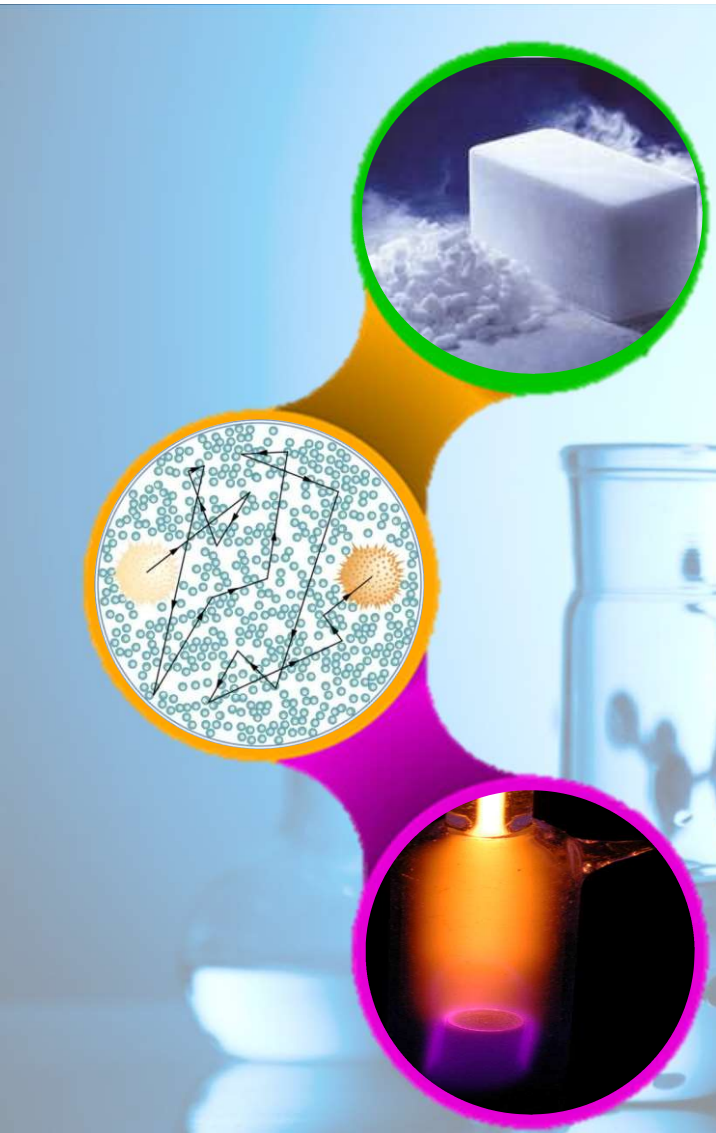
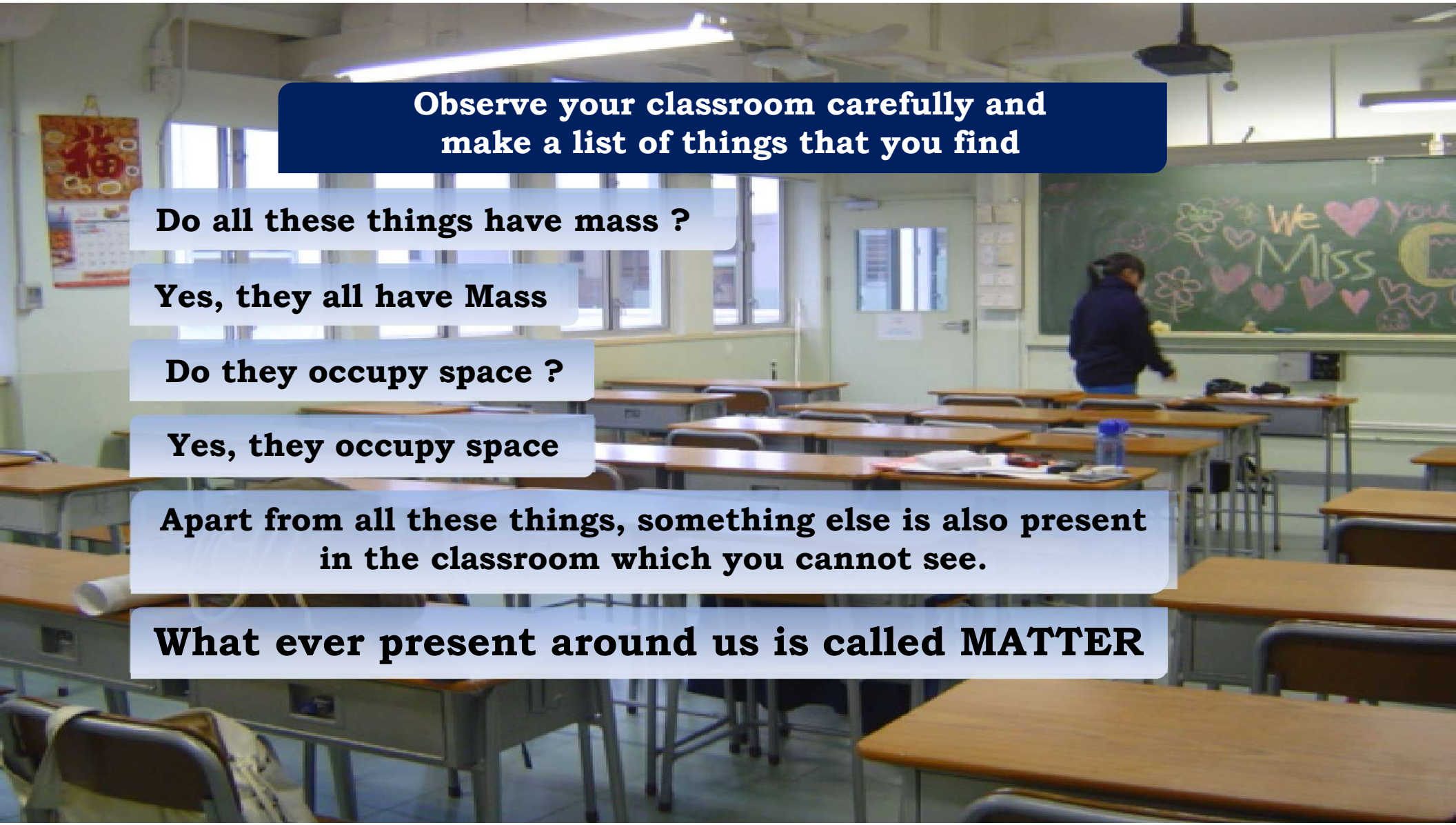


MATTER IN OUR SURROUNDINGS

MODULE : 1

- **Introduction**
- **Definition of matter**



Observe your classroom carefully and make a list of things that you find

Do all these things have mass ?

Yes, they all have Mass

Do they occupy space ?

Yes, they occupy space

Apart from all these things, something else is also present in the classroom which you cannot see.

What ever present around us is called MATTER







Let us see few more examples of matter

MATTER

MODULE : 2

- **Classification of matter**
- **Energy, Mass & Volume**

What is matter ?

Anything that has mass and occupies space is called as matter. 'Which you can perceive through your senses'.

Let's prove that air has mass

Mass = 1 kg

Mass = 1.5 kg

Mass of football has increased due to air hence

Air has mass and occupies space.

What is mass ?

MASS : It is a physical quantity which expresses the amount of matter in a body.

What is weight ?

WEIGHT = (Mass × Gravitational acceleration)

Pan weighing 2kg rice

A girl weighing herself on a weighing machine

What is volume ?

Amount of gas and oil present in a respective container can be given by another physical quantity called...

