ACTIVITY-2

- Take 2-3 crystals of potassium permanganate and dissolve them in 100 mL of water.
- Take out approximately 10 mL of this solution and put it into 90 mL of clear water.
- Take out 10 mL of this solution and put it into another 90 mL of clear water.
- Keep diluting the solution like this 5 to 8 times.
- Is the water still coloured?



Estimating how small are the particles of matter. With every dilution, though the colour becomes light, it is still visible.

CONCLUSION: *After too much dilution, a slight shade of colour still remains in the solution. It shows that particles are too much small in size.*

ACTIVITY-3

- Put an unlit incense stick in a corner of your class. How close do you have to go near it so as to get its smell?
- Now light the incense stick. What happens? Do you get the smell sitting at a distance?
- Record your observations.

CONCLUSION: *Particles of Incense stick reach in the gaseous state and diffuse fastly in air.*

ACTIVITY-4

- Take two glasses/beakers filled with water.
- Put a drop of blue or red ink slowly and carefully along the sides of the first beaker and honey in the same way in the second beaker.
- Leave them undisturbed in your house or in a corner in the class.
- Record your observations.
- What do you observe immediately after adding the ink drop?
- What do you observe immediately after adding a drop of honey?
- How many hours or days does it take for the colour of ink to spread evenly throughout the water?

CONCLUSION: *As the density of ink is less than that of honey, hence the rate of diffusion is faster in the former case than in the latter.*

ACTIVITY-5

- Drop a crystal of copper sulphate or potassium permanganate into a glass of hot water and another containing cold water. Do not stir the solution. Allow the crystals to settle at the bottom.
- What do you observe just above the solid crystal in the glass?
- What happens as time passes?
- What does this suggest about the particles of solid and liquid?
- Does the rate of mixing change with temperature? Why and how?

CONCLUSION: *Higher is the temperature, faster is the movement of particles of matter.*

ACTIVITY-6

- Play this game in the field—make four groups and form human chains as suggested:
- The first group should hold each other from the back and lock arms like Bihu dancers (Fig.).



- The second group should hold hands to form a human chain.
- The third group should form a chain by touching each other with only their finger tips.
- Now, the fourth group of students should run around and try to break the three human chains one by one into as many small groups as possible.
- Which group was the easiest to break? Why?
- If we consider each student as a particle of matter, then in which group the particles held each other with the maximum force?

CONCLUSION: *In the first group of student the force will be maximum as they are compactly packed.*

ACTIVITY-7

- Take an iron nail, a piece of chalk and a rubber band.
- Try breaking them by hammering, cutting or stretching.
- In which of the above three substances do you think the particles are held together with greater force?

CONCLUSION: *In an iron nail the particles are held together with greater force.*

SOLVED QUESTIONS

1. What is the size of particles of matter?
Ans. The particles of matter are very small. They are small beyond our imagination.
2. What is the effect of temperature on the speed of particles of matter?
Ans. As temperature rises, particles move faster i.e., the speed of particles increases.
3. What is diffusion?
Ans. The intermixing of particles of two substances on their own is called diffusion.
4. Name major characteristics of solid state of matter.
Ans. Solid state is characterised by having a definite shape, distinct boundaries, rigidity and incompressibility.
5. According to modern view is matter continuous or particulate?
Ans. Matter is particulate in nature i.e., Matter is made up of particles.

TRY YOURSELF

1. What is matter?
2. Name the three states of matter. Give one example of each.
3. What is plasma?
4. Name different states of matter.
5. Kitchen salt (NaCl) when added to water, gets evenly distributed in it. Which characteristic of particles of matter is exhibited by this?
6. A substance has no mass. Can we regard it as matter?
7. What is common about all things which we see around us?
8. A diver is able to cut through the water in a swimming pool. Which property of matter does this activity show?
9. A solid substance has a definite volume and a definite shape. Why?
10. When a drop of ink is put on the surface of water the colour moves in water and spreads. Why?
11. As a beaker containing water is heated small bubbles escape? Give reasons.
12. The fragrance of a small drop of perfume is felt in the entire room. Give reason.
13. Substance has a definite volume but no definite shape. State whether this substance is a solid, liquid or a gas.
14. When a solid such as sugar or salt or potassium permanganate is added in water it is observed that the pieces of solid disappear. Why?

