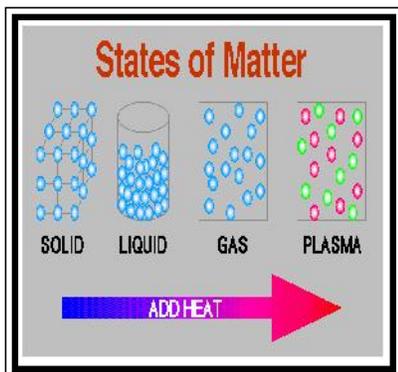


1. WORLD OF MATTER



Syllabus -

- Introduction
- States of matter-solid, liquid and gases.
- Change of matter.
- Evaporation, cooling by evaporation, condensation
- Sublimation
- Absorption of heat.

✍ INTRODUCTION:

Dear students, in previous classes we have learn about different substances their properties. In this year we are going to study different object present in this world. The world that we see and sense, and the world that is beyond the limit of our senses, is full of objects. These include all objects which are present around us.

➤ Matter :

Matter is any thing around you that you can perceive through your senses.

➤ Mass :

Mass is a physical quantity which expresses the amount of matter in a body.

➤ Volume :

The space inside the container is occupied by matter is its volume.

✍ Properties of matter:

- i) Matter is made up of very tiny particles. These particles have space between them. Also they attract each other.
- ii) Matter occupies space.
- iii) Matter has volume and mass.

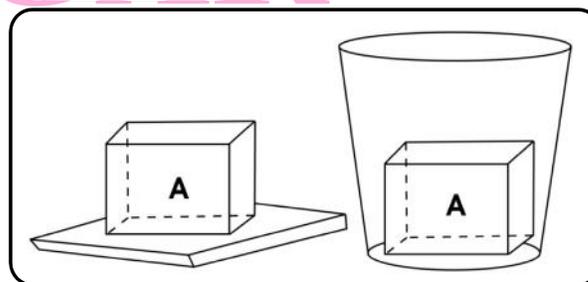
➤ Density:

Density is the ratio of mass to volume.

$$\text{Density} = \frac{\text{Mass}(m)}{\text{Volume}(v)}$$

✍ States of matter:

⇒ Solid state:



➤ Physical Characteristics of solid state.

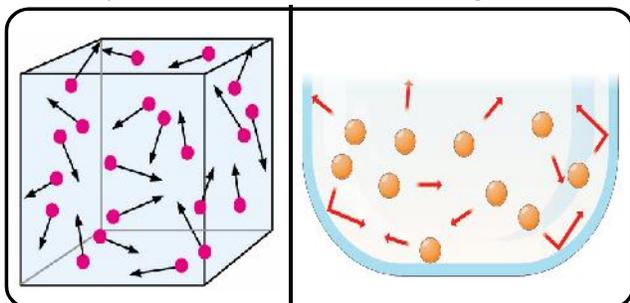
- i) Solid has definite shape and volume.
- ii) Solid shows the property of rigidity. i.e. Solids are almost incompressible.
- iii) Solid shows the property of elasticity. i.e. Some solid can change their shapes when an external force is applied and regain their shape when the force is removed.
- iv) Solids are quite strong because the particles are very close.

➤ Physical Characteristics of liquid state.



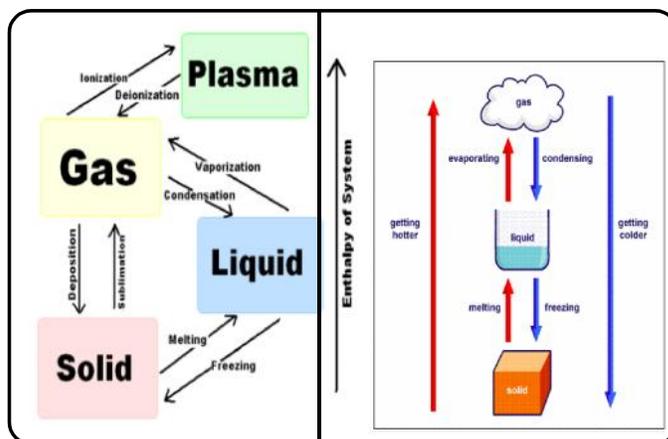
- i) Liquids have a definite volume.
- ii) Liquids do not have a definite shape. They take the shape of the container they are in.
- iii) Liquids cannot be compressed easily because the particles are already very close to each other.