VOLUME : **The space inside the container that is occupied by matter is it's volume.**

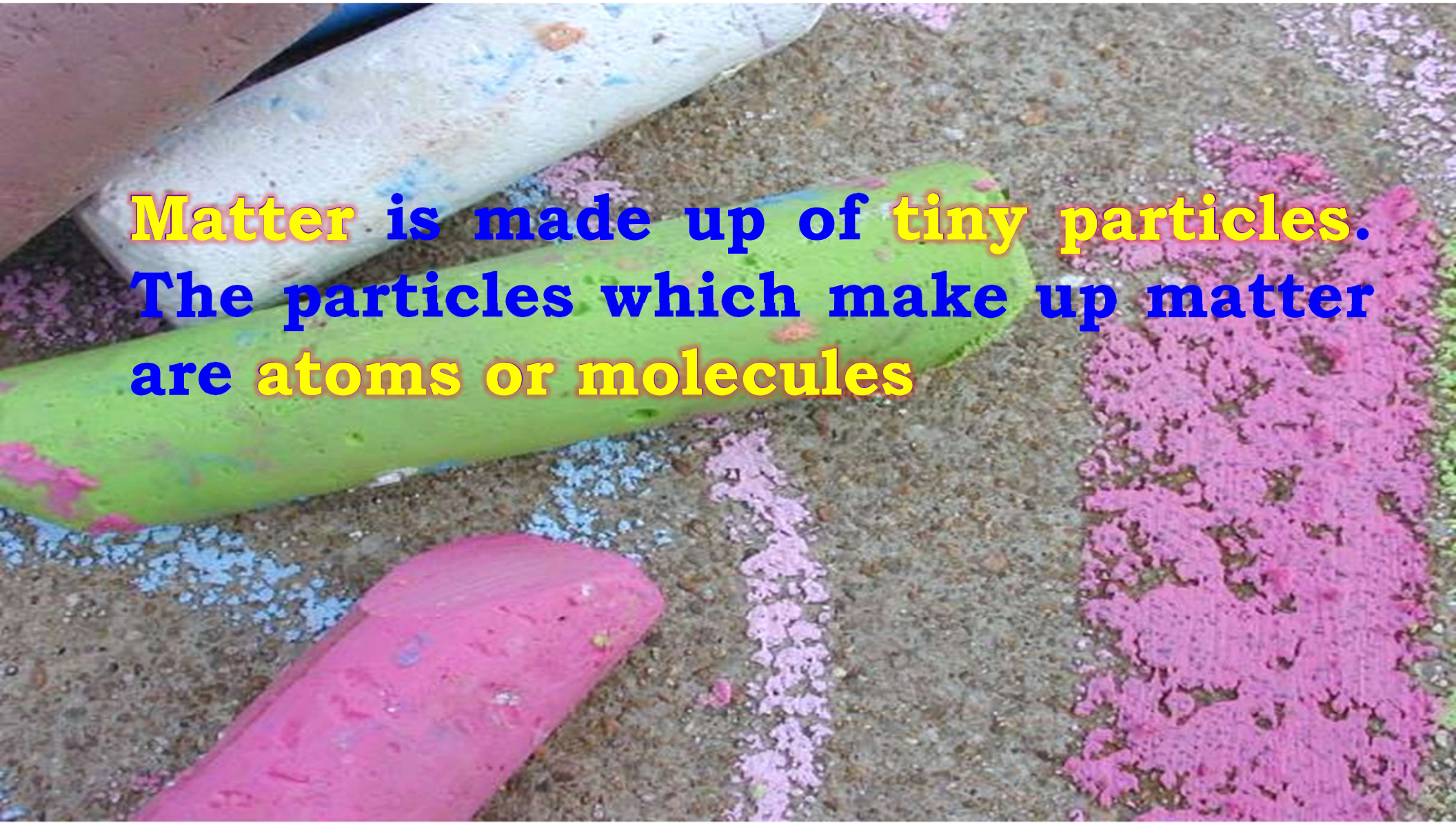
NOT MATTER !!!

SO... IS EVERYTHING AROUND US

R?

HEAT **LIGHT** **SOUND**

All these are forms of ENERGY


Matter is made up of tiny particles.
The particles which make up matter
are atoms or molecules

MODULE : 3

- **Properties of matter**
- **Property 1 - Matter is made up of small particles**

❖ MATTER IS MADE UP OF SMALL PARTICLES

Take 10ml of this solution from and mix it with 90ml of water present in second beaker to dilute it.

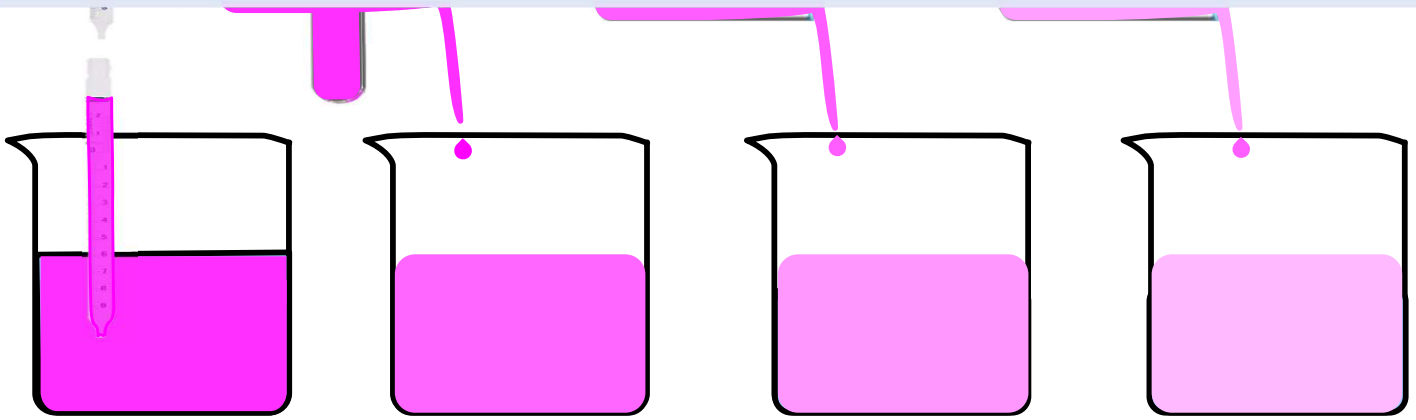
anate can impart

nate crystal is

Continue to dilute it for other beakers ch keep on spreading and imparting color on dilution.

The color of the solution becomes still

This indicates, the particles of matter are very small – they are small beyond our imagination!!!

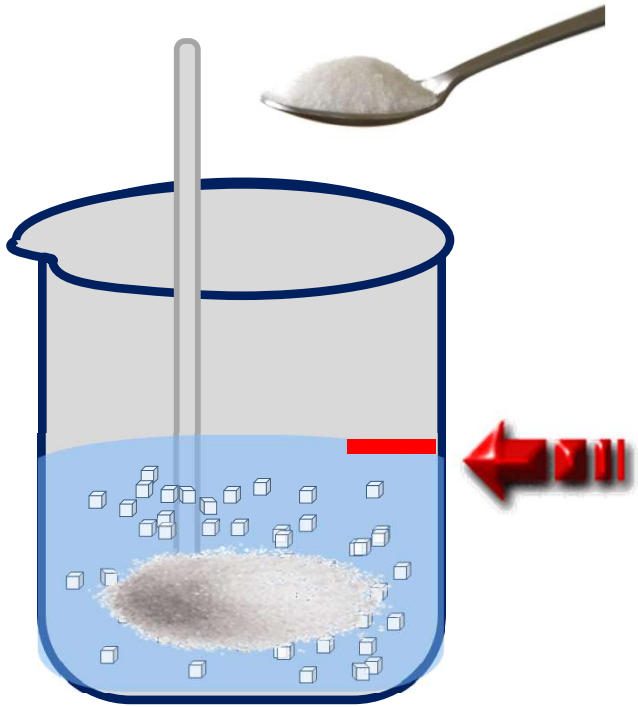


MODULE : 4

- **Property 2 – Particles of matter have space between them**
- **Property 3 – Particles of matter are continuously moving**

❖ THE PARTICLES OF MATTER HAVE SPACES BETWEEN THEM

This indicates, the particles of matter have spaces between them



Take 100ml water in a beaker

Now, mark the level of water.