TEST YOUR CONCEPT

1. Name any two factors due to which the gases show the property of diffusing very fast into other gases.
2. Why is the property of diffusion almost nil in case of solids.
3. Sugar when kept in different jars gain their shape. Is sugar a solid?
4. Do solids show the property of fluidity?

STATES OF MATTER

ACTIVITY-1

- Collect the following articles—a pen, a book, a needle and a piece of thread.
- 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?
- What happens if they are hammered, pulled or dropped?
- Are these capable of diffusing into each other?
- Try compressing them by applying force. Are you able to compress them?

CONCLUSION: *Solid have fixed shape, volume and boundaries, they are hard, rigid and held together with greater force.*

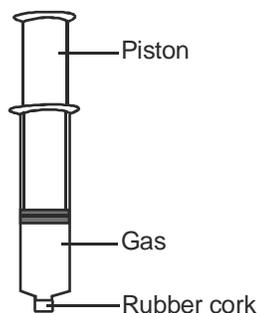
ACTIVITY-2

- Collect 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.
- What will happen if these liquids are spilt on the floor?
- Measure 50 mL of any one liquid and transfer it into different containers one by one. Does the volume remain the same?
- Does the shape of the liquid remain the same?
- When you pour the liquid from one container into another, does it flow easily?

CONCLUSION: *Liquid have fixed volume but different shapes as they acquire the shape of container in which they are kept.*

ACTIVITY-3

- Take three 100 mL syringes and close their nozzles by rubber corks, as shown in Fig.



- Remove the pistons from all the syringes.
- 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.
- What do you observe? In which case was the piston easily pushed in?
- What do you infer from your observations?

CONCLUSION: *Gases are highly compressible as compared to solids and liquids.*

SOLVED QUESTIONS

1. Why have the solids have higher density as compared to liquids or gases?
Ans. The particles in a solid state are tightly packed into a small volume (space). Due to this they generally have a higher density as compared to liquids or gases.
2. Why can't the solids be compressed much?
Ans. The intermolecular space between the particles of solids is very less, because of this solids can not be compressed much.
3. Arrange the solids, liquids and gases in the increasing order of inter molecular forces of attraction.
Ans. Gases < Liquids < Solids.
4. Why do solids have a rigid or fixed shape?
Ans. The particles of solids only vibrate at their mean position and they possess a low kinetic energy. Due to this solids have a rigid or fixed shape.

TRY YOURSELF

1. A solid cannot be compressed easily. Why?
2. Is dry ice the same thing as ordinary ice?
3. Why do ice cubes float on the surface of water?
4. Why is it difficult to clean the blackboard if it is left for a few days? Even after cleaning some dim impression of chalk is left on the blackboard.
5. Ice and water differ in their properties. Ice is harder than water. Give reason.
6. Why does a gas exert pressure?
7. Name the physical state of matter which can be easily compressed.
8. A substance has neither a fixed shape nor a fixed volume. State the physical state of the substance.
9. Why gases are compressive but not liquids?
10. Compare the volumes of solids, liquids and gases.