➤ Physical Characteristics of gases state.



- i) Gases flow i.e. the particles are always changing places with each other.
- ii) Gases spread out to fill the container. They move very fast and there are no forces to stop them from going apart.
- iii) Gases can be easily compressed.

⇒ Change of state:



- i) The state of matter can change when the temperature changes. Generally, solid gets converted into liquid and liquid gets converted into gas when the temperature is raised.
- ii) E.g. Oxygen (O_2) as a gas but has the same properties as liquid. Again if we don't eat ice-cream in time, it gets converted into milk-shake but properties are still same.
- iii) Changing states of matter is about changing density pressure and other physical properties. The basic structure does not change.

➤ Melting point:

- i) The temperature at which the solid gets converted to liquid.
- ii) The process by which solid gets converted to liquid state at fixed temperature is melting.

➤ Freezing point:

It is a temperature at which the liquid gets converted into solid.

➤ Fahrenheit:

The body temperature of the body is measured in Fahrenheit.

E.g. The boiling temperature of water is $212^{\circ}F$ and water freezes at $32^{\circ}F$.

➤ **Evaporation:**

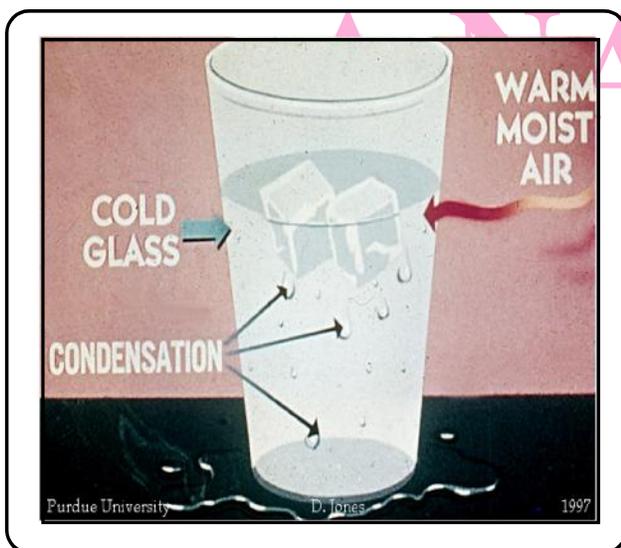
It is a process by which liquid gets converted into gaseous form at any temperature below its boiling point.

In the molecules of liquid, there are some molecules that have a lot of energy and are able to build up enough power to convert themselves into gaseous state. Once they reach that energy level, they leave the liquid state. When the molecule leaves the liquid, we say it has evaporated.

The rate of evaporation depends upon

- i) Change in surface area
- ii) Temperature
- iii) Humidity
- iv) Wind speed, etc.

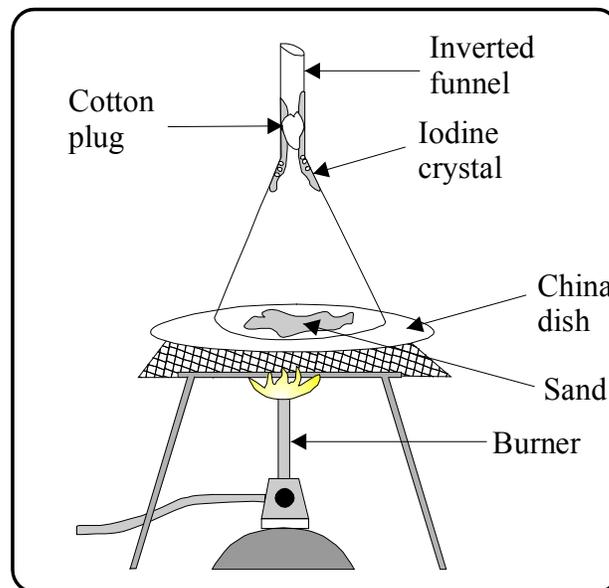
➤ **Condensation:**



It is the process by which liquid drop is formed from its vapor.

