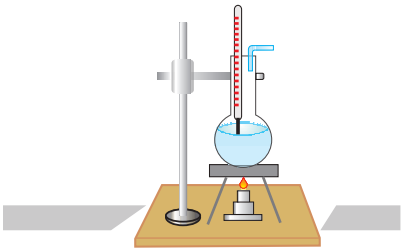


Chapter - 1

Matter In Our Surrounding

CONCEPT MAPPING

Matter

States of Matter

Solids

1. Definite shape.
2. Definite volume
3. Do not flow
4. Particles are closely packed.
5. Incompressible.

Ex.: Table, Chair.

Liquids

1. No definite shape
2. Fixed volume
3. Can flow
4. Particles are loosely packed
5. Little compressible

Ex.: Water, Milk

Gases

1. No definite shape
2. No Fixed volume
3. Can flow
4. Particles are too loosely packed
5. Highly compressible

Ex.: Air, Oxygen

Matter is made up of Particles

Physical Nature of Particles

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

Change of State of Matter

Effect of change in Temperature

Increase in Temperature

Fusion or Malting

Solids melt to form liquid

Melting Point

The temperature at which solid melts to form liquid

Evaporation

Liquids changes into vapours

Boiling Point

The temperature at which a liquid boils to form vapours

Sublimation

The change of solid directly into gas or vapours

Decrease in Temperature

Freezing

Liquid changes into solid

Effect of change of Pressure

Condensation

Vapours changes into liquid

Sublimation

The change of vapours into solid (directly)

Factors affecting Evaporation

1. Exposed surface Area
2. Increase in temperature
3. Humidity
4. Wind velocity

Matter

The matter is the material of which everything in this universe, in and around us is made up of in different shapes. It is anything that occupies space and has mass and offers resistance to any applied force.

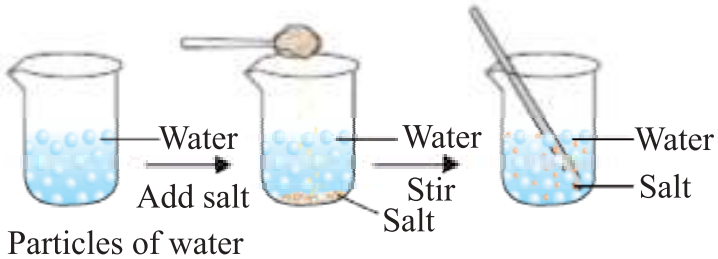
Physical Nature of Particles :

Matter is made up of particles. The particles of matter are very-very small.

Characteristic of Particles :

(i) **Particles of matter are continuously moving** i.e., they possess kinetic energy. As the temperature rises, particles moves faster because kinetic energy of the particles increases.

(ii) **Particles of matter have space between them.** When we make tea, coffee or lemonade (nimbu pani), particles of one type of matter get into the space between particles of the other. This shows that there is enough space between particles of matter.



Particles of water magnified millions of times

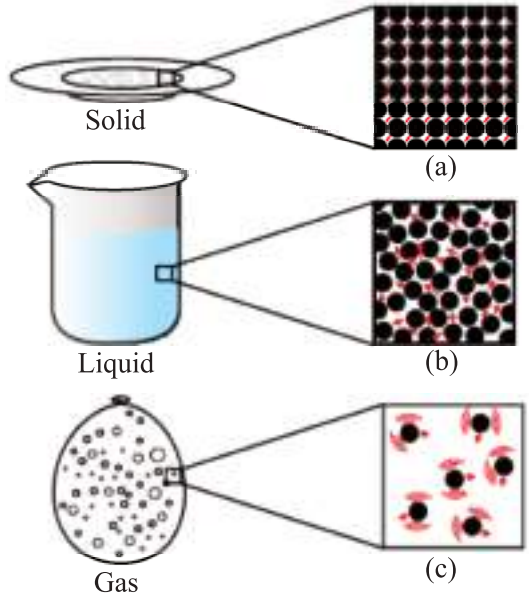
When we dissolve salt in water, the particles of salt got into the space between particles of water.