Add to this 50g of sugar

Dissolve the sugar by stirring it with a glass rod.

You will notice that the level of water is the same, even after the sugar has been dissolved.

So where does the sugar go ???

Sugar particles get into the spaces between the particles of water.

❖ PARTICLES OF MATTER ARE CONTINUOUSLY MOVING

Potassium permanganate particles spread throughout the water particles and mix up on their own without stirring because 'they are moving' or they are in motion.

This movement of different particles among each other (on their own), so that they become mixed uniformly, is called diffusion.

This indicates, particles of matter are continuously moving

MODULE : 5

- **Particles of matter are continuously moving**
- **Brownian motion**

❖ PARTICLES OF MATTER ARE CONTINUOUSLY MOVING

What is kinetic energy?

The kinetic energy of an object is the energy which it possesses due to its motion

The particles of gases produced move rapidly in all directions, mix with the moving particles of air in the room.

When lit their kinetic energy increases, the fragrant molecules come in the vapour phase and are diffused in the surroundings

BROWNIAN MOTION

- The best evidence for the existence and movement of particles in liquids can be explained by Brownian motion.`

- Brownian motion in
- Diffusion and Brown provide the best evi

When a beam of sunlight enters a room, we can observe tiny dust particles suspended in air which are moving rapidly in a very haphazard way

pollengrains were moving rapidly

They move here and there because they are constantly hit by the fast moving particles of air.

water because they are constantly being hit by the fast moving particles of water.

Robert Brown [1827]

MODULE : 6

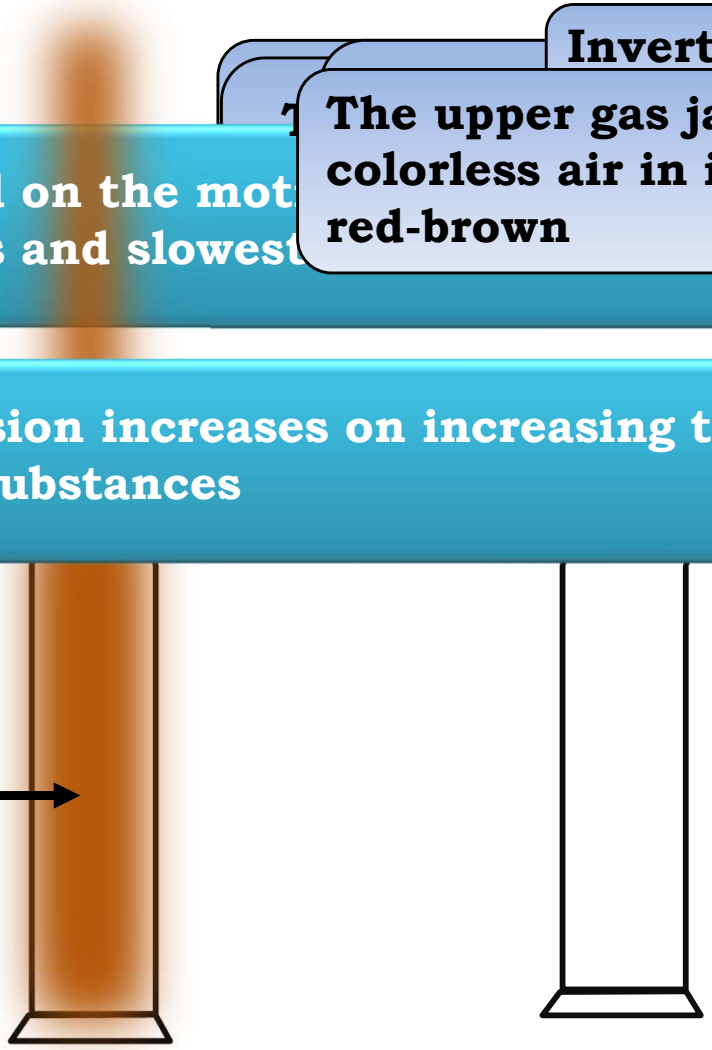
- **Properties of matter**
- **Diffusion**

DIFFUSION

- Diffusion is based on the mot
  is fastest in gases and slowest
- The rate of diffusion increases on increasing the temperature of the diffusing substances

Invert another gas jar

The upper gas jar which contains colorless air in it, also turns red-brown



A gas jar containing red-brown bromine vapour

Diffusion Intermixing of particles of two different types of matter on their own is known as diffusion

The smell of perfume spreads due to the diffusion of

Spreading of ink in water

Diffusion in solids is a very, very slow process.

nes us even from

into water and

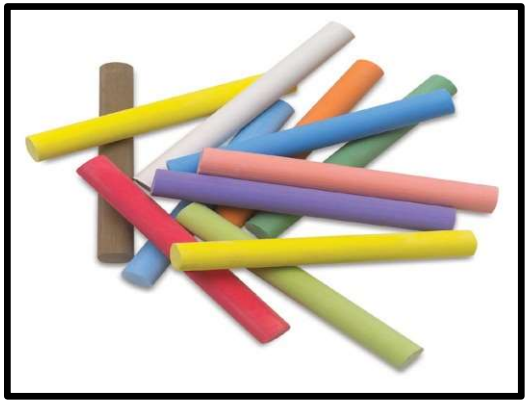
an breathe under

water due to the presence of dissolved oxygen.

MODULE : 7

- **Property 4 – The particles of matter attract each other**
- **Characteristics of matter**

❖ THE PARTICLES OF MATTER ATTRACT EACH OTHER



Chalk

Iron Nail

Ice cube

Take a piece o
and a cube of
hammer

The force of attraction is maximum in the particles of solid matter and minimum in the particles of gaseous matter

of attraction between the particles of iron nail is very very strong

Characteristics of particles of matter

The particles of matter are very, very small.

The particles of matter have spaces between them

The particles of matter are constantly moving, as temperature rises particles moves faster.

The particles of matter attract each other.

MODULE : 8

- **States of matter**

STATES OF MATTER

SOLID

LIQUID

GAS

Matter can even exists in two more states

PLASMA
(Super Hot Gases)

The matter whic
at a very high te
like sun

BOSE EINSTEIN
condensate

Artificially created state of
m
te

Let's study solid, liquid and gases in detailed

MODULE : 9

- **Solid state of matter**
- **Properties of solid state of matter**

SOLID STATE :

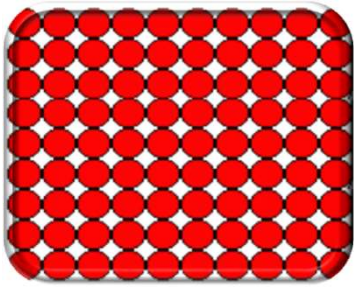
Properties of Solids :

- Solids are almost
- Solids are RIGID.
- Th

2. The kinetic energy of the particles is least.

1. Space between the particles least
2. Force of attraction between the particles is maximum.

closely packed
toge ther
no



Structure of solid

UNBENDING AND
XIBLE.

do change their
n force is applied
t regain their
force is removed.

