

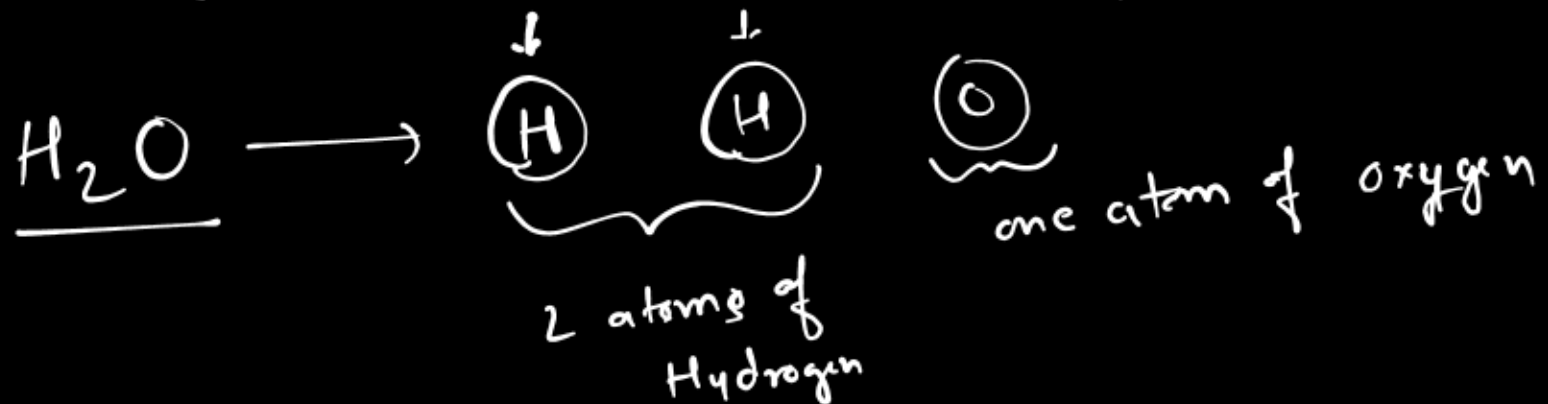
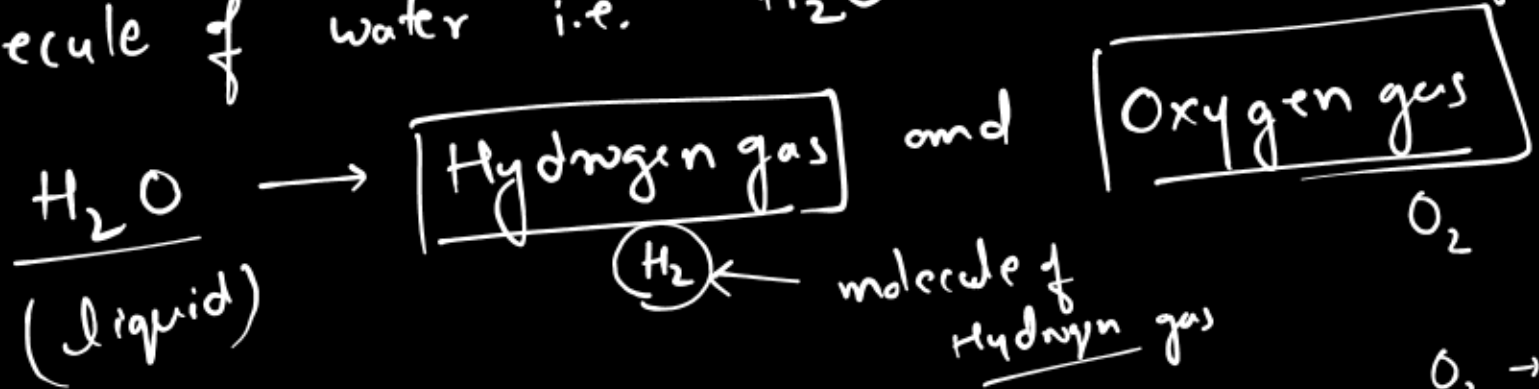
Matter, Material and their Properties

Drop of water

D O O

Smallest particle which behaves as water
→ called molecule of water
 $\boxed{H_2O}$ ↔ liquid transparent

- A molecule of water i.e. H_2O and divide it further



Matter → Anything that has mass and volume.

