

Matter in Our Surroundings

- Physical Classification of Matter.
- Matter - Particle
 - ↳ Characteristics of particles.
- States of matter.
- Interconversion of states of matter (
 - Latent Heat
 - BP
 - MP)
- Evaporation.

"Mass and Volume (occupies space)"

m



M

Ancient
Indian
philosophers

5 elements (Panch tattva)

↳ Air, fire, earth, water, sky.

Greek philosophers

Matter

Modern Science introduced two ways of classification of matter

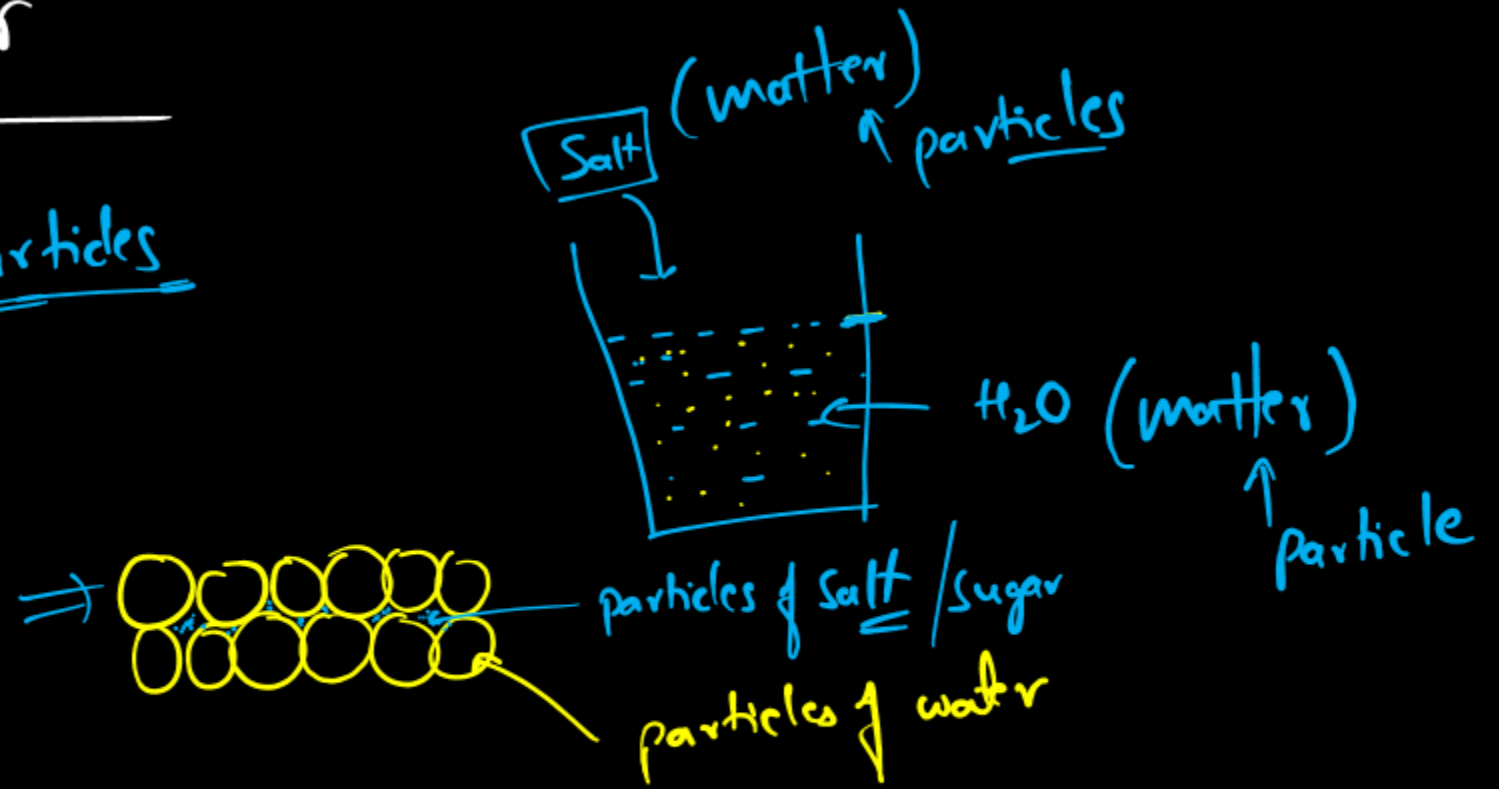
Based on —

Physical nature

Chemical properties
Chemical nature.
(2nd chapter)