It is the process which is responsible for formation of the clouds. This cloud formation is essential for rain and formation of snow.

➤ **Sublimation:**



When solids are directly converted to gas without going through the liquid state, this process is known as sublimation.

➤ **Absorption of heat:**

Every object has a tendency to absorb heat. As long as an object is exposed to a heat source, more heat is absorbed. The different colours respond to heat absorption differently.

Q. 1 A) Fill in the blanks.

- 1) Every substance occupies _____.
- 2) On heating, solid gets converted to _____ and _____ get converted to gases.
- 3) The fourth state of matter is called _____.
- 4) _____ and _____ are sublimatory substances.
- 5) We usually find matter in _____; _____ and _____ forms.
- 6) _____ can exist in all three states of matter.

- 7) _____ have definite shape.
- 8) The solids which maintain their shape after applying external force are said to be _____ .
- 9) _____ do not have definite shape and takes the shape of the container.
- 10) A change in which a solid, on heating, directly changes into gaseous state is called _____ .
- 11) Matter always has _____ .
- 12) 0°C is same temperature as _____ .
- 13) The reverse process of sublimation is called _____ .
- 14) Melting of ice takes place at the temperature _____ .
- 15) _____ describes a physical state of matter.
- 16) In solids, molecules are _____ .
- 17) Melting point of solid oxygen = _____ .
- 18) Water boils at _____ ° F.

- Ans:**
- 1) space
 - 2) Solids, Liquids
 - 3) plasma
 - 4) Camphor, naphthalene balls
 - 5) Solid, liquid, gaseous
 - 6) water
 - 7) solids
 - 8) rigid
 - 9) liquid
 - 10) sublimation
 - 11) both mass and volume
 - 12) 32°F
 - 13) Deposition
 - 14) 0°C and 273 K
 - 15) Phase
 - 16) tightly packed
 - 17) -218.4°C
 - 18) 212

B) 1) Match the following.

	State of Matter	Non-Edible	Edible
1)	Gaseous	Soil	Milk
2)	Solid	Kerosene	Oxygen
3)	Liquid	Carbon monoxide	Peas

Ans:	State of Matter	Non-Edible	Edible
1)	Gaseous	Carbon monoxide	Oxygen
2)	Solid	Soil	Peas
3)	Liquid	Kerosene	Milk

B) 2) Match the following columns.

	Column A	Column B	Column C
1)	Gases	i) rocks	a) iodine crystals
2)	Liquids	ii) oil	b) Oxygen
3)	Solid (non sublimable)	iii) camphor	c) chalk
4)	sublimating substances	iv) Nitrogen	d) cold beverages

- Ans:**
- 1) Gases - Nitrogen - Oxygen
 - 2) Liquids - oil - cold beverages
 - 3) Solid (non sublimable) - oil - chalk
 - 4) sublimating substances - camphor - iodine

B) 3) Match the following columns.

Column I	Column II
i) Muddy water	a) Colloid
ii) Milk	b) Suspension
iii) Mixture of blue vitriol and sand	c) Homogeneous solution.
iv) Mixture of sodium chloride and water	d) Heterogeneous matter.

- Ans:** (i - b) (ii - a) (iii - d) (iv - c)

C) State whether the following statements are true or false :

- 1) Liquids do not have a definite shape.
- 2) Gases have a definite shape and volume.
- 3) Gases can be easily compressed.
- 4) Density of water is greater than ice.
- 5) In solids, intermolecular forces are very weak
- 6) The change in the state of matter, does not change the chemical structure of matter.
- 7) Viscosity of honey is less than water.
- 8) Liquids do not have a definite shape.
- 9) Wax can exist in all three states of matter.
- 10) The melting point and freezing point for a substance are the not same.

Ans :1) True.

