


# MATTER IN OUR SURROUNDINGS

**Chemistry**

**Class-9<sup>th</sup>**

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- 
- **Matter is anything that occupies space and has mass.**
  - **On the basis of the physical state matter is classified as solids, liquids and gases.**
  - **On the basis of chemical composition matter can be classified as pure substances and mixtures.**
  - **Pure substances are either elements or compounds.**
  - **Mixtures may be homogeneous mixtures or heterogeneous**

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# Particulate nature of matter

- Particulate nature means that matter is made up of very small particles.
- These particles are either atom, molecule or ions

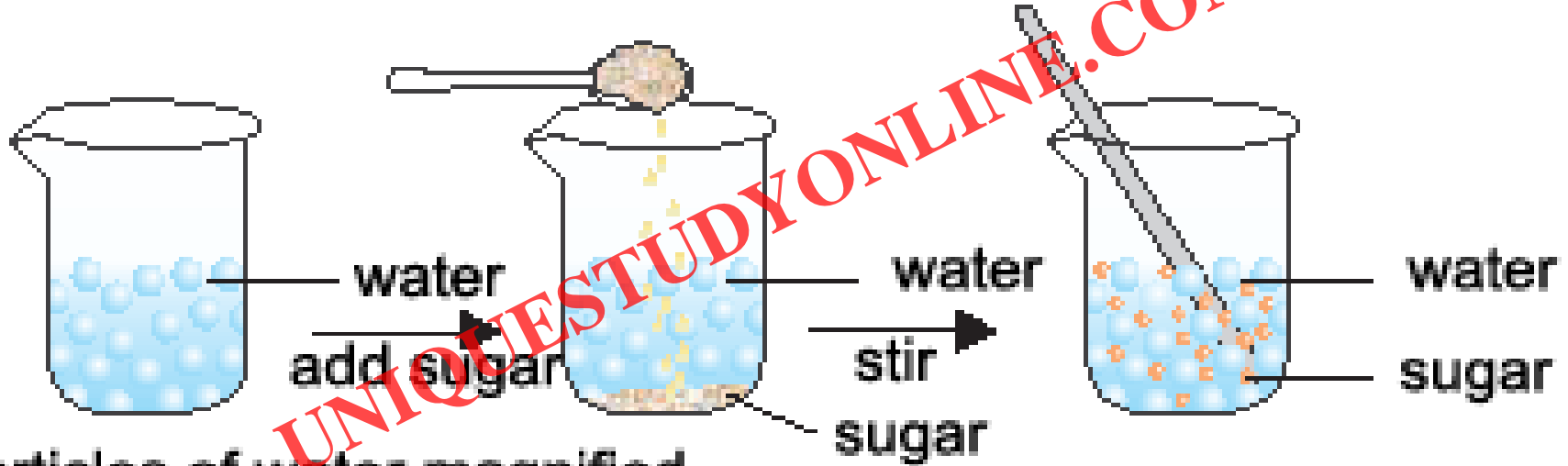
Following properties are associated with particulate nature of matter.

- The particles of matter have space between them.
- The particles of matter are continuously moving.
- The particles of matter attract each other.

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## Activity to prove that particles of matter have space between them

**Activity :-** Take some water in a beaker and note its level. Dissolve some salt or sugar in it with the help of a glass rod. The salt dissolves in the water but the level of water does not change. This is because the particles of salt get into the space between the particles of water.