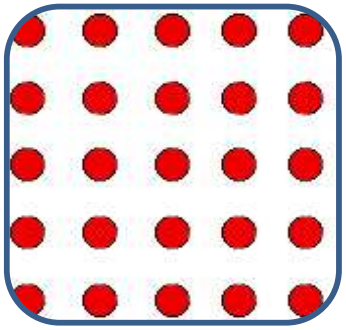
MODULE : 10

- **Liquid state of matter**
- **Properties of liquid state of matter**
- **Gaseous state of matter**
- **Properties of gaseous state of matter**

LIQUID STATE :

3. The kinetic energy of the particles is less
1. Space between the particles is moderate

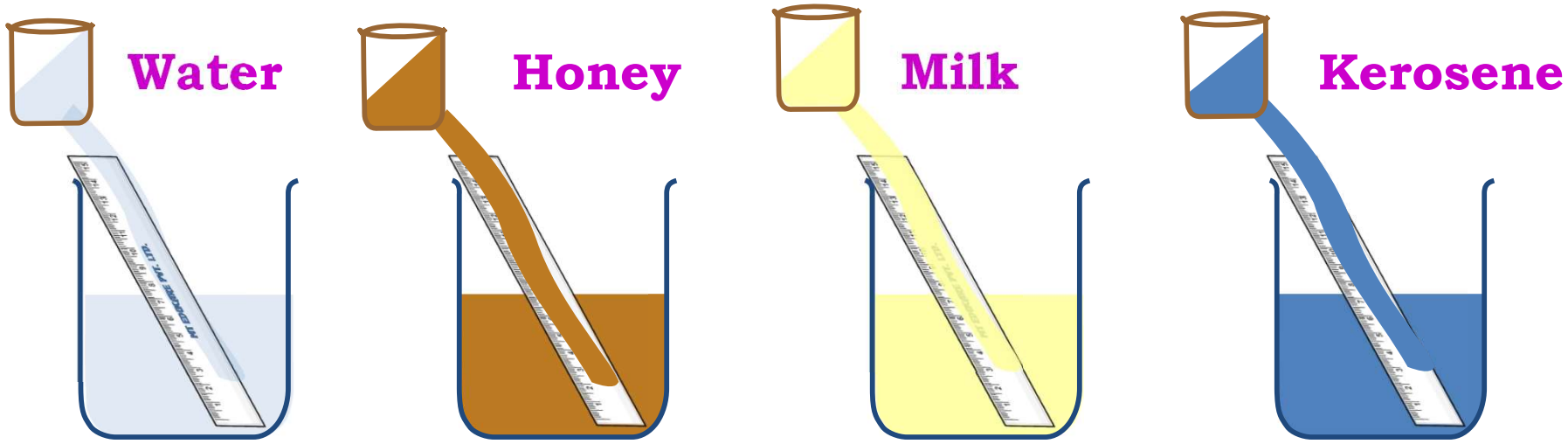
In liquids, particles have a moderate distance between each other; so particles can move.



Structure of liquid

❖ Properties of liquid :

- Liquids have a definite volume. But indefinite shape
- Liquids can not be compressed easily.
- All liquids flow. The property is called as fluidity



- Arrange four transparent containers.
- Place scale in same position.
- Allow these liquids to flow down
- Take four different
- Observ
- Milk, H

This is due t
Viscosity.

Less viscous liquid flow easily.

GASEOUS STATE :

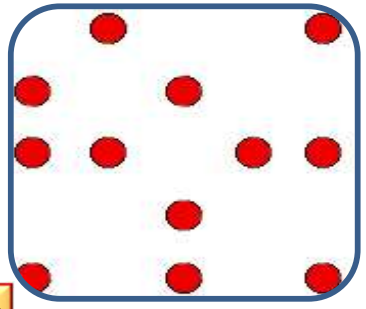
Properties of Gases :

- Gases do not have definite shape and volume.
- Gases flow. The
- Gases move ver
  the solid walls
- Gases can be easily
  together

Since gaseous particles have highest space between them, they move freely.

Because particles are continuously moving.

Soda bottle



Structure of gas

MODULE : 11

- **Distinguish between solid, liquid and gases**

- **Solids, liquids and gases can all diffuse in liquids**
- **Rate of diffusion of liquids are higher than that of solids.**
- **This is because in the liquid state, particles move freely and have greater space between each other as compared to particles in the solid state.**

	Solid	Liquid	Gas
Shape	fixed	not fixed	not fixed
Fluidity	cannot flow	can flow	can very easily flow
Compressibility	not compressible	not compressible	compressible
Ability to fill the container	does not fill the container	does not fill the container	easily fills the container
Spacing between particles	very strong	moderate	very weak
Density	high	moderate to high	very low













MODULE : 12

- **Change of state**
- **Kinetic theory of matter**

CHANGE OF STATE

The phase or state of matter can change when the temperature changes

ENERGY CREATES A
IN STATE
+ E
GASES
OS

Ice
SOLID

Water
LIQUID

Steam

As temperature increases more it turns into steam and particles moves more apart

What ha ns to t particle matt

does t

Liquid → Gas

The change in state of matter is governed by KINETIC THEORY OF MATTER .

1. The space between particles.
2. The force of attraction between the particles.
3. The kinetic energy of particles (energy of motion).

MODULE : 13

- **Temperature scale**
- **Conversion of temperature**
- **Numericals based on temperature**

TEMPERATURE

Temperatu…red in 3 scales.

- **Measure of hotness or coldness of a substance**

CELSIUS (°C)

Common scale

Anders Celsius

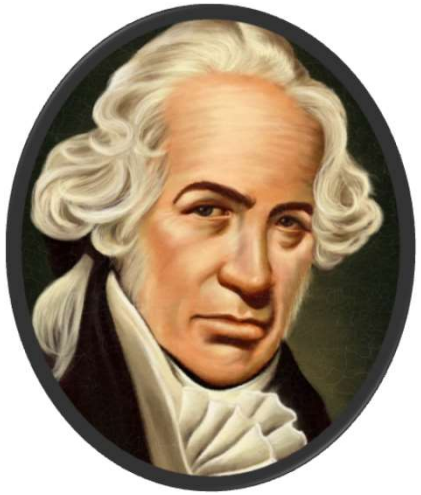
KELVIN (K)

SI Unit

Lord William Thomson Kelvin

FAHRENHEIT (°F)

Doctor's scale



Gabriel Daniel Fahrenheit

Numerical

Convert the temperature of 25^{0}C to the Kelvin scale.

Convert the temperature of 300 K to the Celsius scale.

Solution :

Temp. on Kelvin scale = Temp. on Celsius scale + 273

Temp. on Celsius scale = Temp. on Kelvin scale - 273

Temp. on Kelvin scale = 25 + 273

= 298

Temp. on Celsius scale = 300 - 273

= 27^{0}C

Thus, a temperature of 25^{0}C on Celsius scale is equal to 298 K on the Kelvin scale.