- 2) **False** - Gases don't have a definite shape and volume.
- 3) **True**
- 4) **True**
- 5) **False** - In solids, intermolecular forces are very strong.
- 6) **True** -
- 7) **False** - Viscosity of honey is greater than water.
- 8) **True**
- 9) **True**
- 10) **False** - The melting point and freezing point for a substance are the same.

D) Find the odd word out.

- 1) Mercury, Iron, Sodium, Gold
- 2) ice, stone, oil, sugar
- 3) water, milk, honey, kerosene
- 4) CO₂, Br₂, O₂, N₂
- 5) salt, sugar, camphor, baking soda

- Ans :** 1) Sodium 2) oil
 3) honey 4) CO₂
 5) camphor

E) Correct the following statements.

- 1) Solids have the largest intermolecular space.
- 2) A liquid evaporates above its boiling point.
- 3) Gases have the strongest intermolecular forces.
- 4) When a substance is heated, the kinetic energy of the particles decreases.

Ans : 1) Solids have least.

- 2) Liquid evaporates at its boiling point.
- 3) Gases have weak molecular forces.
- 4) When a substance is heated, K.E. increases

F) Which phenomenon occurs during the following changes :

- 1) Formation of clouds :
- 2) Size of naphthalene balls decreases :
- 3) Drying of wet clothes :

- Ans :** 1) sublimation 2) evaporation
 3) condensation

Q.2 Define -

1) Density -

Ans : Density is the ratio of mass and volume.

2) Sublimation -

Ans : The phenomenon when solids go directly into gaseous state without going through the liquid state is called sublimation.

3) Volume -

Ans : The space inside the container that is occupied by matter is its volume.

4) Mass -

Ans : Mass is a physical quantity expressing the amount of matter in a body.

5) Evaporation -

Ans : The phenomenon of change of a liquid into vapor at any temperature below its boiling point is called evaporation.

Q.3 Answer the following questions.***1) Why does ice float on water?**

Ans : Density of ice is less than that of water. Hence, ice floats on water.

2) What is the full form of LPG?

Ans : Liquefied Petroleum Gas.

3) State the factors that influence the rate of evaporation.

Ans : The rate of evaporation is affected by the surface area, temperature, humidity and wind speed.

4) Explain the term 'crystal lattice'?

Ans : A crystal lattice is an exact organization of atoms. The atoms in a crystal are arranged in a regular repeating pattern.
e.g. rubber band.

5) Explain the term 'phase' with respect to matter.

Ans : i) The phase or state of matter can change when the temperature changes.
ii) Phase describes a physical state of matter.
iii) Things only move from one phase to another by physical means.
iv) If energy is added or energy is taken away, a new physical state appears.
v) Substances can exist in all three phases like water.

***6) The smell of hot sizzling food reaches us in seconds. Explain.**

Ans : The particles of the aroma of food mix with the particles of air spread from the kitchen, reach us and even further away.

7) Explain the term 'elasticity' with respect to solids.

Ans : i) Some solids change their shapes when an external force is applied and regain their shape when the force is removed.
ii) This property is termed as elasticity. e.g. rubber band.

8) Why does a desert cooler cool better on a hot dry day?

Ans : i) The cooling in a desert room cooler is caused by the evaporation of water.
ii) A desert cooler cools better at hot and dry day because the higher temperature on a hot day increases the rate of evaporation of water and the dryness of air also increases the rate of evaporation of water. Due to increases rate of evaporation of water, a desert cooler cools better on a dry day.

9) Why are solids rigid?

Ans : i) Solids are almost incompressible.
ii) Their volume is not changed by any outside force. Their shape does not change even if an external force is applied.
iii) That is why solids are rigid.

10) A rock will remain in the same shape and at the same place for years together unless it is broken by an external force. Why?

Ans : i) Solids are usually hard since their molecules are closely packed together.
ii) They are incompressible. Closer the molecules, harder the substance. They do not change easily by external force. Hence, a rock remains in the same shape and place.

Q.4 Give scientific reasons :

- 1) The fragrance of a burning incense stick can be recognized as soon as one enters the room.**

Ans :i) The fragrance of a burning incense stick is in gaseous state. Hence, it spreads throughout the room.

ii) The molecules of a burning incense stick mix with the molecules in the air and spread in all directions.

iii) It can be recognized from a distance.

iv) Hence, the fragrance of a burning incense stick can be recognized as soon as one enters the room.