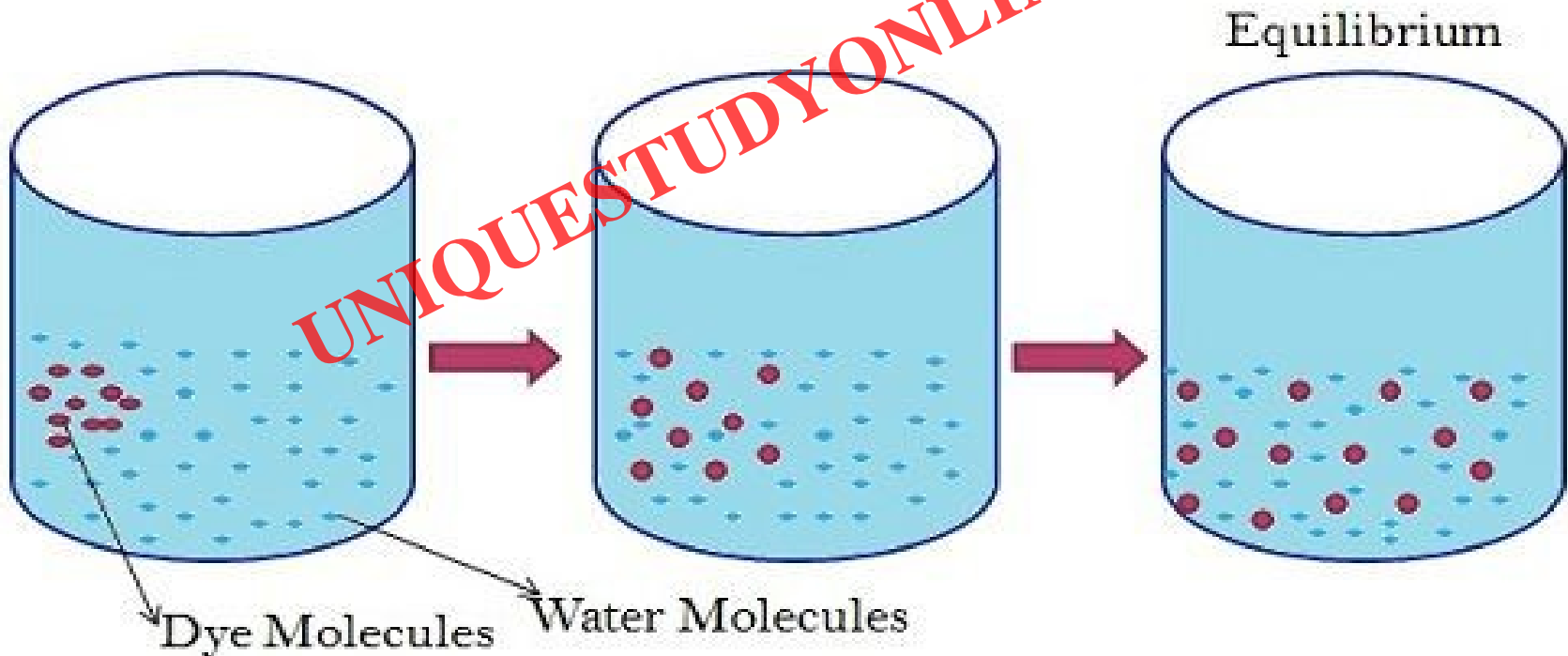


Particles of water magnified millions of times

## Activity to prove that Particles of matter are continuously moving

Take some water in a beaker and put a drop of blue or red ink slowly along the sides of the beaker. Leave it undisturbed for a few hours. The ink spreads evenly throughout the water due to the movement of the particles of water and ink.

*“The intermixing of two or more different types of*





## Activity to prove that particles of matter attract each other

Take an iron nail, a piece of chalk and a rubber band. Try breaking them by hammering, cutting or stretching. It is easy to break a piece of chalk, less easy to break a rubber band and most difficult to break an iron nail. This is because the interparticle forces are maximum in iron



# The three States of matter

Matter exists in three different states which are solid liquid and gas.

## a) Properties of solids :-

- i) Solids have definite shape and volume.
- ii) The space between the particles is minimum.
- iii) The forces of attraction between the particles is maximum.
- iv) The movement of the particles is minimum.
- v) They are least compressible.
- vi) Their rate of diffusion is least.

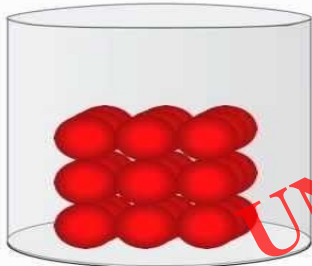
## Properties of liquids :-

- i) Liquids have no definite shape but have fixed volume. Liquids take the shape of the container.
- ii) The space between the particles is more than solids and less than gases.
- iii) The forces of attraction between the particles is less than solids and more than gases.
- iv) The movement of the particles is intermediate.

