Matter and Its Composition

Points to Remember :

1. Matter has mass and occupies space.
2. Matter is made up of atoms and molecules.
3. Atoms are the smallest particles of matter which may or may not have independent existence.
4. Molecules are capable of independent existence. They are made up of atoms of same kind or different kinds.
5. The atoms and molecules are in random motion.
6. There are gaps between the molecules of matter called as intermolecular space.
7. There exists a force of attraction between the molecules known as intermolecular force of attraction.
8. Matter exists in three states : solids, liquid and gas.
9. Matter can change from one state to another on changing temperature and pressure.
10. The change of state of a matter from one form into another is called interconversion of states of matter.

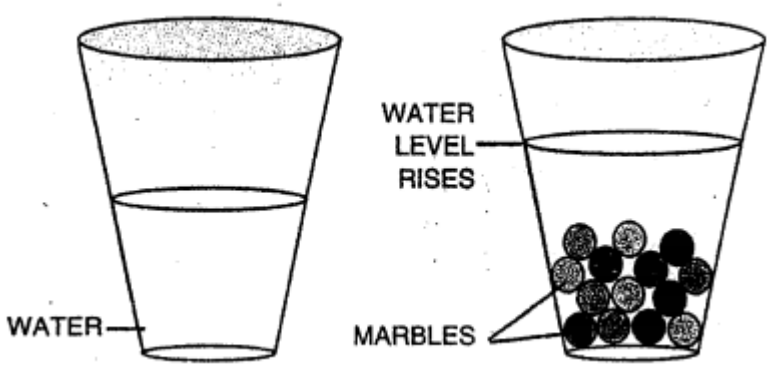
EXERCISE

Question 1.
Define matter.
Answer:
Anything that has mass and occupies space is called matter.

Question 2.
What is the difference between mass and weight.
Answer:
Mass is the “quantity of matter” and weight is “the force with which the earth pulls a body towards itself’. The mass of a body does not change but its weight changes from place to place.

Question 3.
If an object weighs 6 N on earth what will be its weight on moon. What will be the change in its mass?
Answer:
Weight of body on moon = $\frac{1}{6}$th of its weight on earth.
∴ Body will weigh $\frac{1}{6}$ of 6 = $\frac{1}{6}$ x 6 = 1 N on moon
Mass of a body does not change with change in gravity. So mass of a body will remain the same on moon.

Question 4.
Write your observation and conclusion for the following:
(a) When few marbles are put in a glass half filled with water.
(b) Ice is kept at room temperature.
Answer:
(a) Take some marbles and put them into the water of glass tumbler one by one. After some time you will notice that water level crosses the mark and rises. This is because the marbles occupy space. Again weigh the glass with the marbles. You will find that the second mass is greater than the first one. This proves that, marbles have mass.



This proves that, matter has mass and occupies space.
(b) Ice when kept at room temperature again changes back into liquid water.

Question 5.
State three main characteristics of the particles of matter.
Answer:
Characteristics of Matter

1. It can neither be created nor destroyed.
2. It is composed of a particular material which can either be Homogeneous or Heterogeneous.
3. Matter has, volume, mass and weight as per their state.

Question 6.
Differentiate between an atom and a molecule.
Answer:

Atom	Molecule
1. It is the smallest part of an element. 2. It does not have independent existence.	1. It is the smallest part of a compound. 2. It has an independent existence.

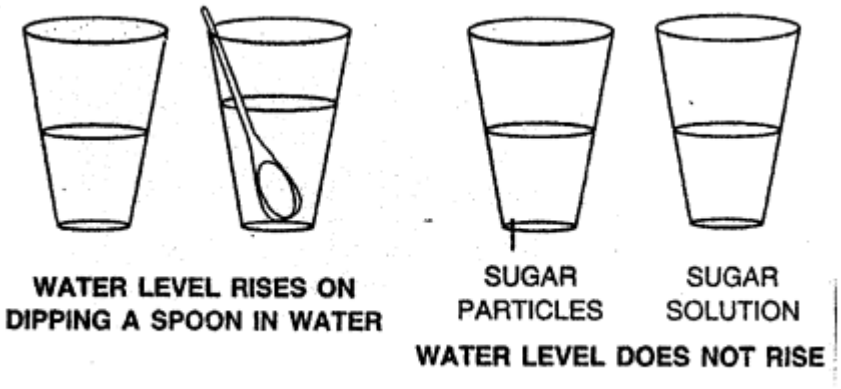
Question 7.
Define :
(a) Solid
(b) Liquid
(c) Gas