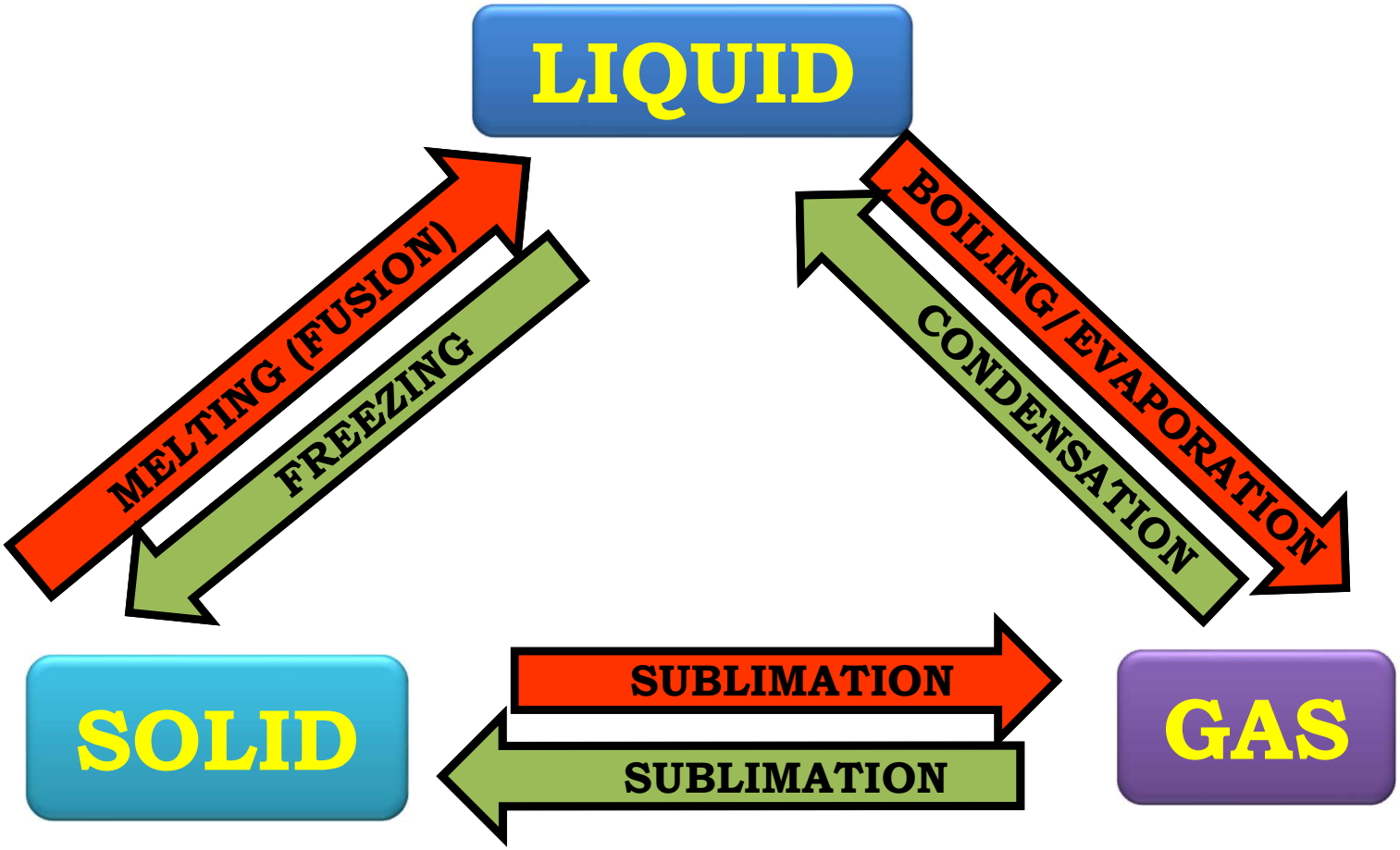
Thus, a temperature of 300 K to the Kelvin scale is equal to 27^{0}C on the Celsius scale.

- absolute zero (0 K)
- Such a volume and below are not practically possible to obtain.
- Hence, all temperatures are positive.

MODULE : 14

- **Inter-conversion of states**
- **Melting**
- **Vaporisation**

INTERCONVERSION OF STATES



EFFECTS OF CHANGE OF TEMPERATURE

Solid to Liquid : Melting

- ✓ The process in which a solid substance changes into a liquid on heating, is called melting (or fusion)
- ✓ The temperature at which a solid substance melts and changes into a liquid at atmospheric pressure is called melting point of a substance .

Ice

The melting point of a solid is a measure of the force of attraction between its particles (atom or molecules)

- ✓ The melting point of ice is 0°C
- ✓ The melting point of iron is 1535°C

Liquid to gas : vaporization

vaporization

Boiling | **Evaporation**

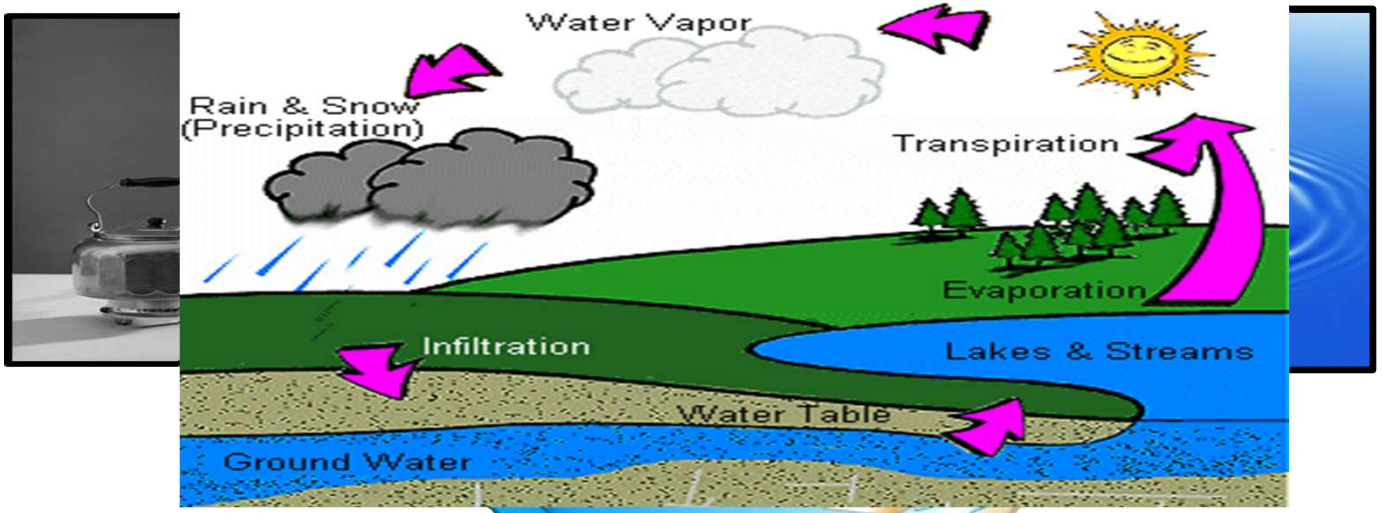
- ✓ **The process in which a liquid substance changes into a gas rapidly on heating, is called boiling .**
- ✓ **The temperature at which a liquid boils and changes rapidly into a gas at atmospheric pressure, is called boiling point of the liquid .**
- ✓ **Boiling point of water is 100°C .**
- ✓ **Boiling point of alcohol is 78°C .**