## Properties of gases :-

- i) Gases have no definite shape or fixed volume. Gases occupy the whole space of the container.
- ii) The space between the particles is maximum.
- iii) The force of attraction between the particles is minimum.
- iv) The movement of the particles is maximum.
- v) They are most compressible.
- vi) Their rate of diffusion is more than solids and liquids.

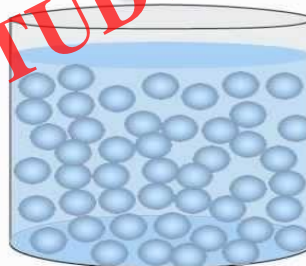
### **solid**



-  rigid
-  fixed shape
-  fixed volume

cannot be squashed

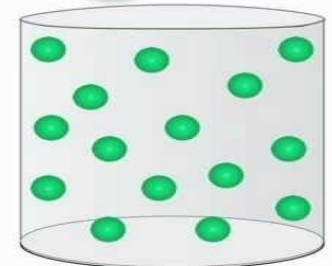
### **liquid**



-  not rigid
-  no fixed shape
-  fixed volume

cannot be squashed

### **gas**



-  not rigid
-  no fixed shape
-  no fixed volume

can be squashed



## Studying Melting point

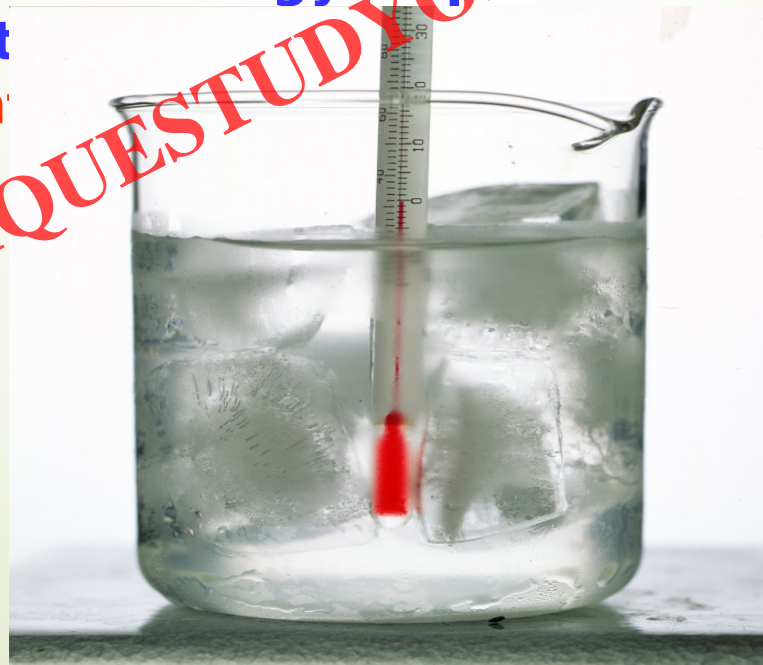
When a solid is heated particles begin to vibrate and move more freely. Then at a fixed temperature the solid into liquid. This process is called melting or fusion.

*The temperature at which a solid melts is called its melting point.*

The melting point of ice is  $0^{\circ}\text{C}$  or  $273\text{ K}$ .

### Latent heat of fusion

The amount of heat energy required to change 1kg of a solid into liquid at its melting point is called the **latent**



When we measure melting point the tip of thermometer must be placed in water enclosed between ice particles.

This ensure that melting point of state with high kinetic energy is observed.

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## Studying boiling point

When a liquid is heated, its particles begin to move faster and at a particular temperature liquid begins to boil and changes into gas (vapour).

Boiling is a bulk phenomenon as entire volume of liquid boils at once and changes into vapour.