⇒ Matter is made up of very small particles called molecules.

⇒ Molecules are made up of even smaller particles called atoms.

⇒ [Atoms are building block of every matter]

• Matter exist in different states like solid, liquid, gas, etc.

States of matter

- (i) $\Rightarrow$ Solids
(ii) $\Rightarrow$ Liquids
(iii) $\Rightarrow$ Gas
- } found in normal conditions of temperature and pressure
- (iv) $\Rightarrow$ Plasma } found in very high temperature (millions of $^{\circ}\text{C}$)
- (v) $\Rightarrow$ Bose - Einstein Condensate } found in very low temperature.
- Least possible temperature is -273°C = 0 Kelvin

Properties of Solids, Liquids and Gas

Features	Solids	Liquids	Gases
① Arrangement of molecules	Regular and very close to each other 	Random and ^{less} close to each other 	Random and wide apart. 
② Movement of molecules	Very little movement, in the form of vibrations	Molecules can move around each other.	Fast movement in random direction.
③ Volume	Definite	Definite	Not-definite
④ Shape	Definite	Not-definite	Not-definite
Examples	Rock, pencil, Book	Water, Oil, milk,	Carbon dioxide, Oxygen (O_2), Hydrogen gas (H_2) Water vapour ($H_2O(g)$)

Changes in the states of matter :

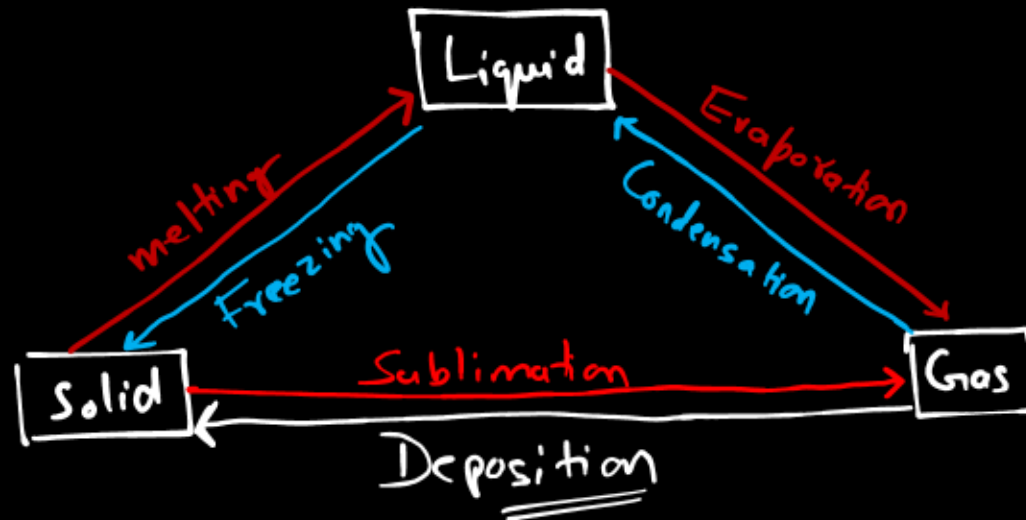
⇒ Matter changes its state on heating or cooling.

On heating, molecules move further apart.

On cooling, molecules move closer together.

H.W. Write Definition of:

Melting
Freezing
etc



→ heating
→ cooling

• Water, Petrol, Oxygen, soft-drinks.

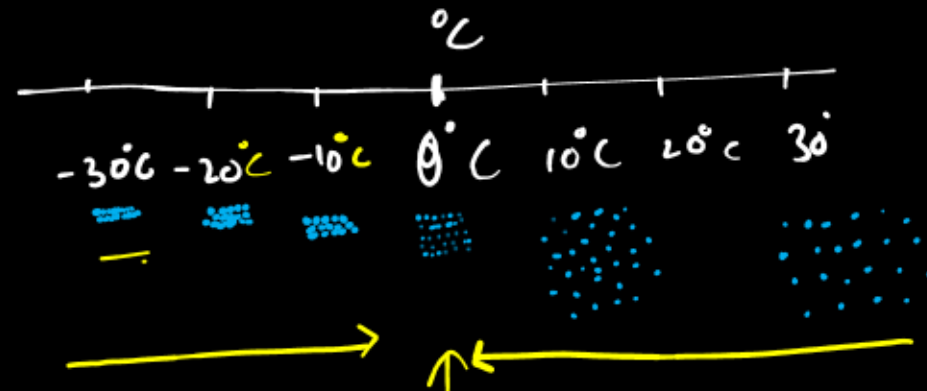
• Carbondioxide, Nitrogen, Carbon monoxide, Plastic.
 CO_2 N_2 CO

Melting point : ^{fixed}
The temperature at which solids starts melting.