TEST YOUR CONCEPT

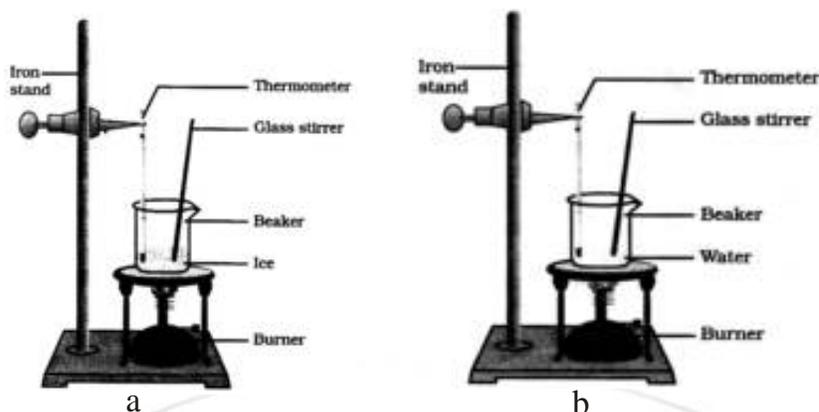
1. Why are liquids and gases called fluids?
2. Ghee freezes at room temperature and mustard oil does not (in winter). Which of these has a higher melting point and lower intermolecular forces?

3. What property of the gas is utilized when natural gas is supplied for vehicles?
4. Which property of gases help us in detecting the leakage of LPG gas?

CHANGE IN STATE

ACTIVITY-1

- Take about 150 g of ice in a beaker and suspend a laboratory thermometer so that its bulb is in contact with the ice, as in Fig.



a. Conversion of ice to water, b. conversion of water to water vapour

- Start heating the beaker on a low flame.
- Note the temperature when the ice starts melting.
- Note the temperature when all the ice has converted into water.
- Record your observations for this conversion of solid to liquid state.
- Now, put a glass rod in the beaker and heat while stirring till the water starts boiling.
- Keep a careful eye on the thermometer reading till most of the water has vaporised.
- Record your observations for the conversion of water in the liquid state to the gaseous state.

CONCLUSION: During the change of state from solid to liquid or from liquid to gas, the temperature remains constant till all the solid has melted or all the liquid has vaporised. The heat energy supplied is used up in overcoming the forces of attraction and hence, the thermometer does not show any rise in temperature.

SOLVED QUESTIONS

1. How does pressure help in converting a gas to a liquid state?
Ans. A gas can be converted into liquid state by increasing the pressure. On increasing pressure the gaseous particles come closer and ultimately get condensed and in this way pressure helps to convert a gas into liquid state.
2. Out of nitrogen, oxygen and carbon dioxide, the gases present in air, carbon dioxide is heaviest. However, it does not form lower layer in atmosphere. Why?
Ans. This behaviour can be explained on the basis of the factor that gravity has no effect on the diffusion of a gas. Thus carbon dioxide (CO₂) remains uniformly mixed in air and does not form the lower layer in the atmosphere.
3. Name any property that is shown by naphthalene but not by sodium chloride.
Ans. Both are solids but naphthalene is sublime substance and shows the property of sublimation. This property is not shown by sodium chloride.
4. Write two points of difference between evaporation and boiling.

Ans. Evaporation	Boiling
1. This involves change of liquid into a gas at any temperature below its boiling point.	1. It occurs only at the boiling point of the liquid. In it the change of liquid to gaseous state occurs at constant temperature.
2. It causes cooling.	2. In it temperature remains constant.
3. It is surface phenomenon.	3. It is a bulk phenomenon.

5. Are gas and vapour mean the same thing or different? Explain.

Ans. They mean the same thing.

The word vapour is used for describing those gases that usually exist as liquid at room temperature e.g. water which exists as liquid at room temperature is called water vapour in gaseous state.

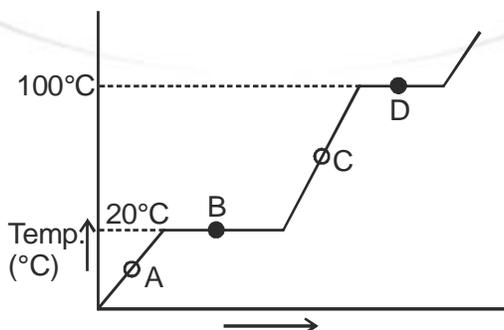
Oxygen is called a gas (not vapour) because it exists as a gas at room temperature.