MODULE : 15

- **Condensation**
- **Freezing**

Gas to Liquid : Condensation

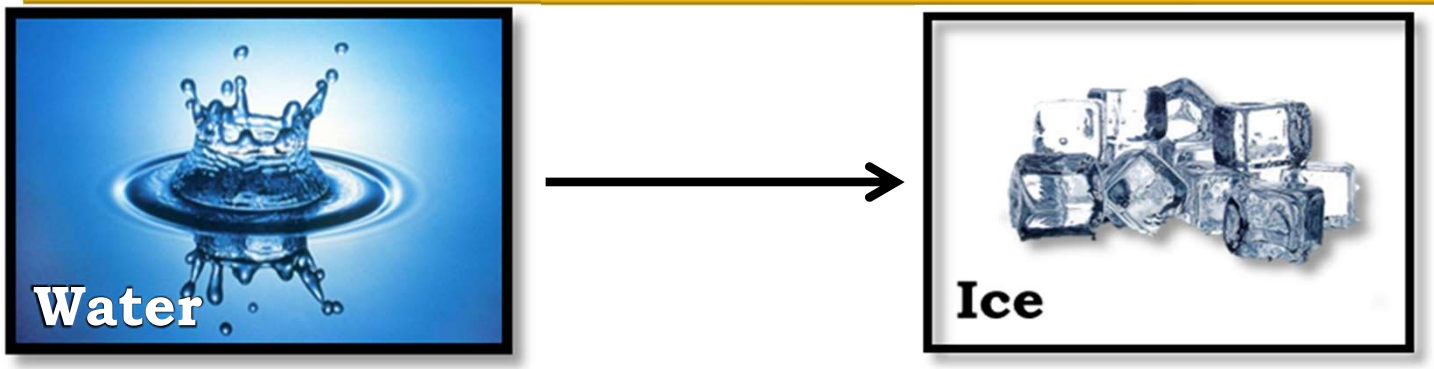
- ✓ **The process of changing of a gas (vapour) to a liquid by cooling, is called condensation**
- ✓ **Condensation is the reverse of boiling**



- ❖ **In this process water vapor formed due to evaporation rises high up the temperature is low, so vapor condenses to liquid and forms clouds.**

Liquid to solid : freezing

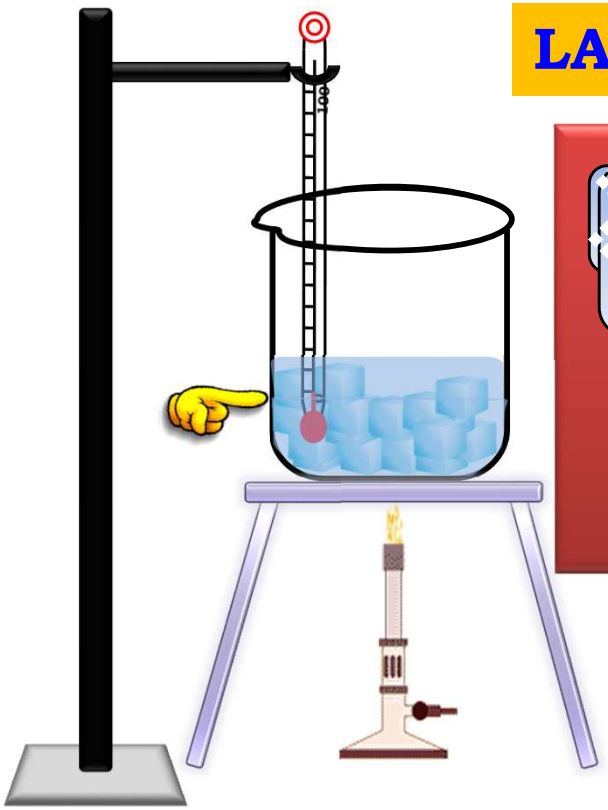
- ✓ **The process of changing a liquid into a solid by cooling , is called freezing .**



- ✓ **Freezing is the reverse of melting .**

MODULE : 16

- **Latent heat of fusion**
- **Latent heat of vaporisation**



LATENT HEAT OF FUSION

This heat energy is used up in changing the state of the solid substance by overcoming the force of attraction between` its particles

ice is

n.

the state of the solid

without any change in temperature.

fusion of ice.

Ice at 0^0C is more effective in cooling a substance than water at 0^0C

For melting each kilogram of ice it takes Latent heat of 3.34×10^5 Joules from the substance and hence cools the substance more effectively.

A piece of ice held in our hand feels very cold.

It takes Latent heat (required for melting) from our hand. Our hand loses heat of ice making us feel cold

Latent heat of vaporisation

The burns caused by steam are much more severe than those caused by boiling water???

Both of them are at 100°C when water changes into steam it absorbs latent heat. Steam contains more heat, in the form of latent heat, than boiling water.

Boiling point of water is 373K
(100°C = 273 + 100 = 373K)

MODULE : 17

- **Effect of pressure on change of state**

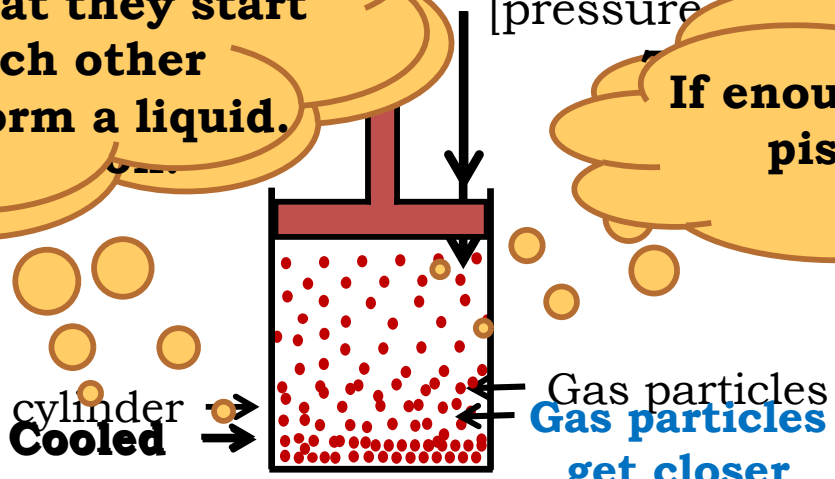
CHANGE OF STATE

Gas can be liquefied by applying pressure and lowering temperature

The phase or state of matter can change when pressure changes

The particles of gas get so close together that they start attracting each other sufficiently to form a liquid.

If enough force is applied to the piston, the gas is highly compressed.