Physical Nature of Matter

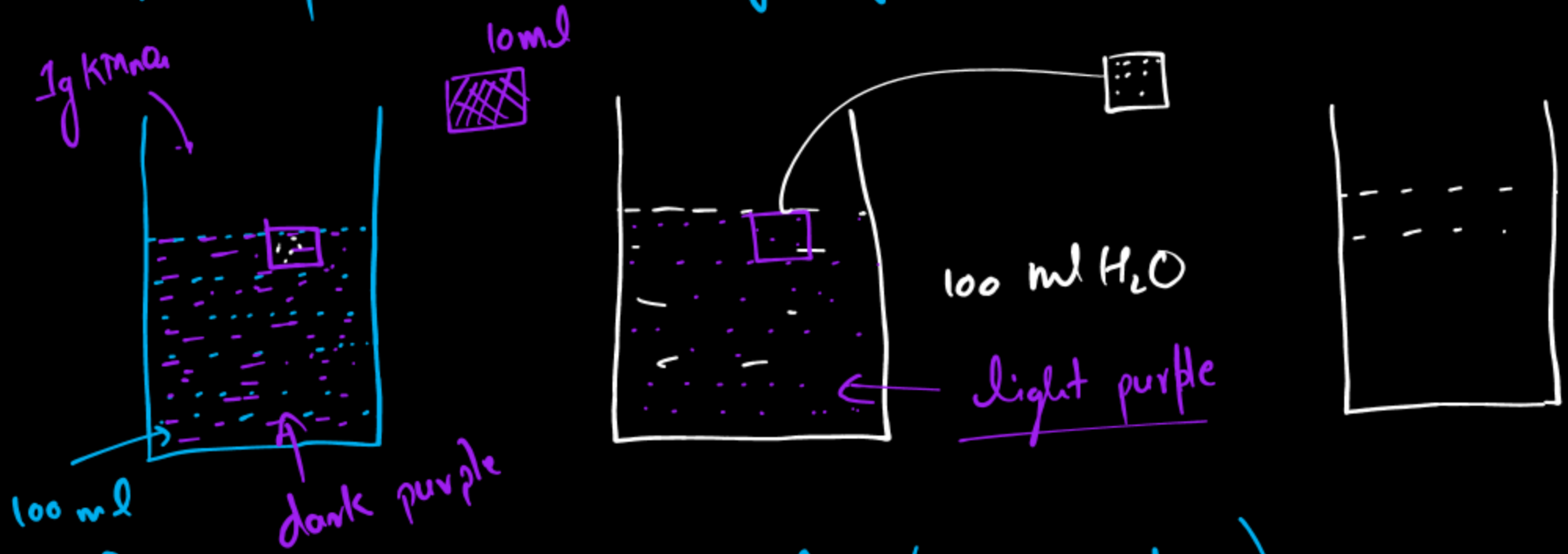
① Matter is made up of particles



Sand ○

② How small are these particles of matter?

⇒ These particles are very-very small. (microscopic)

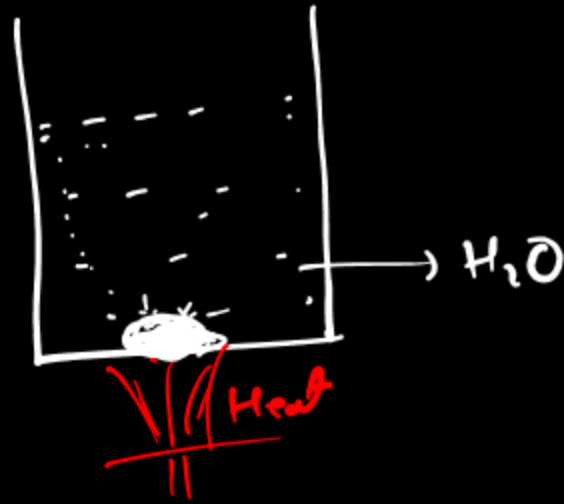
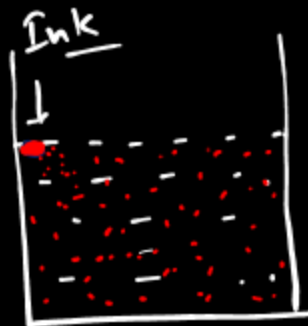


Potassium permanganate (Purple colour)
(KMnO₄) (crystalline)

Characteristics of Particles of Matter

- ① Particles of matter have space between them.
- ② Particles of matter attract each other.
- ③ Particles are always in motion.