Answer:
Giving two examples of each type.
(a) Solid : A solid is that state of matter which has a fixed shape, mass and volume. It suffers very small changes in volume by changing the temperature. It can not be compressed,
e.g. – Sand, Wood, Copper, Ice, etc.
(b) Liquid : It has a definite mass and volume but lacks a shape of its own. It takes up the shape of the containing vessels. It can be compressed to an extents,
e.g. – Milk, water, ink, etc.
(c) Gas : It is a state of matter which has only definite mass but no definite shape and volume. It takes up the shape of the container
e.g. – Carbon dioxide, oxygen, etc.

Question 8.
Why are liquids and gases called as fluids.
Answer:
The particles are free to move in any direction i.e. they can
flow because all substances that can flow are called fluids.
Liquids and gases are fluids.

Question 9.
(a) Define interconversion of states of matter.
(b) Why do solids, liquids and gases differ in their physical state?
(c) Under what conditions do solids, liquids and gases change their state.
Answer:
(a) The process by which matter changes from one state to another and back to original state, without any change in its chemical composition.
(b)Intermolecular force of attraction.
Intermolecular spaces are two important properties of matter that account for the different states of matter.
(c) Matter can change from one state to another on changing temperature and pressure.

Question 10.
Give reasons :
(a) When a stone is dipped in a glass containning some water the level of water rises but when a spoon of sugar is added to it and stired, the water level does not rise?
(b) A drop of ink added to water in a glass turns whole water blue.
Answer:
(a) Take half a glass of water. Dip a spoon in it. What do you observe? The water level rises, indicating that spoon occupies space.



Now remove the spoon, water comes down to its original level. Now add a spoon of sugar to it and stir well. The sugar disappears but the level of water in the glass does not rise, that means the volume of water has not increased. But where did the sugar particles disappear?
The sugar particles being smaller get adjusted between the water molecules. This shows that there are intermolecular space in water.
(b) This is because tfie water as well as ink particles (molecules) are in continuous random motion. Due to motion, the blue coloured particles of the ink spreads all over and give blue colour to the water.

Question 11.
Fill in the blanks :

(a) Air is a matter because it has **weight**, **mass** and **space** and it can be **compressed**.
(b) The molecules are made up of **atoms**.
(c) The quantity of matter in an object is called its **mass**.
(d) The state of matter with definite volume and definite shape is called **solid**.
(e) The substances which can flow are called **fluids.**

Question 12.
Name the terms for the following :
(a) The change of a solid into liquid.
(b) The force of attraction between the molecules of matter.
(c) The particles of matter which may or may not have independent existence.
(d) The process due to which a solid directly changes into its vapours.

(e) The change of vapour into a liquid.

Answer:

(a) Melting.
(b) Intermolecular force of attraction.
(c) Solid.
(d) Sublimation.
(e) Condensation.

Question 13.

Classify the following into solid, liquid and gas :
Coal, kerosene, wood, oxygen, sugar, blood, water vapour, milk, wax.

Answer:

Solids	Liquids	Gases
Coal	Kerosene	Oxygen
Wood	Milk	Water vapour
Wax	Blood	
Sugar		

ADDITIONAL QUESTIONS

Question 1.

Define matter.

Answer:

Anything that has mass and occupies space is called matter.

Question 2.

What is volume ?

Answer:

The amount of space occupied by a matter is called its volume.

Question 3.

What is mass ?

Answer:

Mass is the quantity of matter contained in the body.

Question 4.

If an object weighs 6 kg on earth. What will be its weight on moon ?

