

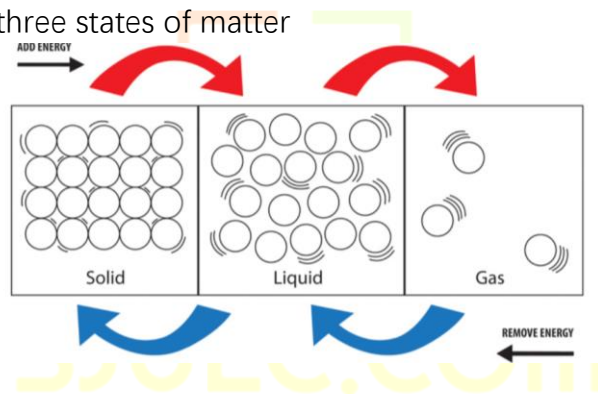
**SCIENCE FORM 1**  
**CHAPTER 3 MATTER**

**Matter**

- anything that has a mass and occupies space
- almost everything around us is matter
  - o living thing: animals, plants and humans
  - o non-living thing: air, water, soil and stone
- Non matter : eg heat, light, sound, temperature
- Matter is made up of many very small particles
- characteristic of particles
  - o particles are discrete: meaning particles are completely separated from one another and there are spaces between them
  - o particles always moving: either vibrating, moving about or colliding into one another, depending on the state of the matter

**States of Matter**

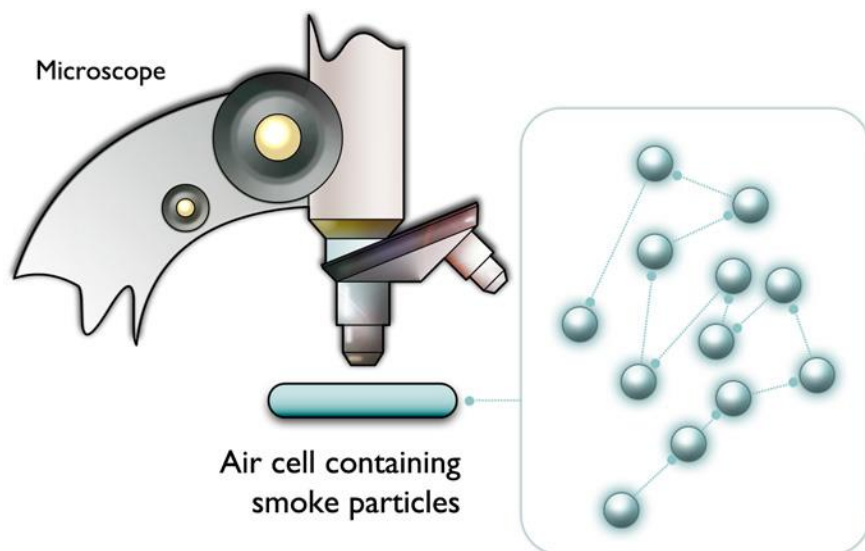
- matter exist in three states: solid, liquid or gas
- Differences between three states of matter



Solid	Liquid	Gas
Has a definite shape	Take the shape of container	Take the whole shape of container
Definite volume	Definite volume	Fills up its container
Cannot be compressed	Cannot be compressed	Can be compressed
Does not flow	Flows from high level to a lower level	Flows in all direction
Arranged very close together in a regular pattern	Not arranged but particles are close together	Particles are very far apart from one another
Very little space between particles	More space between particles	Lots of space between particles
Vibrate about their fixed position	Can glide and slide over one another	Can move freely and collide into one another

## Brownian movement

- the random movement of particles in matter
- takes place in liquids and gases (zig-zag motion in all direction)



## Density

- is the mass per unit volume of substance
- how compact a substance is or how much matter is contained in one unit volume of the substance
- unit :  $\text{g}/\text{cm}^3$  or  $\text{kg}/\text{m}^3$
- method to measure density:
  - o determine the mass using lever balance or beam balance
  - o find its volume using the water displacement method

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Volume} = \frac{\text{Mass}}{\text{Density}}$$

$$\text{Mass} = \text{Density} \times \text{Volume}$$

- density of several substances

Material	Density (g/cm <sup>3</sup> )
gold	19.3
mercury	13.6
lead	11.3
silver	10.5
aluminum	2.7
rubber	1.1
water	1.0
cork	0.24
air	0.0013

### Density and the ability to float

- an object floats in a liquid if it is less dense than the liquid  
Eg. Ice floats on water because it is less dense than water
- an object sinks in a liquid if it is denser than liquid.  
Eg. Stone sinks in water because it is less dense than water



- substances with lower densities will float on substances with higher densities

### Application of the properties of matter

- Man can apply different states of matter and the concept of density everyday life.
- Man can make use of his knowledge of the application of the different states of matter to enable him to store and transport gases and liquids.
- Some of examples are

- some gases can be compressed into liquid form, thus reducing its volume and allowing it to be transported easily.
- Liquid and gases can flow, pipes are used to transport matter in these states

3. Man can also make use of concept of density in everyday life. Some example are :

a. Buoy.