Heat ↑ motion ↑



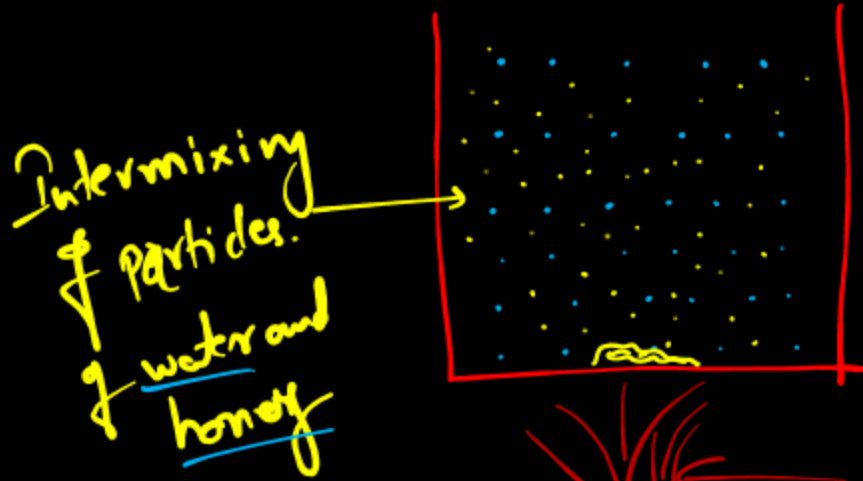
Diffusion

Kinetic Energy

Next topic

NaCl \Rightarrow Sodium chloride

On ~~the~~ increasing temperature, kinetic energy of particles increases. Hence their speed of motion also increases.



\rightarrow Intermixing of particles of smell and air (Heat lit incense stick)

Diffusion: Intermixing of particles of matter is called diffusion. Two different types

Rate of diffusion increases with increase in temperature
(Heat)

the "On heating, diffusion becomes faster".

Classification of matter based on physical nature

On the basis of physical nature, ~~of~~ matter has been classified into three physical states a.k.a 3 states of matter.
↓
They are found on earth.

3 states of matter present on earth.

① → Solid

② → Liquid

③ → Gas

3000°C - 6000°C

[Liquid ⇒ -196°C
Nitrogen]

There are two more states which are not ^{naturally} present on earth

⇒ ④ Plasma (found at very high temperature)

⇒ ⑤ Bose-Einstein Condensate (BEC) (found at very low temperature)

Lowest possible temp.

-273°C

3 states



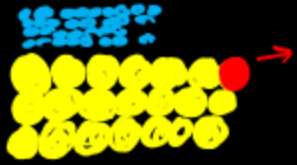
are found
of matter.

because of

difference

in the characteristics of particles

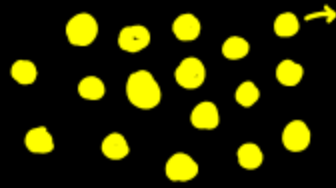
① Solid - state



- Particles are very close to each other (touching each other)
- Held together by very strong force of attraction

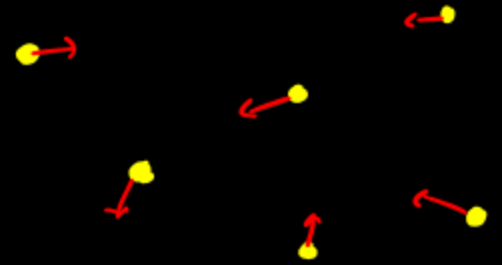
- They cannot move but they vibrate on their mean position

② Liquid - state



- ⇒ Particles are slightly far apart. (space)
- ⇒ They have strong force of attraction (less than solids)
- ⇒ particles are free to move

③ Gas - state.



- ⇒ Particles are far away from each other. (more space between particles)
- ⇒ Very low (negligible) force of attraction.
- ⇒ They can move freely.

Solid

• Definite shape: fixed

• Volume: fixed

• Compressibility: cannot be compressed
(Negligible)

• External force: No change in shape
They may break.

eg. Stone, metals (except mercury Hg).
Sponge, rubber band.