- Melting point of ice (water) is 0°C

Freezing point : The fixed temperature at which liquid starts freezing.

- Freezing point of water is 0°C.



Freezing point
as well as
melting point of
water

Boiling point

The fixed temperature at which liquid starts boiling.

- Large part of liquid turns into gas at its boiling point.

- Boiling point of water is 100°C.

Expansion and Contraction of substance



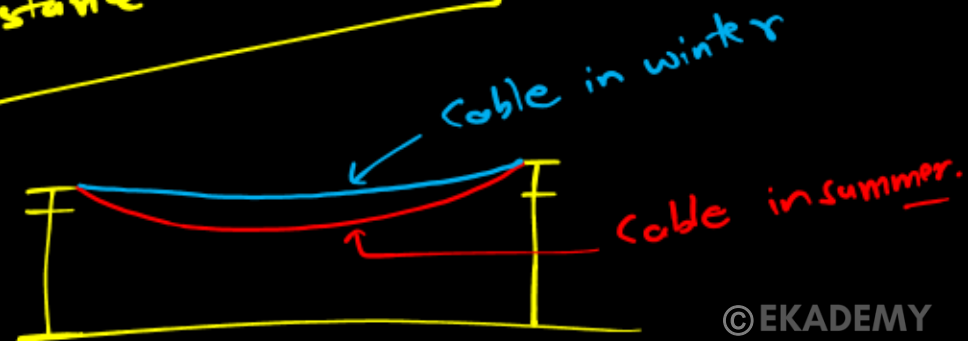
on heating → molecules starts moving rapidly.

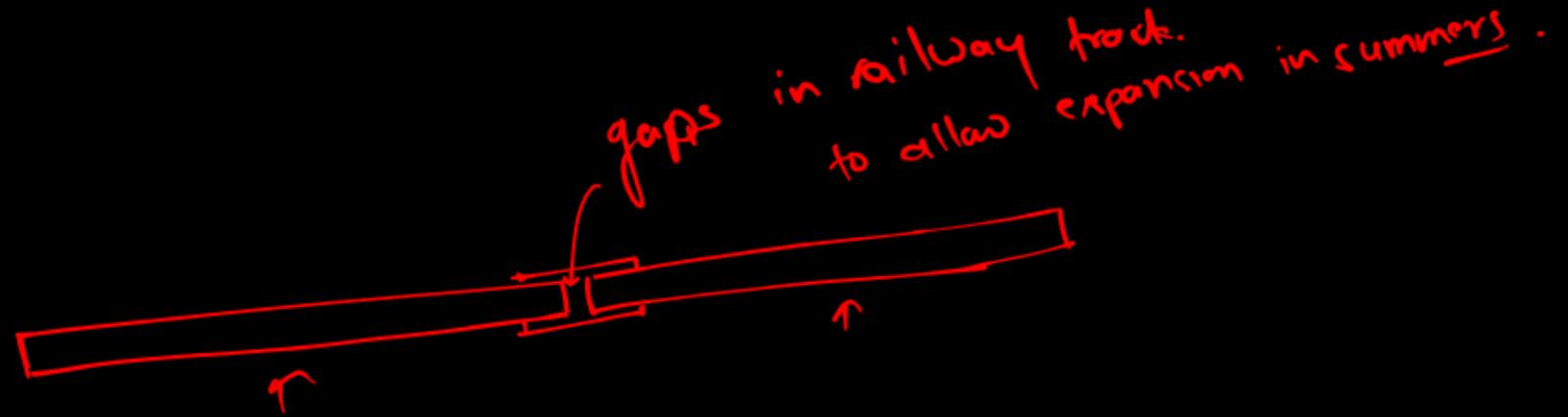
↓
therefore it occupies more

space

↓
Substance expands

eg. electric cables | between the poles
expands in
Summer, so they appear loose.