TRY YOURSELF

1. Define latent heat of fusion?
2. When a liquid boils its temperature remains constant through the heat is continuously supplied. Explain where does the supplied heat energy go?
3. What is S.I. unit of density?
4. In which physical state, water exists at: a. 100°C b. 0°C ?
5. How are Kelvin scale and Celsius scale related to each other?
6. On a hot summer day the cycle tyres burst suddenly. Explain why?
7. What happens when a solid is heated?
8. Name the main terms involved in the change of states of matter.
9. Name the substances which undergo sublimation.
10. What is dry ice?
11. Define sublimation.
12. Naphthalene balls disappear after sometimes without leaving any solid. Give reason.
13. Why is ice at 273 K more effective in cooling than water at the same temperature.
14. Which produces more severe burns : boiling water or steam at 100°C ?

TEST YOUR CONCEPT

1. Dry ice is
 - a. ice having no water of crystallisation
 - b. ice that has been dried
 - c. solid carbon dioxide
 - d. None of these
2. Which of the following processes is known as fusion?
 - a. change of liquid to solid
 - b. change of solid to liquid
 - c. change of liquid to vapour
 - d. change of gaseous state to solid state
3. Which one is a sublime substance?
 - a. Table salt
 - b. Sugar
 - c. Iodine
 - d. Potassium Iodide
4. A beaker of a liquid with a vapor pressure of 350 torr at 25°C is set alongside a beaker of water and both are allowed to evaporate. In which liquid does the temperature change at a faster rate? Why
5. The graph shows the heating curve for a pure substance.



- (i) What is the physical state of substance at A?
- (ii) What is the physical state of substance at B?
- (iii) What is the physical state of substance at C?
- (iv) What is the physical state of substance at D?

EVAPORATION

ACTIVITY-1

- Take 5 mL of water in a test tube and keep it near a window or under a fan.
- Take 5 mL of water in an open china dish and keep it near a window or under a fan.
- Take 5 mL of water in an open china dish and keep it inside a cupboard or on a shelf in your class.
- Record the room temperature.
- Record the time or days taken for the evaporation process in the above cases.
- Repeat the above three steps of activity on a rainy day and record our observations.
- What do you infer about the effect of temperature, surface area and wind velocity (speed) on evaporation?

CONCLUSION:

- ❖ *If surface area is increased, the rate of evaporation increases.*
- ❖ *If temperature is increased, the rate of evaporation increases because with the increase of temperature, more number of particles get enough kinetic energy to go into the vapour state.*
- ❖ *If wind speed is increased, the rate of evaporation increases because with the increase in wind speed, the particles of water vapour move away with the wind, decreasing the amount of water vapour in the surroundings.*
- ❖ *If humidity is decreased, the rate of evaporation increases and vice-versa.*

SOLVED QUESTIONS

1. Why do a surgeon spray ether on a portion skin, when a minor surgery has to be done.
Ans. Surgeons perform minor surgeries on a portion of skin by spraying ether which is a volatile liquid (b.p. = 308 K). Being volatile ether evaporates at a faster rate from skin and it brings down the temperature of skin to quite a low temperature and skin becomes almost numb. Under these conditions minor cut can be easily made on skin. So, as to perform the surgery and patient will not feel any pain because of numbness that has been created.
2. Why do we see water droplets on the outer surface of a glass containing ice-cold water?
Ans. It is due to the fact that water vapours present in air on coming in contact with cold glass of water loses energy and gets converted into liquid state, which are then seen by us as water droplets.
3. Why should we wear cotton clothes in summer?
Ans. During summers we perspire more which helps to keep our body cool. Our body is kept cool because during evaporation of sweat the energy is absorbed from body that leaves the body cool. Cotton being a good absorber of water helps in absorbing sweat and exposing it to the atmosphere for easy evaporation.