Diffusion: Negligible diffusion between two solid.

Liquid

Shape: not fixed
they take the shape
of container.

Volume: fixed

Compressibility: (can be compressed slightly)

→ Liquid can change
their shape as they flow
eg. water, oil, milk, juice,

Diffusion: Liquid, solid and Gas
diffuse in liquid.

Gas

shape: not fixed
- take the shape of container

Volume: not fixed
- take the volume of container

Compressibility: Highly
compressible.

eg. LPG → Liquefied Petroleum Gas.

CNG → Compressed Natural Gas.

→ Can change shape

eg. → Oxygen, Hydrogen, Nitrogen,
CO₂ Air. H₂ H₂

Diffusion: Because of high speed of particles and more



⊕ →

space between them,
one gas can diffuse in
other gas very fast.

□ particles of gas
are ^{continually} moving with high
speed and in random
direction.

↓
They often hit each other
and walls of container
in which they are kept.

Force per unit area on the walls of
container is called pressure.

← { because of this they exert force of
the walls of container

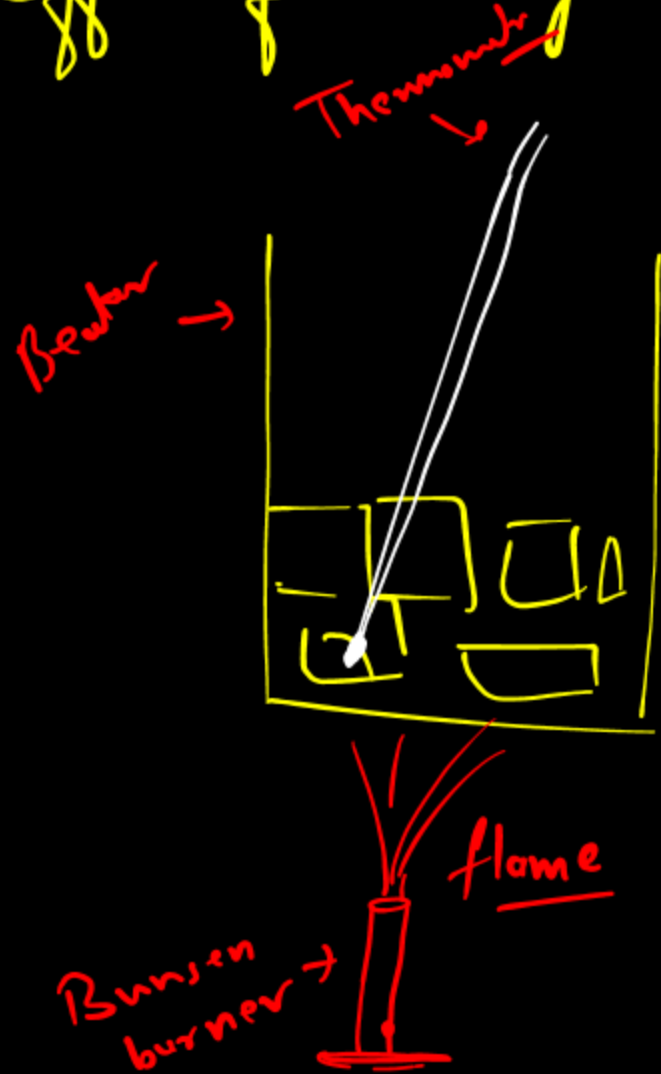
↓
i.e. the pressure exerted by the gas.

Can matter change its state?

↙
Change in temp.

↘
Change in pressure.

Effect of change of temperature on State of matter.