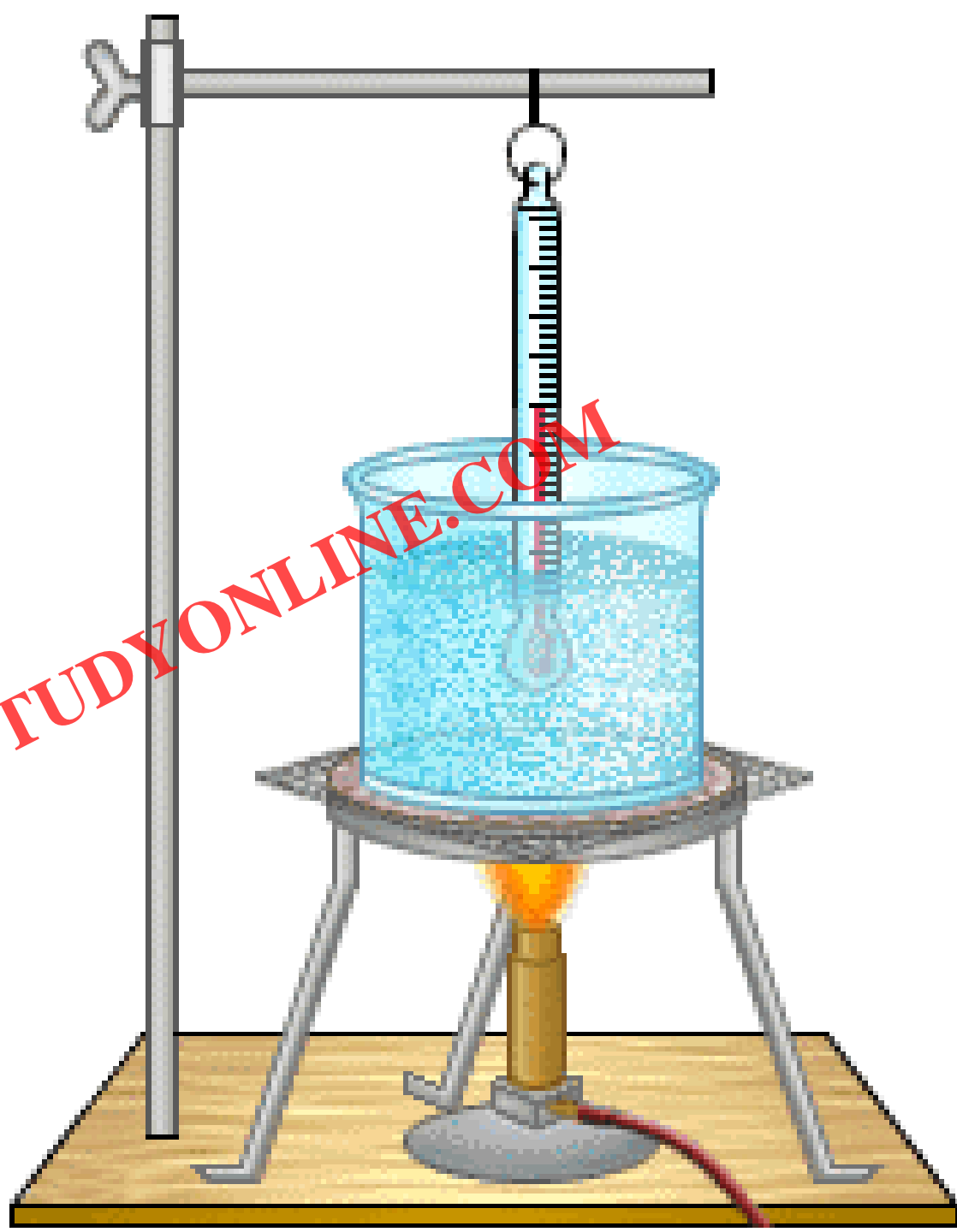
*The temperature at which a liquid starts boiling is called its boiling point.*

The boiling point of water is  $100^{\circ}\text{C}$  or  $373\text{K}$  ( $273 + 100$ ).

**Latent heat of vaporisation :-**

The amount of heat energy required to change 1kg of a liquid into gas at atmospheric pressure at its boiling point is called the **latent heat of vaporisation.**

When we measure boiling point the tip of thermometer must be placed just above surface of boiling water.