Particles are varying and have spaces between them

(iii) **Particles of matter attract each other.** When we open a water tap, try to break the stream of water with out fingers, can we do this ? No, because the stream of water remains together. Particles of water are held together because of the force of attraction between them.

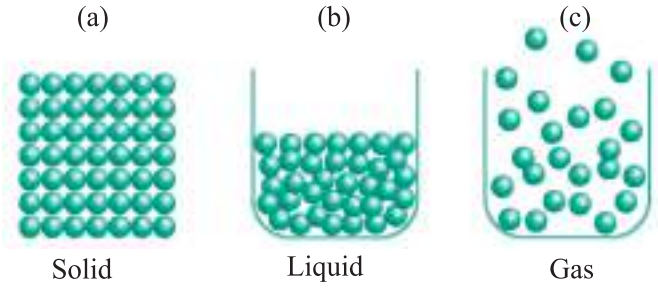
- *The space between the particles and kinetic energy of particles is minimum is solids, intermediate in liquids and maximum in gases.*
- *The force of attraction between the particles is strongest in solids, intermediate in liquids and weakest in gases.*

- *Movement of particles is minimum in solids, more in liquids and maximum in gases.*



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.

Dig. Three states of matter



Arrangement of particles in three states of matter and their movements

States of Matter

The physical states of a matter are : (i) Solid, (ii) Liquid, (iii) Gas.
We can classify our body into three states of matter i.e.,

(i) Bones and teeth are solids.
(ii) Blood and water present in our body are liquids.
(iii) Air in our lungs is gaseous and also there is 70% of water is in our body.

(i) Solid State:

Characteristics of solid states are :

(a) Have definite shape.

(b) Have distinct boundaries.

(c) Have rigidity and incompressibility.

(d) Have definite volume.

Some Exceptional Examples: Rubber band is a solid because it can change its shape under force and regains its shape when force is removed. If excessive force is applied, it breaks.

The solids have fixed and rigid shape. The kinetic energy of the particles in the solid state is very less and therefore, solids have fixed and rigid shape.

- *We can compress sponge as its pores are filled with air but it is solid.*
- *Salt and sugar take the shape of the container in which they are placed but shape of their crystals do not change, so they are solids.*

(ii) Liquid State :

The characteristics of liquid state are :

(a) Have fluidity i.e., they are not rigid.

(b) Low compressibility.

(c) No definite shape and boundaries. They take the shape of the vessels.

(d) Have definite volume.

- *Force of attraction between the particles of liquid keeps its volume same.*
- *Liquids are substances having fixed (definite) volume and no fixed shape. They take the shape of the container in which they are stored.*
- *The gases (oxygen and carbon dioxide) from the atmosphere diffuse and dissolve in water. Due to these gases aquatic plants and animals are able to survive. Diffusion is much more in liquids than in solids due to free movement of particles of liquids.*

(iii) Gaseous State :

The characteristics of gaseous state are :

(a) Have fluidity.

(b) Have high compressibility.

(c) Have no definite boundaries.

(d) Have no definite shape.

(e) Have no definite volume.

- *The particles in a gas are free to move in any direction hence gases can flow.*
- *Gases are substance that do not have fixed volume and occupy all the volume available to them.*

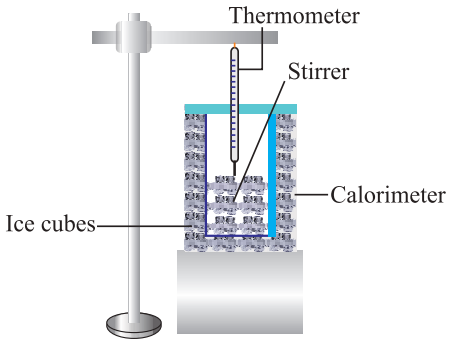
- *Pressure of gas is the force applied on the walls of vessel by the irregular moving gas particles.*