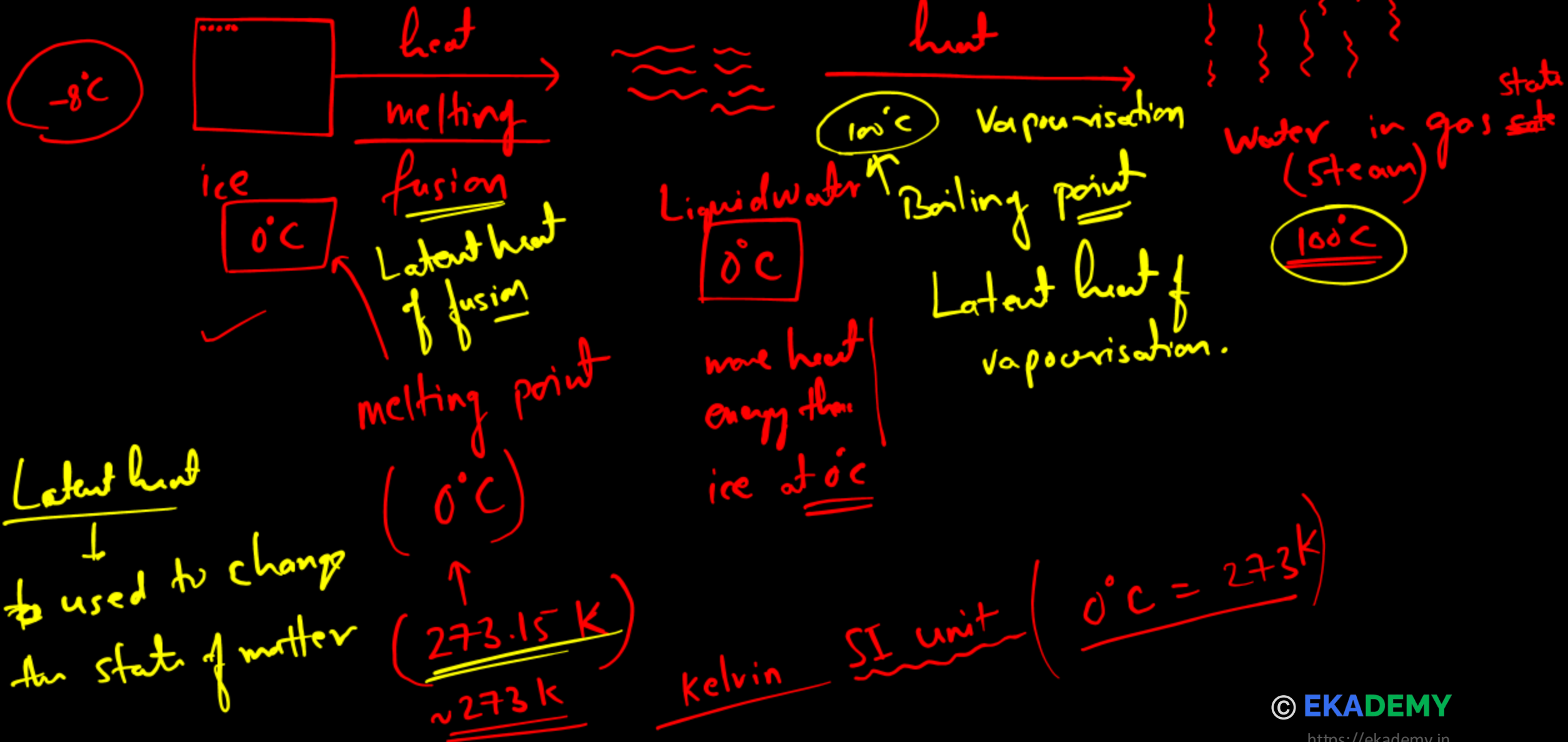
-8°C \longrightarrow 0°C

rise
~~drop~~ in temp.

ice starts to melt,

Latent heat

Latent = hidden



Pressure ↓

Boiling ↓

Melting Point: Temp. at which ^{Bulk of} solid melts to form liquid at atmospheric pressure (at atm)

