

Friday, 13th November 2020

## I- Matter and Measurement

States of matter: liquid, gas (gaseous state), solid

A Solid matter has a definite shape and a definite volume. Liquid matter has a definite volume but, not have a definite shape. It takes the shape of the container. Gaseous matter does not has neither a definite shape nor definite volume.

Matter can exists on one element or a combination of elements (compound). The smallest particle of a compound is molecule.

condense

to freeze

- evaporate

vapourise

- ice

melt

Sublimation

g, m; fundamental units

$\text{m}^2$ ,  $\text{g/cm}^3$ ; derived units

density

to exert a

force: 3<sup>rd</sup>  $\text{g/cm}^3$ ; gramme per cubic centimetre

gramme per centimetre cubed

(exert)

Relative density / Specific gravity

Friday, 27<sup>th</sup> November 2020

## II - Liquids

A liquid exerts forces in a container in many directions : upwards, sideways and downward. The liquid pushes sideways against the walls of the container, downward against the bottom.

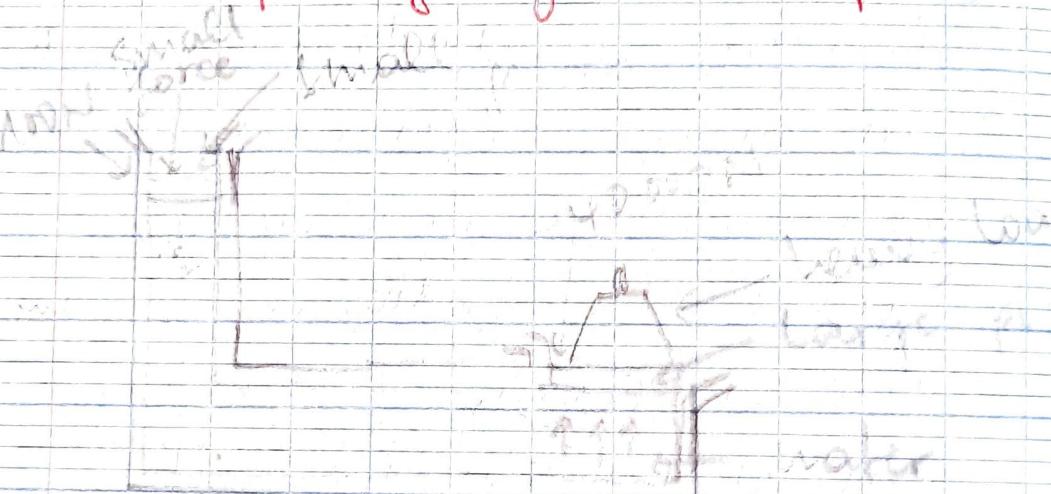
The existence of the upward force is called buoyancy and the force is a buoyant force.

**Archimedes' principle** When we immerse an object in a liquid, it appears to lose weight which is equivalent to the amount of liquid displaced.

The pressure in a liquid is directly proportional to the depth

~~Water~~ When we apply a small amount of force to a confined area of a liquid, the pressure is transmitted to the whole liquid.

### Principle of hydraulic press:



A small force is applied on a small piston. Because of the depth, the pressure will be intensified and because of the Pascal law of pressure, the pressure will be transmitted to the whole liquid.

Friday, 11th December 2020

### III - Gases

The Earth's atmosphere or the air we breathe consists of a mixture of gases.

Air has mass and exerts pressure. At sea level, this pressure is enough which air exerts to support a 76 cm column of mercury in a vacuum tube.

Changes in weather will cause small changes in atmospheric pressure.