MODULE : 18

- **Sublimation**

EXAMPLES OF SUBLIMATORY SUBSTANCES

Ammonium chloride

Anthracene

Camphor

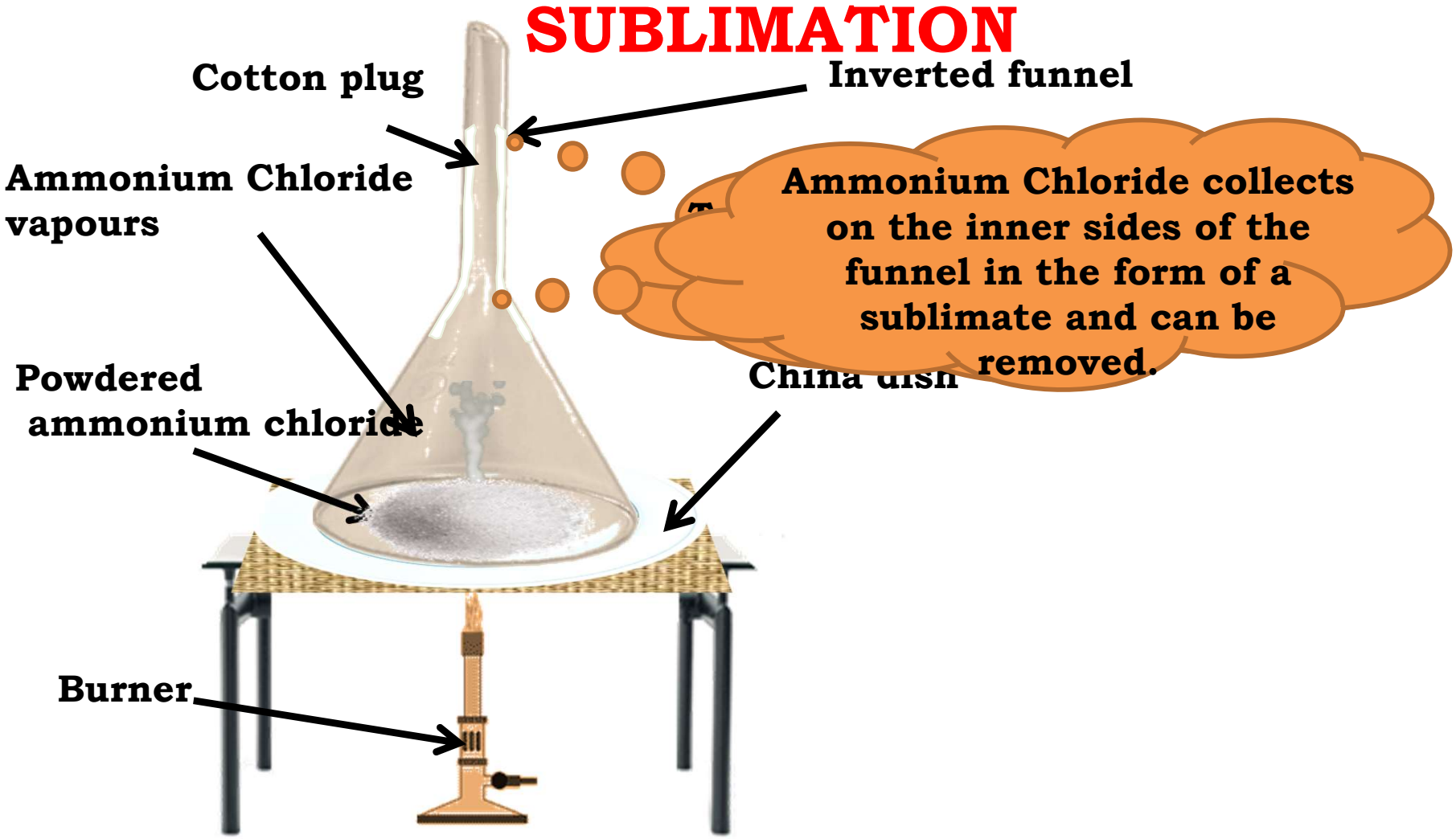
Carbon dioxide

Iodine

★ **Naphthalene balls are kept in toilets. What's the reason?**

Naphthalene balls are sublimatory substances so it changes to gaseous state and spreads its fragrance through out the washroom giving us a pleasant aroma.

SUBLIMATION



MODULE : 19

- **Evaporation**
- **Factors affecting evaporation**

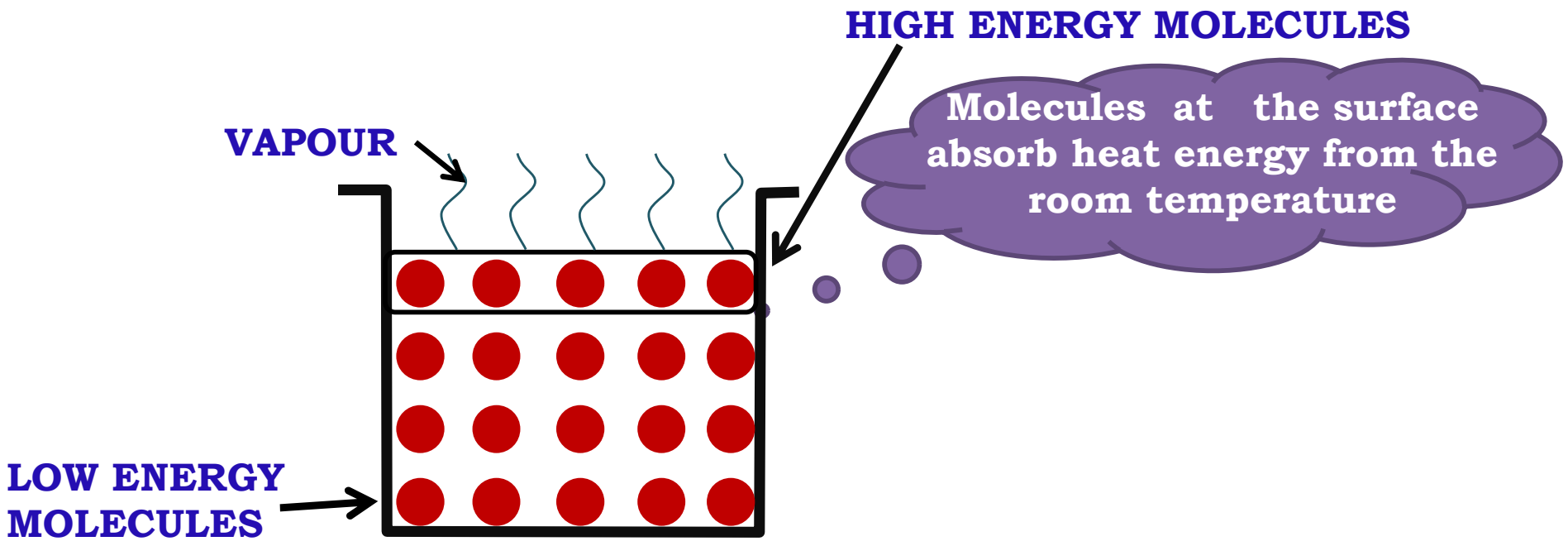
EVAPORATION

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

LIQUID  **VAPOUR**

Even at room temperature & normal air pressure.

PROCESS OF EVAPORATION



As soon as the molecules leave the liquid state we say it has evaporated.

❑ FACTORS AFFECTING RATE OF EVAPORATION

★ **SURFACE AREA**

(More the surface area, more the evaporation)

★ **TEMPERATURE**

(Higher the temperature, higher the evaporation)

★ **HUMIDITY**

(More humidity, less eva

Humidity is the amount of water vapour present in the air.

★ **WIND SPEED**

(More the wind speed, M

When the speed of wind increases, the particles of water vapour move away with the wind, decreasing the amount of water vapour.

MODULE : 20

- **Examples of boiling and evaporation**
- **Difference between boiling and evaporation**