M.P of Water is 0°C (273 K)
 ↓
 pressure at sea level

$$5^{\circ}\text{C} \rightarrow (5 + 273)\text{K}$$

$$\boxed{278\text{K}}$$

$$100^{\circ}\text{C} \rightarrow \underline{373\text{K}}$$

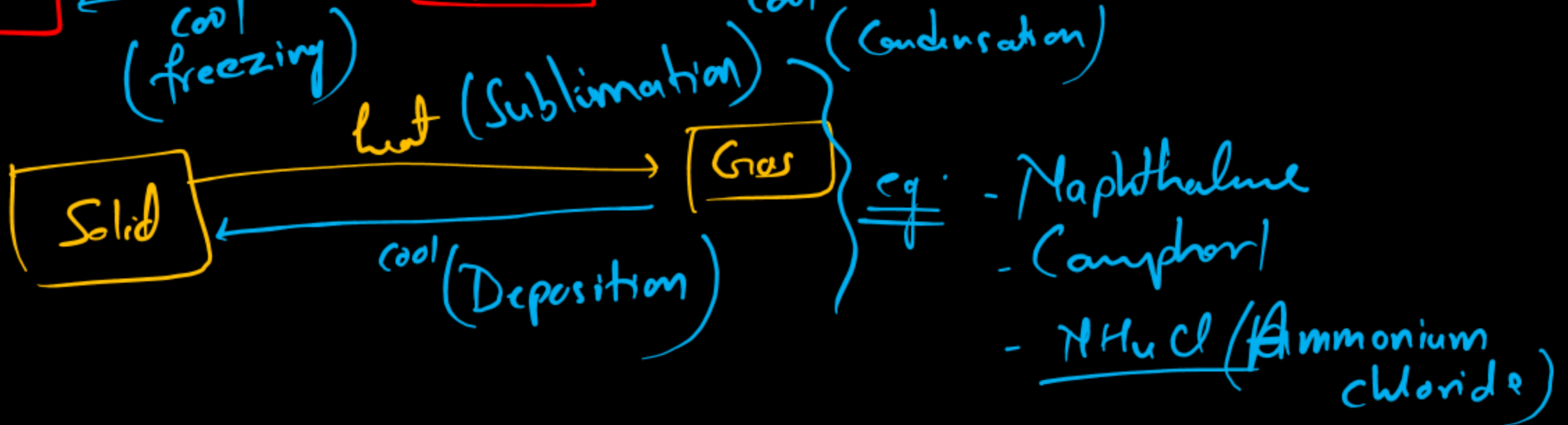
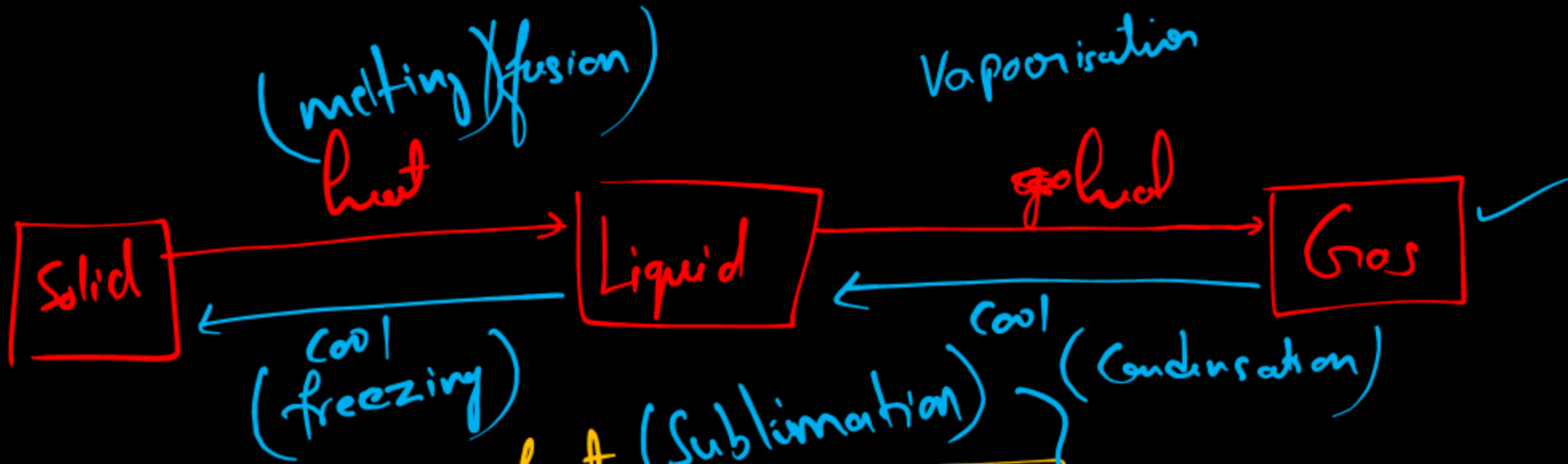
Latent heat of fusion