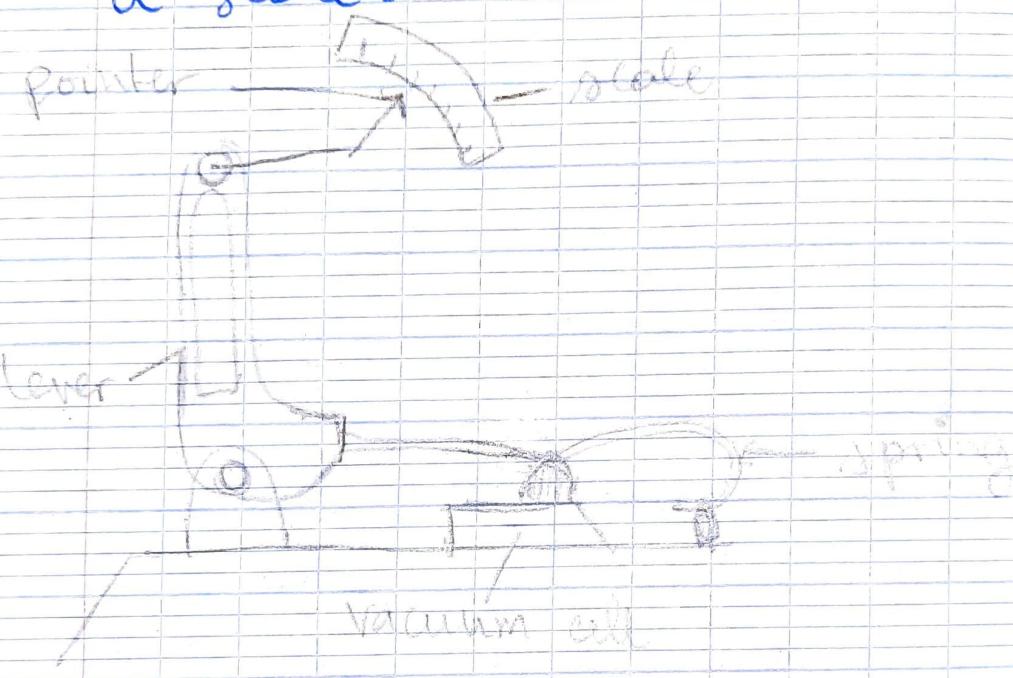
The instrument which measures changes in atmospheric pressure is the barometer. A <sup>common</sup> particular type of barometer is an aneroid barometer.

The components of an aneroid barometer:

It consists of a vacuum cell which is attached by levers to a pointer

for standard barometric pressure.  
Ansible:

A change in the atmospheric pressure causes a small movement in the surface of the cell. The lever transmits this movement to the pointer which moves across a scale.



Gases are compressible  
Greater the pressure which is applied,  
lower is the volume occupied

Boyle's law: If the temperature of a fixed mass of gas remains constant the volume is inversely proportional to the pressure

Gas: pressure, temperature, volume

(characteristics)  $\frac{V_1}{V_2} = \frac{P_2}{P_1}$

Principle of siphons transfer a liquid  
from a place ~~with~~<sup>higher level</sup> higher pressure to  
a container ~~of~~<sup>with</sup> a lower pressure according  
to gravity

Friday, 11th November 2020

## Force

Quantity with magnitude and direction; vector quantity  
Quantity with magnitude but no direction; scalar quantity

Magnitude = (size, amount)

Force is a vector quantity because it can be expressed in terms of magnitude and direction

A number of different forces can be expressed as one force which is the resultant.

The resultant of two forces can be expressed using the parallelogram of forces rule

Velocity is  
vector and  
speed is  
scalar



If two forces acts on a body and keep it at rest, the resultant of the forces is zero. That body is in equilibrium. A body is in equilibrium if the resultant of the forces acting on this body is zero.

Magnitude is indicated by the length of ~~no~~ lines. Direction is indicated by the arrow on lines.

Force R is the resultant of force x and force y

Force of gravity: Force that exists between Earth and an object on Earth

Gravitational force: Force that exists between two objects on Earth

\*Newton's law of gravitation : The force of attraction that exists between two bodies is directly proportional to their masses and inversely proportional to the square of the distance that separates them.

$$F = \frac{G m_1 m_2}{r^2}$$

Gravitational force acts horizontally and the force of gravity acts vertically

Center of gravity : Point of a body where the force of gravity is greatest

Friday, 8<sup>th</sup> January  
November 2024

## Motion

Synonym of motion; movement

If a body is not at rest, it is in motion. The rate at which a body is moving is called speed (high speed, low speed). We obtain the speed by dividing the distance that the body covered by the time that it took for the body to cover that distance. Velocity is the <sup>term to describe the</sup> speed & direction which has direction.

Velocity ← Vector quantity  
Speed ← Scalar quantity

Mass: Amount of matter found in a body

Weight: Force of gravity that is applied on an object.

Momentum = mass  $\times$  speed velocity

Acceleration is the rate at which the velocity of the body changes.

Friction: Force of resistance to motion

Efficiency of a machine; Reduces the effects of friction by greasing, oiling a machine

Acceleration is calculated by dividing the change of velocity by the time the change takes

$$A = \frac{V_2 - V_1}{t}$$

$g$  = Acceleration due to gravity  
 $= 9.8 \text{ m/s}^2$

The subject of an equation is the unknown value of an equation



A pendulum  
can help to calculate g

or a thread

A metallic ball attached to a string  
swings from side to side  
The period is <sup>time of a</sup> a complete swing

$$t = 2\pi \sqrt{\frac{l}{g}}$$

} t: time / period  
l: length of a string  
g: Acceleration due to gravity

For each measurement of g,  
l is constant. For each measurement  
of l, g is constant.

Acceleration due to gravity is the  
rate at which the velocity of a free

~~ability~~  
~~subject~~  
falling body changes due to the  
force of gravity

Galileo proved that the acceleration  
due to gravity is not related to the  
weight of a body