Answer:

Weight of body on moon = $\frac{1}{6}$th of its weight on earth

∴ Body will weigh $\frac{1}{6}$ x 6 = 1 kg on moon

Question 5.
If an object is taken to the moon from the earth what will be its mass ?
Answer:
Mass of a body does not change with change in gravity. So mass of a body will remain the same on moon.

Question 6.
Name the smallest particle from which matter is made up.
Answer:
The smallest particle from which matter is made up is atom.

Question 7.
What are molecules ?
Answer:
Molecules are made of atoms. Molecules exhibit the properties of that kind of matter and has independent exi stance.

Question 8.
Give one difference between atoms and molecules.
Answer:
Atoms may or may not have independent existance. Molecules have independent existance.

Question 9.
Define:
(a) Intermolecular force of attraction.
(b) Intermolecular space.

Answer:
(a) The molecules of matter are always in motion and attract each other with a force called intermolecular force of attraction due to which they are held together.
(b) The molecules can move only when there are gaps or space between them, this space is called intermolecular space.

Question 10.
Classify the following into solids, liquids and gases.
Oxygen, milk, common salt, wax, stone, water vapour, carbon-dioxide, sugar, mercury, coal, blood, butter, copper, coconut oil, kerosene.
Answer:

Solids	Liquids	Gases
Common salt	Milk	Oxygen
Wax	Mercury	Water vapour
Stone	Blood	Carbondioxide
Sugar	Coconut oil	
Coal	Kerosene	
Butter		
Copper		

Question 11.
Why do solids, liquids and gases differ in their physical states ?
Answer:

1. Intermolecular force of attraction.
2. Intermolecular spaces are two important properties of matter that account for the different states of matter.

Question 12.
What are fluids ? Give two examples.
Answer:
Substances that can flow are called fluids, e.g. gases (oxygen, hydrogen), liquids (water, petrol, sulphuric acid).

Question 13.
Define interconversion of states of matter.
Answer:
The process by which matter changes from one state to another and back to original state, without any change in its chemical composition.

Question 14.
What are the two conditions for the interconversion of states of matter ?
Answer:
Two conditions are : change in

1. Temperature
2. Pressure

Question 15.
How a liquid changes into its gaseous state ? Explain ?
Answer:
As a liquid is heated, its particles starts gaining energy and move more vigorously which

increases the gaps between the particles and decreasing the force of attraction. Ultimately a liquid changes into gaseous state.

Question 16.
Water cycle is an example of inter conversion of states of water. Explain.
Answer:
Water from oceans, rivers lakes from leaves of trees (transperation) changes into vapours when temperature increases or evaporates and enters the atomsphere as clouds when temperature falls the vapours change into water and some of it in the form of snow fall on mountains and earth in the form of water and hales and this continues. Thus water cycle is example of inter convertion of states of water.

Question 17.
State the general properties of a solid.
Answer:
General Properties Of A Solid :

1. Solids are hard that is, they have a definite shape and volume.
2. Solids are generally incompressible.
3. Solids are rigid, that is, they do not flow.

Question 18.
What is the relation between intermolecular space and intermolecular force ?
Answer:
The force of attraction between the molecules of a given substance is called intermolecular force and the space between these molecules is called intermolecular space.
The basic relation between the two is that they are inversely proportional to each other. More is the intermolecular force lesser is the intermolecular space and vice-versa.

Question 19.
Why liquids do not have a definite shape ?
Answer:
Molecules of a liquid are held by weak intermolecular forces. This force is strong enough to hold the molecules together but not strong enough to hold them at fixed positions. As a result liquids have a fixed volume but not shape.

Question 20.
What happens when a solid is heated ?
Answer:
When a solid is heated, its molecules gain energy and vibrate faster. A stage comes when they overcome intermolecular force of attraction and start moving from each other. This results in melting of solid.

Question 21.
Give reasons for the following.