- *2) In LPG cylinder, the gas filled is in the liquefied state.**

Ans :i) Gases can be easily compressed.

ii) Applying pressure the particles which are so far apart can easily be squeezed together and can be liquefied.

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

- 3) Burns caused by steam are more severe than those caused by boiling water.**

Ans :i) Burns caused by steam are more severe because particles in steam have more energy than water at the same temperature.

ii) While changing the state of liquid to vapour, steam has gained energy in the form of latent heat.

- *4) A gas exerts pressure on the walls of a closed container.**

Ans :i) In the gaseous state, the particles move about randomly at high speed.

ii) Due to this random movement, the par-

ticles hit each other and also the walls of the container.

iii) The pressure exerted by the gas is because of the force exerted by the gas particles per unit area on the walls of the container.

- 5) We paint outer side of the container of a solar cooker with black paint.**

Ans :i) We paint outer side of the container of a solar cooker with black paint because black surface absorbs more heat as compared to white.

ii) While changing the state of liquid to vapour, steam has gained energy in the form of latent heat.

- 6) We pour very hot tea in a saucer, before drinking.**

Ans :i) Evaporation is a surface phenomenon.

ii) If the surface area is increased, the rate of evaporation increases.

iii) Hence, a very hot tea is poured in a saucer for increasing the surface area before drinking, for faster cooling.

- 7) We find dew drops, especially in the early morning on the leaves.**

Ans :i) During day time, the atmosphere absorbs water, due to evaporation, which turns into vapour.

ii) During night time the temperature of the atmosphere drops and condensation takes place.

iii) Thus, we see water drops on the leaf which is a cold surface.

- 8) We wear cotton clothes in summer.**

Ans :i) We should wear cotton clothes in summer, because in summer we perspire more.

ii) Our body mechanism tries to maintain our body in a particular temperature.

- iii) During evaporation, the particles at the surface of the liquid gain energy from our body surface and change into vapour.
- iv) Cotton, being a good absorber of water helps in absorbing the sweat and exposes it to the atmosphere for easy evaporation.

Q.5 Answer the following questions.

- 1) Explain the term 'condensation' and give its significance in the environment.**

- Ans :** i) Condensation is the formation of liquid drops from the vapour.
- ii) It usually occurs when a parcel of rising air expands and cools.
 - iii) If it cools enough, some of the water vapour molecules clump together faster.
 - iv) In the environment it is the process which creates clouds, and so it is essential for rain and formation of snow as well.
 - v) This process keeps the earth's climate cooler, than it would otherwise be if there was no water.

- 2) Mention some properties of matter.**

Ans : Properties of matter :

- i) Matter is made up of tiny particles. These particles have space between them. Also they attract each other.
- ii) Matter occupies space.
- iii) Matter has volume and mass.

- 4) How does solid get converted into liquid?**

Ans : i) On increasing the temperature of solids, the kinetic energy of the particles increases.

- ii) Due to the increase in kinetic energy, the particles start vibrating with greater speed.
- iii) The energy supplied by heat overcomes the forces of attraction between the particles.
- iv) The particles leave the fixed positions and start moving more freely. A stage is reached when solid melts and is converted into liquid.

- 5) Write any two properties of a metalloid.**

Ans : i) A metalloid has properties intermediate between those of a metallic element and a nonmetallic element.

- ii) Metalloids are poor conductors of electricity.

- 6) State any three characteristics of solids.**

- Ans :** i) Solids have a definite shape and volume.
- ii) Most of the solids are rigid while some are plastic and some are elastic.
 - iii) Solids are practically incompressible, i.e., their volume is not very much changed by external forces.

- 7) State any three characteristics of liquids.**

- Ans :** i) Liquids have a definite volume.
- ii) Liquids do not have a definite shape. They take the shape of the container in which they are stored.
 - iii) When they spill on a plane surface, they spread and flow in the surrounding areas, i.e., they have fluidity.
 - iv) They have very low compressibility.