Change of State of Matter

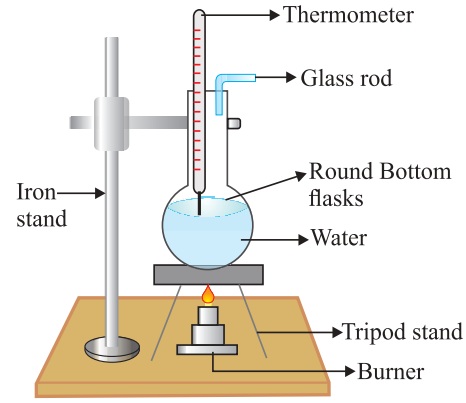
- Water can exist in three states of matter i.e., solid – ice, liquid – water, gas – water vapour.
- On heating ice melts into water and then converts into water vapours.

Change in the physical state of matter can be done in two ways :

(A) **By Changing the Temperature :**



(a) **Melting of ice to form water**



(b) **Boiling of water to form water vapour**

(i) **Melting Point :** The temperature at which a solid melts to form liquid at atmospheric pressure is called its melting point. Melting point of ice is 273.16 K (0ºC). During melting the temperature of ice does not rise even though heat is being supplied continuously due to latent heat of fusion. This latent heat of fusion is used up to overcome the forces of attraction between ice particles. At 0º C energy of water particles is much more than the energy of particles of ice at 0ºC.

- ***Latent Heat of Fusion :*** *The amount of heat required to change I kg solid to its liquid state (at its melting point) at atmospheric pressure.*

(ii) **Boiling Point :** The temperature at which a liquid boils to form vapours at atmospheric pressure is called its boiling point. Boiling point of water is 373 K (100º C + 273 = 373 K).

- ***Latent Heat of Vapourization :*** *The amount of heat required to change 1 kg liquid to its gaseous state (at its boiling point) at atmospheric pressure.*
- *During boiling the temperature of water does not rise even though heat is being supplied continuously as this heat of vapourization is used up to overcome the forces of attraction between water particles.*

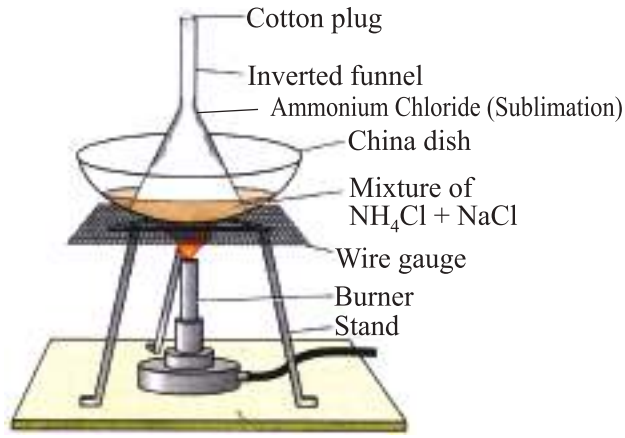
At 100ºC, energy of water vapours is much more than the energy of water at 100ºC. So, we can change one state of matter to another state by changing temperature.

Solid State ⇄ (Heat / Cooling) Liquid State ⇄ (Heat / Cooling) Gaseous State

- At 25ºC, Water is liquid.
  At 0ºC, Water is solid (ice).
  At 100ºC, water is gaseous state (steam).

(iii) Sublimation : The change of solid directly into vapours on heating and of vapours into solid on cooling without passing through the intervening liquid state is called sublimation.

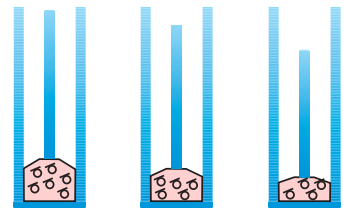
Example : When camphor or ammonium chloride is heated in a China dish covered by a inverted funnel (with cotton plug in its upper open end), the vapours of ammonium chloride are converted into solid ammonium chloride on coming in contact with the cold inner walls of the funnel.