1. **Gases can be compressed easily :**
   The reason for this property of gases is that there is very large intermolecular space between gas molecules. On mere applying pressure, they are easily compressed.
2. **Liquids can flow easily :**
   In liquids intermolecular force is weaker than that of solids. So molecules in a liquids can slip over one another and liquids can flow unlike solids.
3. **We need to classify things :**
   We need to classify things in order to distinguish them. In this way, things can be categorized and can be easily studied.
4. **Pure substances have fixed melting or boiling poin :**
   Pure substances consists of only one kind of matter. All the particles of a pure substance are alike. It has a definite composition and similar properties. This is the reason that pure substances have fixed melting or boiling points.
5. **Electricity is not considered matter :**
   Electricity neither has mass nor it occupies space. Beside it can not be seen by our eyes. This is why electricity is not considered matter.

Question 22.
Define the following terms.

1. **Matter**—Anything that has mass and occupies space is called matter.
2. **Intermolecular force** — The force of attraction between the molecules of a given substance is called intermolecular force.
3. **Element** — It is defined as that pure substance which contains only one type of atoms e.g. hydrogen, chlorine.
4. **Atom** — An atom is the smallest part of an element that takes place in a chemical reaction.
5. **Molecule** — A molecule is a smallest part of a compound that exists independently.

Question 23.
Write your observation and conclusion for the following:

1. When a small stone is gently dipped into a glass filled with water.
2. When one of the balloons suspended to the metre scale is punctured while other remains inflated ?

Answer:

1. You will see that some water flows out of the tumbler and collects in the bowl. Remove the stone from the tumble. The level of water in the tumbler comes down.

Now, pour the water collected in the bowl back into the tumbler. The glass tumbler is filled again. This is because the stone occupied space and therefore drives the water out of the tumbler. This proves that not only solids but liquids also occupy space.

2. Take two similar balloons and inflate them equally. Suspend one balloon to the left of a metre scale and the other one to the right of it, as shown in the figure below. Balance the scale in the middle with the help of a peg.

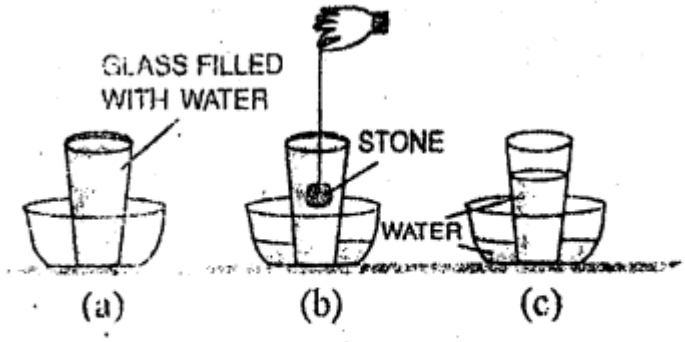
Question 24.

How will you prove by an experiment that solids occupy space ?

Answer:

Experiment to show that solids occupy space :

Take a glass bowl. Place a glass tumbler full of water in it. Now tie a stone with thread and lower into the water. Some water flows out of tumbler into bowl. When we remove stone from tumbler the level of water in tumbler comes down. This shows that solids occupy space.



Both water (liquid) and stone (solid) occupy space

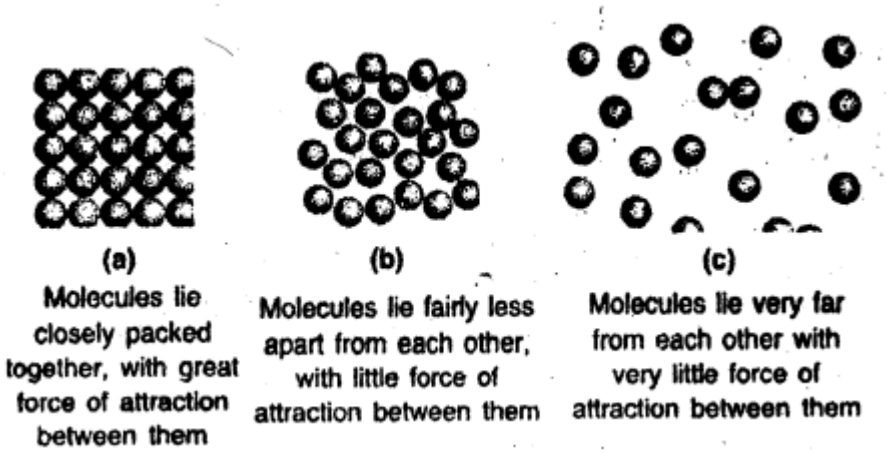
Question 25.