## Effect of pressure on gases

When pressure is applied on gas the particles come close which increases the inter particle forces and the gas changes into liquid.

Hence we can liquefy gases by applying pressure and decreasing the temperature.

Compressed solid carbon dioxide is called dry ice. If the pressure is reduced it changes directly to gas without coming into liquid state. So solid carbon dioxide is known as dry

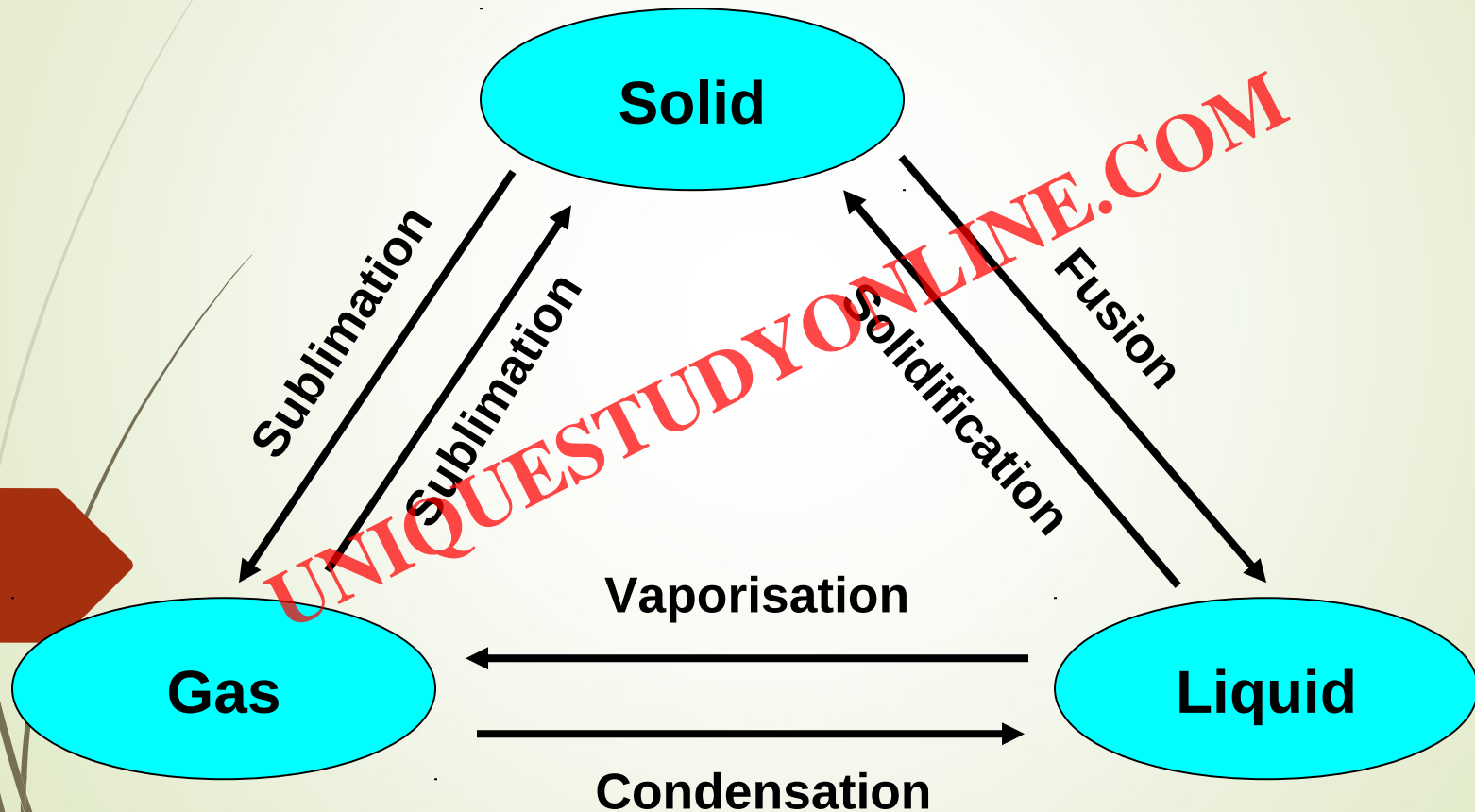


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# Interconversion of the three states of matter

The state of matter can be changed by changing the temperature or pressure.