TRY YOURSELF

1. Why does a desert cooler give more comfort on a sunny dry day rather than on humid day?
2. In summer clothes dry in lesser time as compared to colder days. Give reason.
3. Why does the water kept in a plate evaporate faster as compared to that kept in a test tube?
4. Wearing cotton clothes is more comfortable in summer. Give reason.

TEST YOUR CONCEPT

1. Give reason: At many places, especially in rural areas, people often sprinkle water on the ground in front of their hoes during hot summer evenings.
2. Heat becomes unbearable in summer, especially after rain. Why?
3. Explain the following:
 - (i) Bottled drinks are cooled more effectively when surrounded by lumps of ice than iced water.
 - (ii) Why does atmospheric temperature fall after hailstorm?
 - (iii) Why is water sprayed on roads in evening in hot summer?
 - (iv) Why do sandy soils, get heated up quickly as compared to wet soils?
4. Explain why?
 - (i) You feel cool when you touch a piece of ice. (ii) A gas fill a vessel completely.
 - (iii) Camphor disappears without leaving any residue.
 - (iv) The temperature does not rise during the process of melting and boiling, though heat energy is constantly supplied.
 - (v) Water stored in an earthen vessel becomes cool.

- (vi) We can get the smell of perfume sitting several metres away.
(vii) An iron almirah is a solid at room temperature.

PRACTICE QUESTIONS

SHORT ANSWER TYPE QUESTIONS [TWO MARKERS]

1. Arrange the following in the order of increasing density :
Air, exhaust from a car, exhaust from a chimney, water, honey, chalk, iron and cotton.
2. Name the factors affecting evaporation.
3. Give reasons for the following observations :
a. Naphthalene balls disappear after sometimes without leaving any solid.
b. We can get the smell of perfume sitting several meters away.
4. Convert the following temperature to Celsius scale : **a.** 330 K **b.** 573 K
5. Why is it easy and faster to sip tea from a flat plate rather than a glass?
6. Define latent heat of vaporization and write its units.
7. What is the chemical name of dry ice? Why is it called dry ice?
8. Boiling point of water on hill station like Shimla is lower than in Delhi. Why?
9. Give reasons why :
a. A solid does not diffuse into another solid **b.** Heat energy is needed to melt a solid
10. The smell of hot food reaches you several metres away. Give reason.
11. When sugar (or common salt) is kept in vessels of different shapes it takes the shape of its container. Do you think sugar is a solid ?
12. Define latent heat of fusion. Write its unit.
13. What is the common name of solid carbon dioxide? What is its use?
14. What are the factors which affect the process of evaporation?
15. Why a liquid has a definite volume?
16. The solids, liquids and gases dissolve and diffuse into liquids. But the rate of diffusion of a liquid in another liquid is greater than the rate of diffusion of a solid in a liquid. The diffusion of a gas into another gas is very fast. What do you conclude from these statements?
17. Give two reasons to justify the following :
a. Water at room temperature is liquid **b.** An iron almirah is a solid at room temperature
18. By placing finger in the running stream of water, you are not able to break the stream of water. What do you conclude from this ?
19. Change the following Celsius temperature to Kelvin Scale : **a.** -273°C **b.** -100°C **c.** -40°C **d.** $+39^{\circ}\text{C}$
20. What is the effect of temperature on the kinetic energy of the particles of a substance ?
21. Which produces more severe burns: **a.** Boiling water or **b.** Steam?
22. Give two factors which increase the rate of evaporation.
23. Why is oxygen called a gas? Give two reasons.
24. Why are gases so easily compressible where as it is impossible to compress a solid or a liquid?
25. Why does ice not deposit in the freezer of a refrigerator equipped with defrosting technique. Explain.