Name the three states of matter and define them.

Answer:

There are three states of matter

- **Solid State :** The molecules are very close to each other hence intermolecular spaces are small and intermolecular force is strong.



(a) Molecules lie closely packed together, with great force of attraction between them

(b) Molecules lie fairly less apart from each other, with little force of attraction between them

(c) Molecules lie very far from each other with very little force of attraction between them

Hence solids have definite volume, rigid, retain definite shape and are incompressible.

- **Liquids** : The molecules are less closely packed have more intermolecular spaces than solid, less stronger forces than solids.
  Hence liquids have definite volume but no definite shape. They take the shape of container in which they are put.
- **Gases:** The molecules in the gases are for apart with weakest force of attraction.
  Hence gases have neither definite volume nor definite shape and compressible.

Question 26.
Give reasons :

1. **Why do liquids and gases flow but solids do not ?**
   The molecules of liquids and gases are far apart i.e.
   have more gaps, intermolecular attraction force is very less as compared to solids, hence liquids and gases can flow but solids do not as gaps in solid molecules is less and molecular force of attraction very strong.
2. **A gas fills up the space available to it.**
   Intermolecular force of attraction is least and intermolecular spaces are very large, hence gases can fill up the space available to them.
3. **The odour of scent spreads in a room.**
   Scent fumes (molecules) being gases fill the spaces between air molecules and the molecules of air fill the spaces between scent molecules due to diffusion, fumes spread into a room.
   OR
   Due to inter-mixing of scent molecules and air molecules, scent fumes spread into the room.
4. **We can walk through air.**
   The molecules of air are far apart i.e. large gaps and we can walk through air easily.

5. **Liquids have definite volume but no difinite shape.**
   The molecules of liquid are loosely packed and intermolecular force of attraction is small but number of molecules in it remain the same. Hence liquids have definite volume but no definite shape.

Question 27.
Give reasons :
(a) When a teaspoon of sugar is added to half a glass of water and stirred, the water level in the glass does not rise.
Add one teaspoon of sugar to it and stir. The sugar disappear but the level of water in the glass does not rise that means the volume of water has not increased. Because the sugar particles are adjusted between the water molecules. The shows that there are intermolecular gaps in water.

(b) When an empty gas jar is inverted over a gas jar containing a coloured gas, the gas also spreads into the empty jar.
This shows that gases can fill up all the space that they get, and they have neither a fixed shape nor a fixed volume. They have no free surfaces, either.

(c) A red ink drop added to small amount of water in a glass turns water red in some time.
If we put a drop of red ink in a glass of water, its particles diffuse with particles of water slowly but continuously and the water turns red.

Question 28.
Give an experiment to explain that there are intermolecular spaces between water molecules.
Answer:
Take a completely filled glass of water. Add a spoon full of sugar. Stir it well. The volume of water hence the level of water in glass remains the same where has gone the volume of sugar added? Actually the sugar molecules took the spaces (gaps) between the molecules of water and level of water in glass remains the same. This shows that there are intermolecular spaces between the water molecules.

Question 29.
Differentiate between the following.
Answer:
(a) Liquids and gases

Liquids	Gases
Have definite volume but no	Have no definite shape or
definite shape	volume
Intermolecular force of attraction	Intermolecular force of
is weaker than that in solids	attraction is the weakest (almost negligible)
Molecules are not as tightly	Intermolecular space is the
packed as in solids and intermol	maximum and the
ecular space is more than that in solids.	molecules are far apart.
Molecules have no fixed position	Molecules move around freely
Can be compressed slightly	Can be easily compressed
Are capable of flowing	Can flow in all directions.

(b) Atoms and Molecules

Atoms	Molecules
1. It is the smallest part of an element.	1. It is the smallest part of a compound
2. It does not have independent existence	2. It has an independent existence.