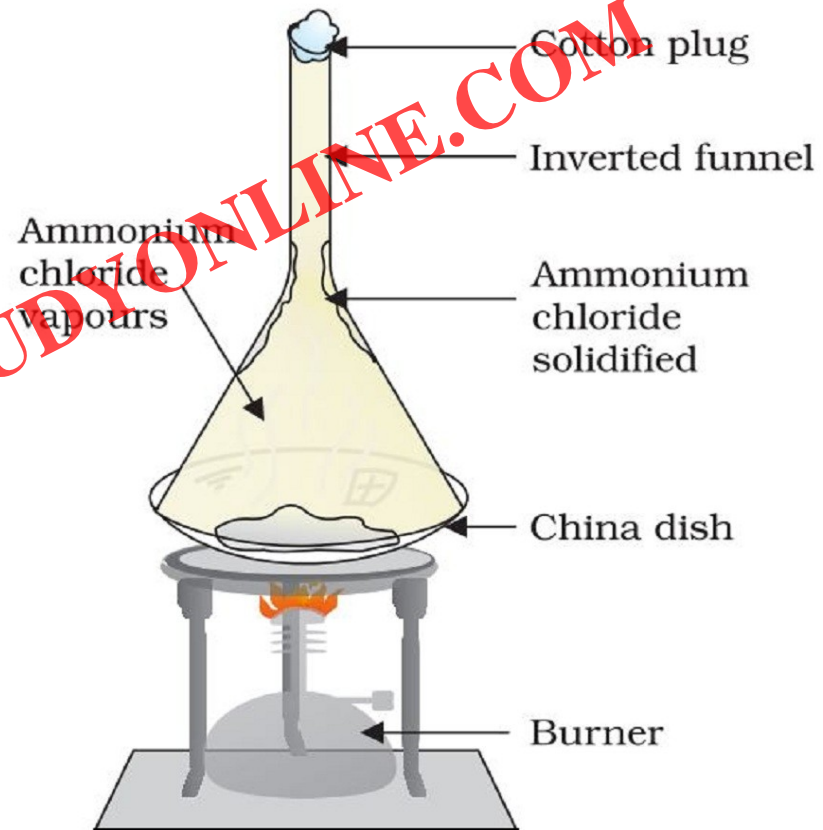
# Separation techniques

These techniques are used to separate components of a mixture on basis of variation in physical properties like boiling point, melting point, solubility etc.

# Sublimation

The change of state directly from solid to gas or from gas to solid is called **sublimation**.

**Eg :-** If solid camphor or ammonium chloride is heated, it changes into vapour. If the vapours are cooled it changes into solid.



# Evaporation

The change of a liquid into vapour at any temperature below its boiling point is called **evaporation**.

Evaporation is a surface phenomenon. Particles at the surface of liquid absorb enough energy to overcome the forces of attraction i.e. latent heat of vapourization and it changes to vapour state.

## b) Factors affecting evaporation :-

- The rate of evaporation depends upon surface area, temperature, humidity and wind speed.
- Increase in the surface area increases the rate of evaporation.
- Increase in temperature increases the rate of evaporation.
- Increase in humidity decreases the rate of evaporation.
- Increase in wind speed increases the rate of evaporation.

# Evaporation and its cooling effect

When a liquid evaporates, the particles of the liquid absorb heat from the surroundings and evaporates as a result the surroundings become cold.

Eg :- People sprinkle water on the roof or open ground because during evaporation water absorbs heat from surface which make the hot surface cool.

During summer we perspire more as sweat absorbs heat from our body making the body cool.

Wearing cotton clothes in summer keeps us cool because cotton absorbs sweat and when the sweat evaporates it absorbs heat from our body thus making the body cool.

Desert cooler works better on a hot and dry day as evaporation is more in such conditions.