mass of substance = 1 kg

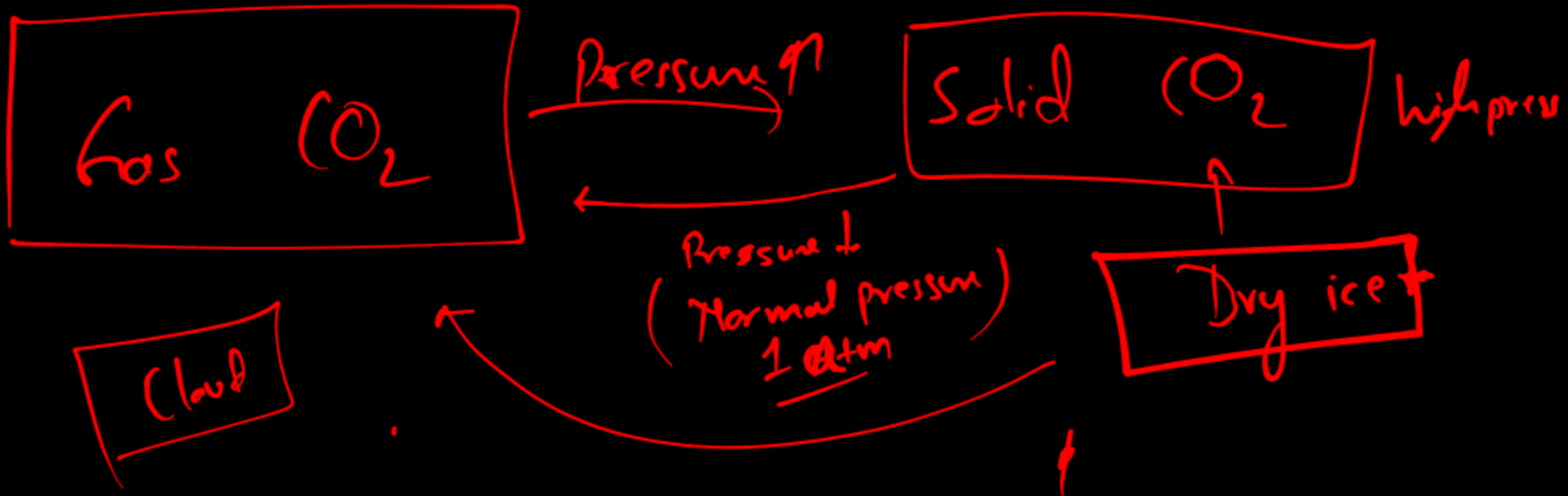
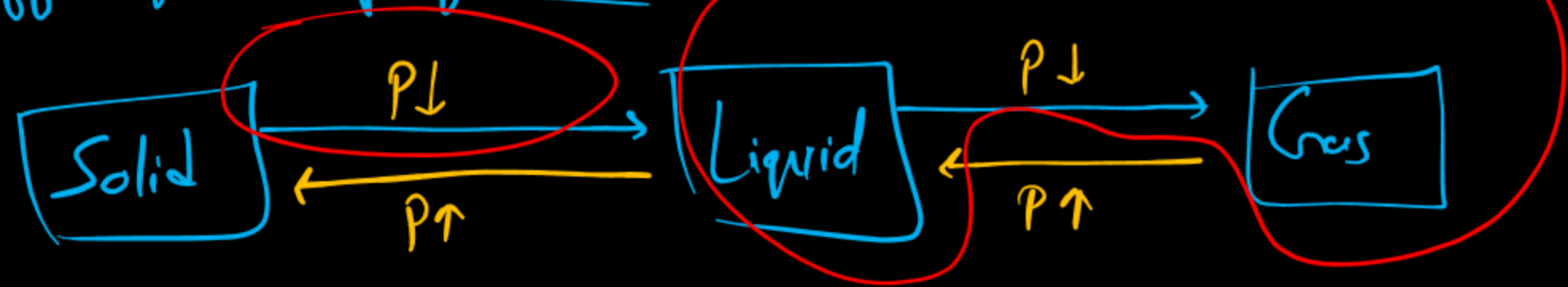
at sea level 1 atm = $1.01 \times 10^5 \text{ Pa}$

Dog eats the cat's food and vice versa

Latent heat of vapourisation

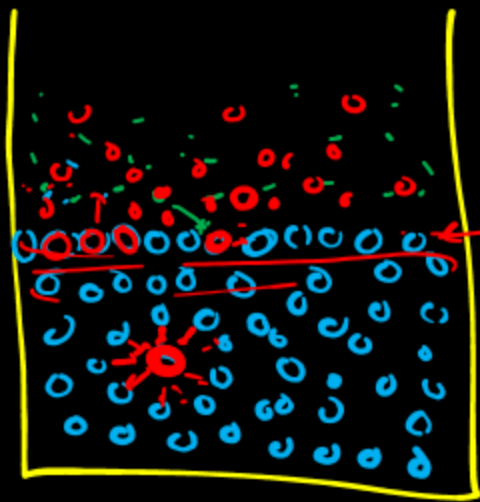


Effect of change of pressure



Evaporation

Water evaporates at any temp.