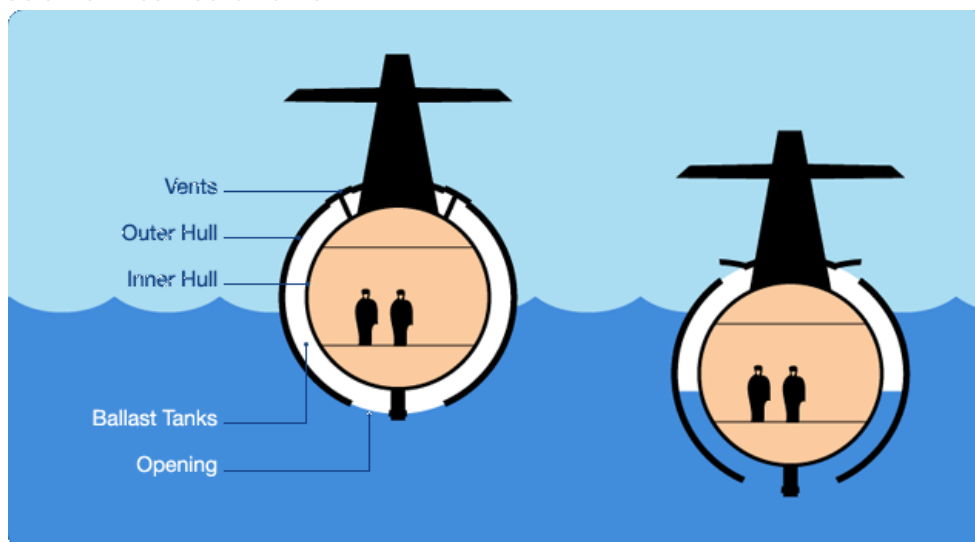
The buoy is filled with air and has a lower density than water, places in certain areas to keep ships away from unsafe areas.

b. Raft.

The raft has a lower density than water, stay afloat and used to carry goods and people on river

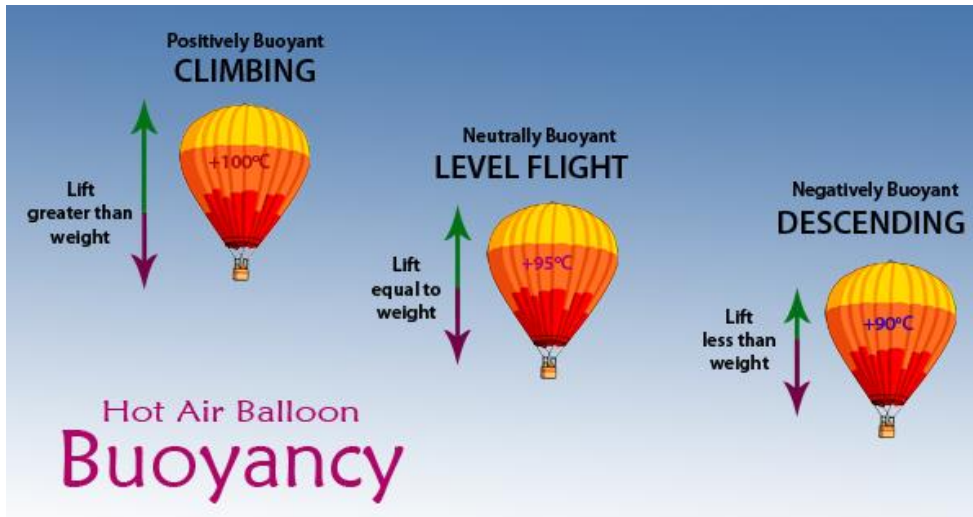
c. Logs.  
The logs have a lower density than water, they are floated down rivers to factories built on riverbanks

### Submarines rise or dive



- A submarine goes up and down in the sea by using ballast tanks.
- When the submarine is at the surface, its ballast tanks are filled with air, thus making its density less than that of the surrounding water.
- In order to submerge, the ballast tanks are filled with water, making the overall density of the ship higher than the surrounding water.

## Hot air balloon



- Hot air balloons fly because the hot air inside the balloon is less dense than the air outside of the balloon.
- The principle is really very simple, hot air rises and cold air sinks.
- To make the air inside the balloon hotter, a balloon pilot can turn on the propane burner.
- When the pilot wants the air inside the balloon to be cooler they can simply allow it cool naturally (everything hot cools down if the heat is removed) or if they want to speed up the cooling process they can let some hot air out of the balloon using a vent panel in the top of the balloon.

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