Usually substance expands on heating

Exception: Water expands on freezing
i.e., ice occupies more space than liquid water.

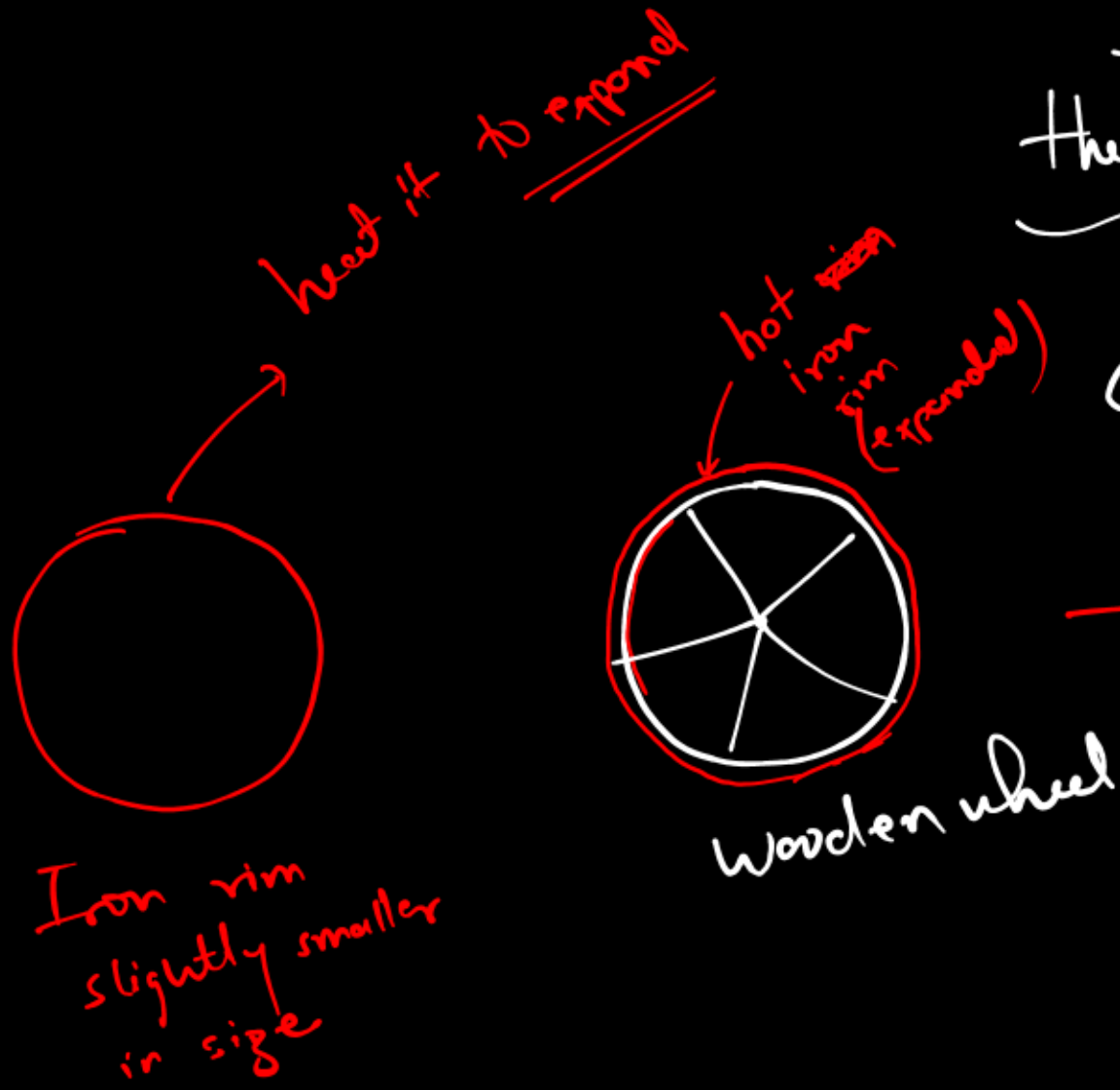
On cooling, molecules or particles starts moving slowly.