OBJECTIVE TYPE QUESTIONS

Question 1.
Fill in the blanks:

1. Water is a matter because it has mas and occupies **space.**
2. Any matter which has a definite **volume** but no definite shape is called a **liquid.**
3. **Fluid** can flow.
4. The molecules are at a greater distance in **gases** compared to liquids.
5. Water boils at **100 °C.**
6. The physical state of a substance, which has a fixed volume but no fixed shape is **liquid.**
7. All matter is made up of tiny particles called **atoms.**
8. Liquids have a definite **Volume.**
9. The temperature at which a liquid boils is called the **boiling** point of that liquids
10. Molecules in a **solid** are packed very closely.
11. Liquids have no definite **shape.**
12. When a gas is cooled, its molecules **loose** energy,
13. Matter is anything that has **mass** and occupies s**pace**.

Question 2.

I. Write whether the following statements are true or false.
(a) Only water can exist in three different states.
(b) If the container in which a gas is collected has an opening, the gas will flow out and spread itself indefinitely.
(c) Solids have the largest inter-molecular space.
(d) There is no difference between evaporation and boiling.
(e) All solids, on heating, first change to the liquid and then to the gaseous state always.
(f) The intermolecular force of attraction is the weakest in gases.
(g) A gas has no free surface.
(h) Intermolecular force of attraction is greater in gases than in liquids.
Answer:

(a) True
(b) True
(c) False
(d) False
(e) False
(f) True
(g) True
(h) False.

II. Write true or false for each statement. Rewrite the false statements correctly.
(a) Matter cannot exist in different states.
(b) If the intermolecular space is more than the intermolecular force will be weaker.
(c) Solids and liquids can flow.
(d) Solids can be compressed easily.
(e) The smallest part of an ^element capable of independent existence is called an atom.
(f) The intermolecular space in a gas is almost negligible.
Answer:
(a) False. Matter can exist in different states.
(b) True.
(c) False. Gases and liquids can flow.
(d) False. Solids cannot be compessed easily.
(e) True
(f) False. The intermolecular space in a gas is very large.

Question 3.

For each of the following statements, say whether it describes a solid, a liquid or a gas.
(a) Particles move about very quickly **Liquid**
(b) Particles are quite close together **Solid**
(c) Particles are far apart and move in all directions **Gas**

Question 4.
Match the following:

Answer:

Question 5.
Name the phenomenon which causes the following changes:

1. Formation of water vapour from water is **vaporation.**
2. Disappearance of camphor is **sublimation.**
3. Conversion of ice into water is **melting.**
4. Conversion of water into steam is **boiling.**

Question 6.
Give two examples for each of the following :
(a) Substances which sublime.
Naphthalene, camphor, dry ice.

(b) Substances which do not change their states.
Paper, sugar.

(c) Substances which are rigid and not compressible.
Glass, stone, pen.

MULTIPLE CHOICE QUESTIONS

Question 1.
Which one is a kind of matter:
Answer:

1. light
2. **petroleum**
3. sound
4. heat

Question 2.
The state of matter which has no definite shape or volume is called
Answer:

1. solid
2. liquid
3. **gas**
4. water

Question 3.
There are large intermolecular gaps in
Answer:

1. water
2. iron ball
3. common salt
4. **air**

Question 4.
All kinds of matter
Answer:

1. **occupy space and have definite mass**
2. have mass and definite shape
3. can change their states
4. have definite volume

Question 5.
A kind of matter which can sublime is
Answer:

1. water
2. plastic
3. milk
4. **iodine**

Question 6.
A substance which can change its state
Answer:

1. wood
2. **oxygen**
3. paper
4. cloth

Question 7.
The process by which a solid changes into a liquid is called
Answer:

1. freezing
2. **melting**
3. condensation
4. evaporation

Question 8.
A solid is a state of matter that has
Answer:

1. no definite shape.
2. large intermolecular space.
3. **high intermolecular force of attraction,**
4. no definite volume.

Question 9.
Which of the following is a property of the liquids ?
Answer:

1. **they can flow**
2. they are malleable
3. they have a definite shape
4. they are rigid

Question 10.
Gases
Answer:

1. cannot be compressed easily.
2. **occupy the entire space of the container.**
3. have definite shapes.
4. cannot flow.