Surface particles participate in evaporation

Hence, it is a Surface phenomenon

Vaporisation at Boiling point

Water vaporises at 100°C

Bulk phenomenon.

Factor affecting evaporation

① Temperature:

Evaporation \propto temperature[?]

directly proportional

temp[↑] Eva[↑]
temp[↓] Eva[↓]

② Surface area:
(SA)

Evaporation \propto SA

③ Humidity:

Evaporation \propto $\frac{1}{\text{Humidity}}$

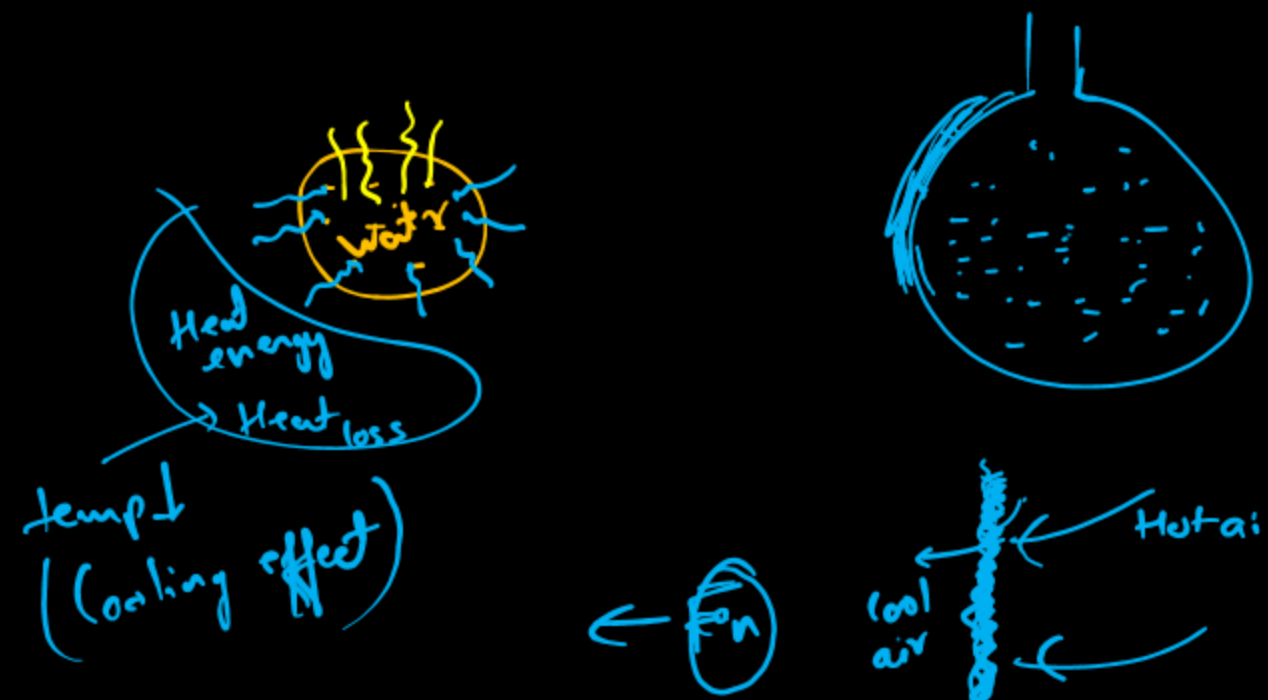
inverse relation

Humidity[↑] Eva[↓]

④ Wind Speed

Evaporation \propto Wind Speed

Water has high latent heat of vaporisation



250

$$0^{\circ}C \rightarrow 273K$$

$$250^{\circ}C \rightarrow (273 + 250) K$$

$$0K = -273^{\circ}C$$

$$15K = \underline{\underline{-258^{\circ}C}}$$

(15 - 273)

0K ⇒ Absolute Zero