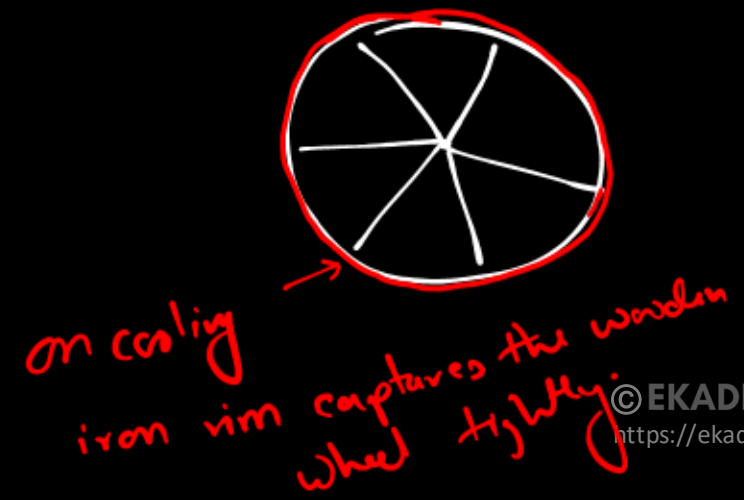
they take up less space



Contraction of substance



→ on cooling



Solutions

① Solubility :

↳ It is property of a substance to dissolve in some other substance, to form a mixture (uniform mixture)

- Uniform mixture
- non-uniform

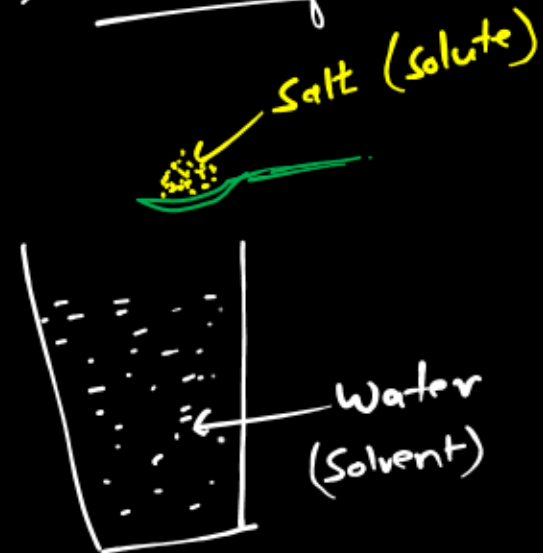
② Solute :

- The substance which gets dissolved.
- They are generally small in amount (proportion)

③ Solvent :→ The other substance which dissolves the solute is called solvent.

- They are generally large in amount (proportion)

* Water is k/a Universal solvent.



④ Solution : when solute dissolves in a solvent to form uniform mixture, it is then called solution.

eg. sugar → added to → water

↓

forms solution
(sugar solution)

Types of solution based on physical states of solute and solvent.

(i) Solid-in-liquid solution : Solute → solid
solvent → liquid
eg. • sugar in water

(ii) Liquid-in-liquid solution : Solute → liquid
solvent → liquid
eg. • vinegar in water

• ethanol in water

Solute → gas &
solvent → liquid

eg. • Oxygen dissolved in water
• CO₂ dissolved in water under pressure.

Aquatic animals breathe in oxygen dissolved in water.

(iv)

Gas-in-solid

Solute $\rightarrow$ gas

Solvent $\rightarrow$ solid

eg. Hydrogen gas (H_2) in metals

(H_2 dissolved in platinum).

(v)

Liquid-in-solid

Solute $\rightarrow$ liquid

Solvent $\rightarrow$ solid

eg. Mercury dissolved in silver/gold/sodium

(only liquid metal
at normal temperature)

(VI)

Solid-in-solid

Solute $\rightarrow$ solid
Solvent $\rightarrow$ solid

eg. metal alloy

↳ steel $\rightarrow$ { Iron $\rightarrow$ solvent
Nickel & chromium $\rightarrow$ solute

(VII)

Gas-in-gas

eg. air $\rightarrow$ { ^(N₂) Nitrogen, ^(O₂) oxygen, ^(CO₂) Carbon dioxide, ^{H₂O(g)} water vapour
mixed homogeneously / uniformly.
Solution

Physical and chemical changes

→ Physical change

↳ A type of change in which only the physical properties of a substance changes and no new products are formed.