8) State any three characteristics of gases.

- Ans: i) Gases have neither a definite shape nor a definite volume.
 ii) They spread in all directions.
 iii) They can be compressed or expanded easily.

Q.6 Write short notes on the following:

1) Intermolecular forces and physical states of matter.

Ans. Physical states of matter :

- i) Matter exists in three states, viz., solid, liquid and gaseous. Solids have a definite shape and a definite volume. They retain their shape, even when their position is changed.
 ii) Liquids do not have a definite shape, but they have a definite volume. When they spill, they flow in the surrounding area. Hence, they are stored in containers. They take the shape of the container in which they are stored.
 iii) Gases do not have a definite shape and volume. They do not stay in an open container. They spread all around. They do not have a definite shape.
- 2) Intermolecular forces :
- i) The forces among the constituent particles (atoms/molecules) are called intermolecular forces.
 ii) In solids the intermolecular forces are strong enough to keep the particles together in fixed positions. As a result solids have a definite shape and volume.
 iii) In liquids the intermolecular forces are not strong enough to keep the

particles together in fixed position. As a result, liquids have a definite volume but not a definite shape.

- iv) In gases the intermolecular forces are extremely weak. As a result, the molecules of a gas move freely and a gas occupies all the available space. Therefore, gases have neither a definite shape nor a definite volume.

Q.7 Answer the following questions.

1) Convert 100°C into Fahrenheit :

Solution :

$$\text{Formula : } (F - 32) \times \frac{5}{9} = c.$$

$$\therefore F - 32 = \frac{9c}{5}$$

$$\therefore F = \frac{9c}{5} + 32$$

$$= \frac{9 \times 100}{5} + 32$$

$$= 180 + 32$$

$$= 212$$

Ans: 100°C = 212°F.

2) A wooden block of mass 12 grams has dimensions of 2cm x 3cm x 1cm. What would be its density?

Ans: Given : Mass = 12grams

$$\text{Volume} = (2 \times 3 \times 1) \text{ c.c.}$$

$$\text{Density} = ?$$

Solution :

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$= \frac{12}{2 \times 3 \times 1}$$

$$= 2$$

Ans: Density of the block is 2gm/cc.

Q.8 Distinguish between the following:**1) Solids and Liquids :**

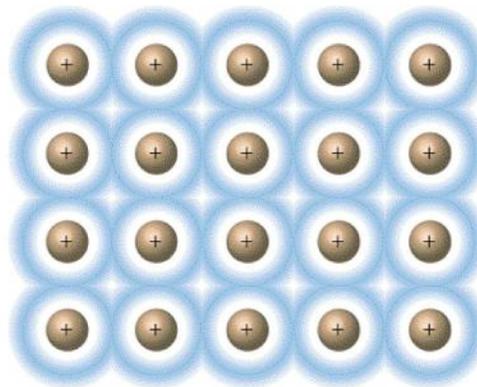
Solids	Liquids
i) Solids have a definite shape.	i) Liquids have no definite shape.
ii) They have very low compressibility.	ii) They have moderate compressibility.
iii) In solids the intermolecular forces are very strong. e.g. iron, stone, salt.	iii) In liquids, the intermolecular forces are moderately strong. e.g. water, alcohol, mercury.

2) Solids and Gases :

Solids	Gases
i) Solids have a definite shape and volume.	i) Gases have neither a definite shape nor a definite volume.
ii) They have incompressibility.	ii) They have high compressibility.
iii) In solids, the intermolecular forces are very strong. e.g. iron, stone.	iii) In gases, the intermolecular forces are very weak. e.g. hydrogen, oxygen.

3) Liquids and Gases :

Liquids	Gases
i) Liquids have a definite volume.	i) Gases do not have a definite volume.
ii) They have moderate compressibility.	ii) They have high compressibility.
iii) In liquids, the intermolecular forces are moderately strong. e.g. water, alcohol, mercury.	iii) In gases, the intermolecular forces are very weak. e.g. oxygen, air.

Q.9 Draw the Diagrams.**1) Structure of a solid****2) Mixture of sand and iodine crystals.**