Room

Open space

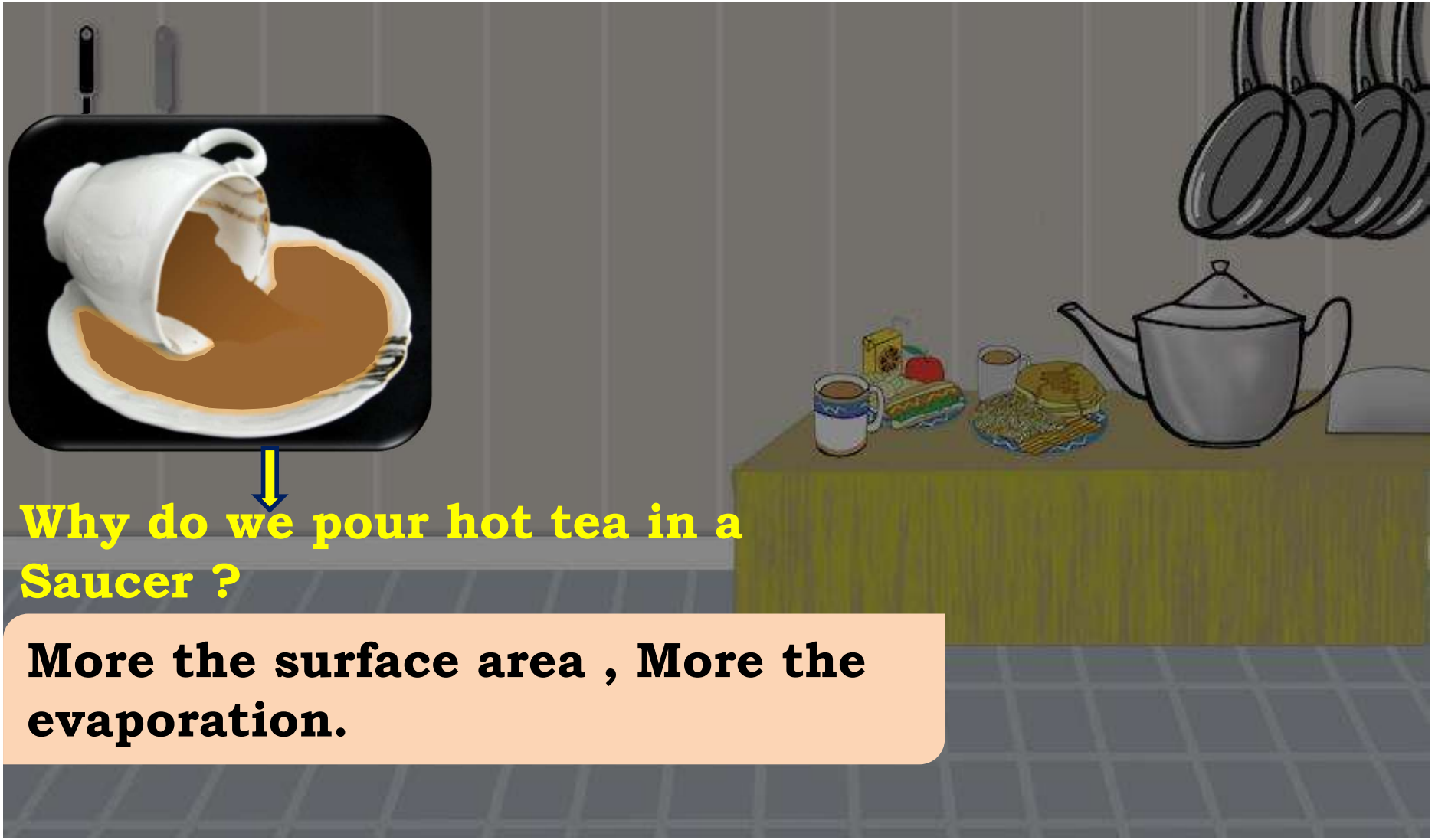
Because of the wind speed
More the wind speed, more the rate of evaporation.

ter. Why ?

Rainy day

Next day no rainfall.

Because of it's surface area, less the surface area, less the rate of evaporation.


Why do we pour hot tea in a Saucer ?
More the surface area , More the evaporation.

VAPOURISATION : CHANGE OF STATE FROM LIQUID TO GAS

VAPOURISATION

- **BOILING**
- **EVAPORATION**

- ❖ External heating is required
- ❖ Bulk phenomenon

Does not occur only at the surface- happens as a whole-

- ▪ Heating temperature
- ❖ Example : Boiling of water

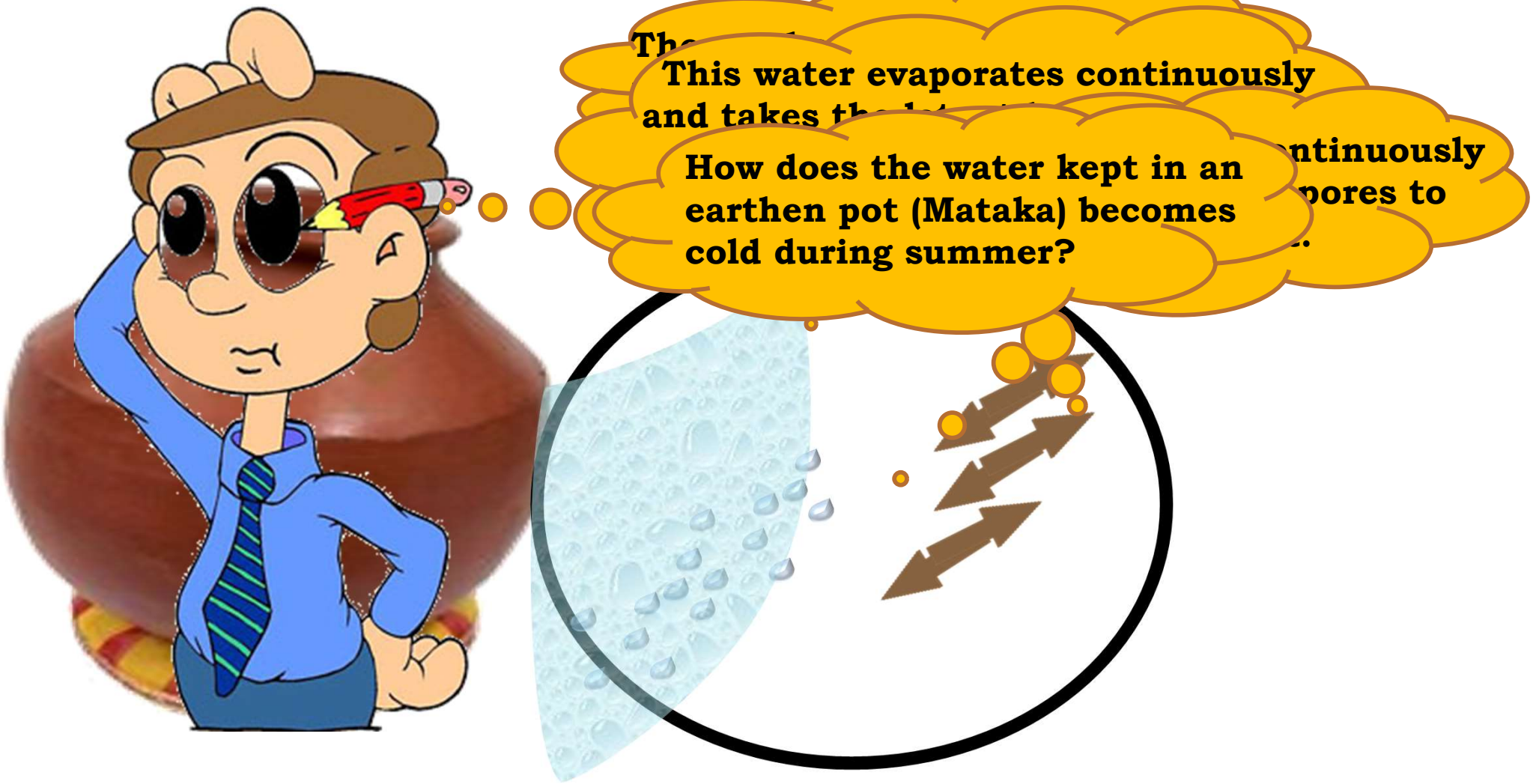
- ❖ External heating is NOT required
- ❖ Surface phenomenon

Occurs only at the surface-

- ▪ Surface area
- ▪ Wind speed
- ▪ Temperature
- ▪ Humidity in air
- ❖ Example : drying of clothes

MODULE : 21

- **Examples of evaporation**
- **Examples of condensation**
- **Give reasons on evaporation and condensation**


This water evaporates continuously
How does the water kept in an earthen pot (Mataka) becomes cold during summer?

★ **What do you feel when spirit is applied on your hand?**

➡ **Spirit applied at that region absorbs latent heat energy from the hand and evaporates. Hence that region becomes cold.**

Why do we see water droplets on the surface of the bottle containing cold water?

It is due to condensation i.e. Water vapour from the air comes in contact with the cold surface of the bottle and hence gets condensed into liquid. Hence we see water on the surface of the bottle.

Why should we wear cotton clothes in summer?

During summers we perspire more due to the mechanism of our body which keeps us cool. Cotton being a good absorber of water helps in absorbing the sweat and exposing it to the atmosphere for easy evaporation.