SHORT ANSWER TYPE QUESTIONS [THREE MARKERS]

1. What is dry ice? How is it prepared?
2. State the general properties of liquid state of matter.
3. What is the difference between a gas and a vapour ?
4. Convert the following temperature to the Kelvin scale : **a.** 25°C **b.** 373°C
5. Write the main properties of solid state of matter.
6. Define a solid. Give its main characteristics.
7. Compare the force of attraction between iron, rubber band and chalk.
8. **a.** Solids and liquids are collectively known as condensed phases. Explain.
b. At what temperature solid ice and liquid water exist together ?
c. Why are gases compressible but not the liquids ?

9. Show that the state of matter can be changed into another state by changing the temperature. How can you show the interconversion of the states of matter ?
10. Arrange the following substances in increasing order of force of attraction between their particles : water, sugar and oxygen.
11. Define a liquid. Give its characteristic properties.
12. Define a gas. Give its characteristic properties.
13. Justify the following statements :
 - a. Sand is a solid
 - b. Rate of evaporation of a liquid increases with temperature
 - c. Nail polish remover evaporates faster than water
14. Define condensation and freezing. Also differentiate between them.
15. a. Define the term evaporation. Water kept in an earthen pot becomes cool after some time. Explain why?
b. Why is ice at 0°C more effective in cooling than water at 0°C?
16. a. Define melting point of a solid. What does melting point of a solid indicate?
b. Name the common substances which undergo sublimation.
17. Differentiate between boiling and evaporation.
18. Define the term boiling point of a liquid. Write an activity to show that water can be made to boil even at a temperature below its normal boiling point (100°C).
19. Mention the conditions of existence of three separate states of matter in terms of attracting force and separating force.
20. The compressibility of a liquid is higher than that of a solid but much smaller at compared to the compressibility of a gas.
21. Mention the general properties of gaseous state of matter.
22. Mention the practical utility of high compressibility of gases.
23. We can move our hands in air but to do so in water or through a solid wood block much effort is needed. Explain.
24. What is evaporation? In what way is it different from boiling?

LONG ANSWER TYPE QUESTIONS [5 MARKERS]

1. a. Why do solids have fixed shape and fixed volume?
b. Why is air dense at the sea level?
c. On melting of ice, there is decrease in volume instead of increase. Why?
d. What is the binding force between molecules if a substance is a gas under ordinary conditions of temperature and pressure?
e. Why are average kinetic energies of hydrogen, carbon dioxide and ethane the same at the same temperature?
2. Write the differences in the characteristics of solid, liquids and gases.
3. a. When we light an incense stick (agarbatti) in a corner of our room, why does its have lower boiling point?
b. Liquid A has higher vapour pressure than liquid B. Which liquid out of A and B will have lower boiling point?
c. Name the five states of matter, which the scientists are now talking of?
d. What do you understand by plasma?
e. Name the Indian physicist who worked for a fifth state of matter.

PAST ARCHIVES

1. *What is the effect of sprinkling of water on the roof or open ground on a hot sunny day?* [CCE 2015]
2. *Draw a well labelled diagram showing sublimation of ammonium chloride.* [CCE 2015, 14]
3. *A substance has no mass. Can we consider it as matter?* [CCE 2014]
4. *Why the temperature remains constant during sublimation?* [CCE 2014]
5. *On suffering from fever which will lower down your body temperature, more ice or ice cold water? Why?* [CCE 2014, 12]
6. (i) *Explain the term density. Arrange different states of matter in increasing order of density.*
(ii) *Explain how ice floats on water?* [CCE 2014]
7. *How change in temperature and humidity affect the rate of evaporation?* [CCE 2014]
8. *Rubber band changes its shape. Is it solid?* [CCE 2013]
9. *Why perspiration keeps our body cool?* [HOTS CCE 2011]
10. *Ramesh took two beakers A and B containing hot water and cold water respectively. In each beaker, he dropped a crystal of copper sulphate. He kept the beakers undisturbed. After some time what did he observe and why?* [PBQ]