Physical properties : shape, size, state, texture, colour, temperature.

⇒ physical change can often be reversed.

⇒ & Generally there is change in state, shape and size.

Chemical change

→ A type of change in which chemical nature of a substance changes and forms a new substance.

eg of chemical change: ① burning of wood, Burning of wax, burning of plastic, rusting of iron, burning of paper.

eg. of physical change: ① cutting wood into pieces, melting of wax, folding of plastic, melting of iron, cutting of paper.

Properties of materials

Materials can be classified based upon properties like appearance, solubility, transparency, conductivity, etc.

① Based upon appearance :

① Lustrous objects :

• These objects have metallic shine (Lustre)

eg. Gold, Silver, Copper, Diamond,
→ They have ability to reflect light.

① Non-lustrous object

→ Objects which do not shine.

eg. wood, paper, graphite

② Based on Transparency : Ability of object to allow light (amount of light) to pass through it

(i) Transparent object :

↳ Materials that allow light to pass through it completely.

eg. glass, air, water

② Translucent objects

↳ They allow light to pass through them partially.

a.k.a. semi-transparent

eg: Oil paper, frosted glass, some plastics, etc.

③ Opaque objects: • Do not allow light to pass through them at all.

eg. Stone, wall, wood, etc

③ Based on hardness

→ (i) Hard Object

↳ cannot be scratched easily.

eg → Iron, Gold, Aluminium, Copper, stone, etc.
(↑ soft metal) Diamond.

(ii) Soft Object : can be scratched easily.

eg. wood, sodium, butter, chalk.

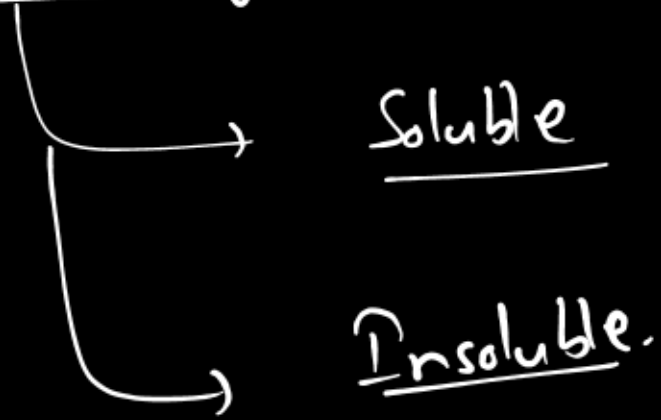
④ Based on texture

└─> feel of the material

└─> ① Rough : Surface of road, page of a note-book.
have rough surface. , surface of stone.

└─> ② Smooth : → Glass surface. , polished surface.

⑤ Based on solubility



⑥ Based on conductivity

→ Conductor of electricity: Metals, graphite

→ Insulator of electricity: Plastic, wood, rubber

→ Good conductor of heat ⇒ Iron, aluminium, copper

→ Bad conductors of heat ⇒ wood, plastic, rubber

Note: [Superconductors are materials through which electricity ~~can~~
flows without experience any resistance / hindrance]

⑦ Based on magnetic property

→ Magnetic material

→ materials which get attracted towards a magnet

eg. iron, nickel, cobalt

→ Non-magnetic material

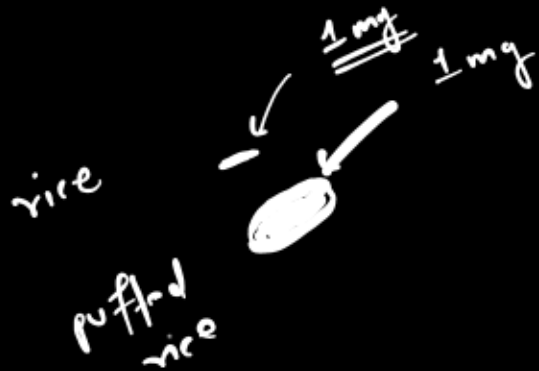
→ Do not get attracted towards a magnet.

eg. wood, rubber, plastic

Based on floatation / density.