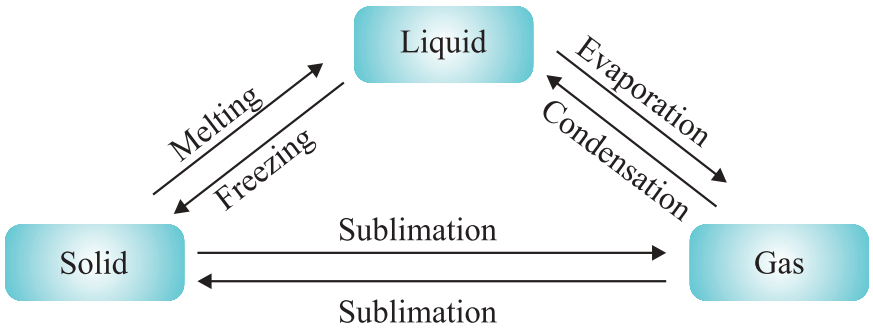
Sublimation of Ammonium Chloride

(B) Effect of Change of Pressure :

If we compress a gas in a cylinder, the distance between the particles of gas is reduced and finally gas is liquefied on lowering temperature.



- *By applying high pressure, the particles of a gas can be brought close together.*
- *Solid carbon dioxide (dry ice) is changed into carbon dioxide gas directly without changing into liquid when pressure is reduced to one atmospheric pressure.*
- *Thus, states of matter i.e., solid, liquid and gas are determined by temperature & pressure.*



Evaporation : A surface phenomenon in which liquid changes into vapours at any temperature below its boiling point is called evaporation. Particles on the surface of a liquid have higher kinetic energy than others, so they break the forces of attraction between the particles & escape from the surface of liquid in the form of vapours.

Factors affecting evaporation : Rate of evaporation depends on :

(a) **Exposed surface area :** On increasing surface area of liquid, rate of evaporation increases.

(b) **Increase in temperature :** Increases kinetic energy of particles hence rate of evaporation increases.

(c) **Humidity :** When the humidity of air (degree of dampness of air) is low, evaporation rate is increased. More humidity, less evaporation.

(d) **Wind :** When wind speed increases, rate of evaporation also increases.

Evaporation always causes cooling : The cooling caused by evaporation is based on the fact that when a liquid evaporates, it takes latent heat of vaporization from surroundings which on losing heat get cooled.

Examples :

(i) When we put acetone on our hand, it gets vapourized by taking heat from our hand and our hand feels cool.

(ii) We should wear cotton clothes in summer to keep cool and comfortable as cotton is good absorber of water, so it absorbs the sweat from our body and exposes it to air for evaporation of sweat thus cools our body.

(iii) Often people sprinkle water on ground during summer. This water takes heat from ground and surrounding air to evaporate, thus making the place cool.

QUESTIONS

VERY SHORT QUESTIONS

1. Write different states of matter.
2. Which has more density – liquid or solid ?
3. What is the melting point of ice ?
4. Boiling point of alcohol is 78ºC. Change it into Kelvin scale ?
5. Why do gas exert pressure ?
6. How do we liquefy the gases ?
7. What happens to particles when salt dissolves in water ?
8. What is the physical state of water :
   (a) at 0º C (b) 25ºC
9. What is the chemical name of dry ice ?
10. Why is heat energy needed to melt a solid ?

SHORT QUESTIONS

1. Classify the matter on the basis of physical characteristics ?
2. Why solid carbon dioxide is called 'dry ice' ?
3. Why do we keep ether and acetone at cool places ?
4. Write two factors which will increase rate of evaporation ?
5. Which gas is supplied in the liquefied form at home and in hospitals ?
6. Compare the force of attraction between iron, rubber band and chalk ?
7. Arrange sugar, water and oxygen in the increasing order of force of attraction between their particles ?
8. Define boiling point, melting point and evaporation ?
9. What is sublimation? Name two substances which undergo sublimation.
10. Why does steam causes more severe burns than boiling water?
11. Change the temperature in celsius scale temperature :
    (a) 293 K (b) 470 K.