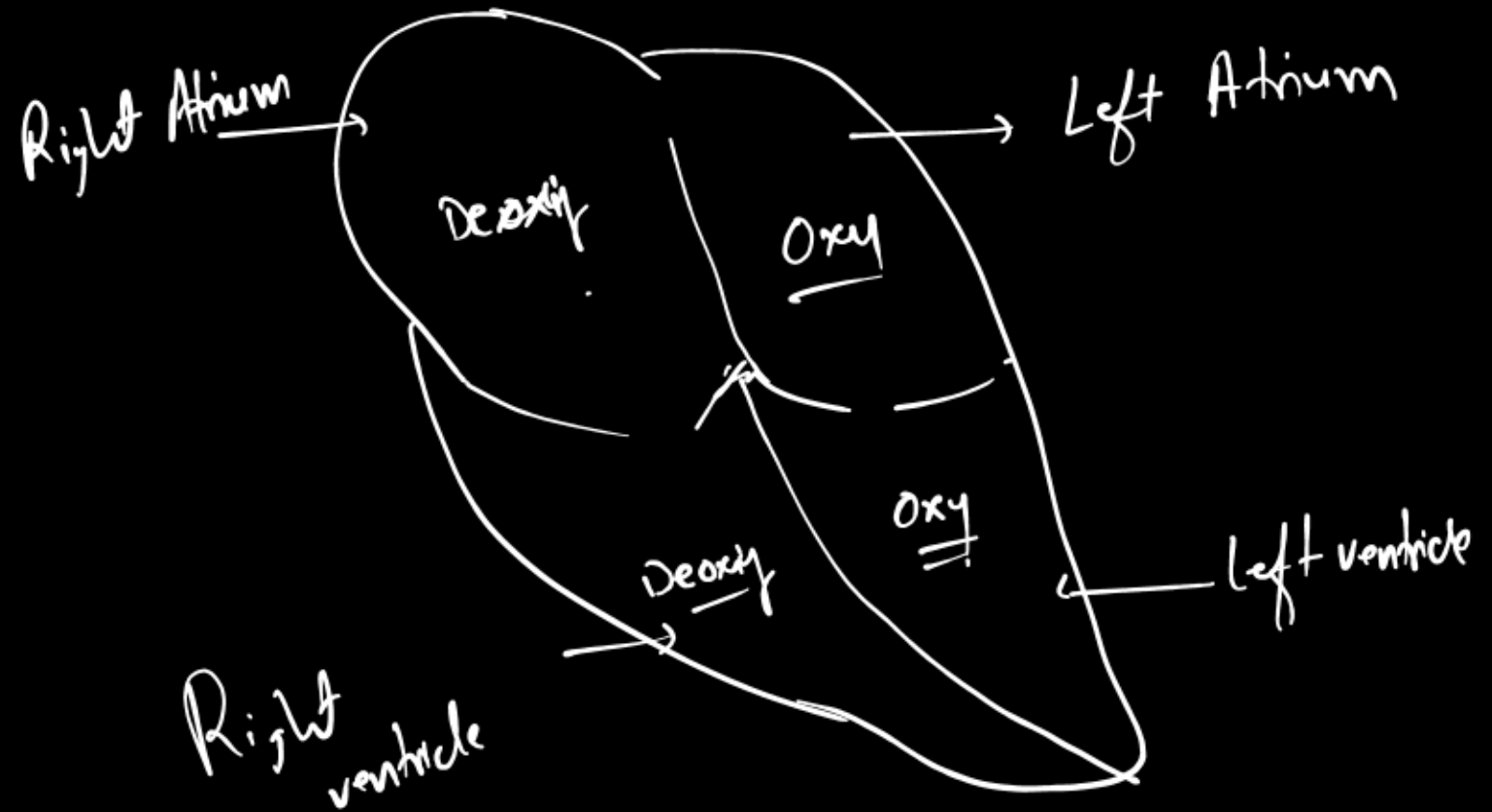
=> Property of floating or sinking of an object depends on its density.

=> materials that are less dense than water float on water. eg. ice, feather, paper, some wood, Styrofoam (thermo col), Saturn (theoretically)



⇒ Materials that are more dense than water, sink.
eg. iron, other metals, stone, rocks, etc.

End of the chapter



Food and Health

⇒ Food