

Physics:- "The word "Physics" is derived From a Greek word "physiké" which means **Nature**"

Definition:- "The study of knowledge of, nature is called Physics."

(OR)

"Physics is the branch of science in which we study about

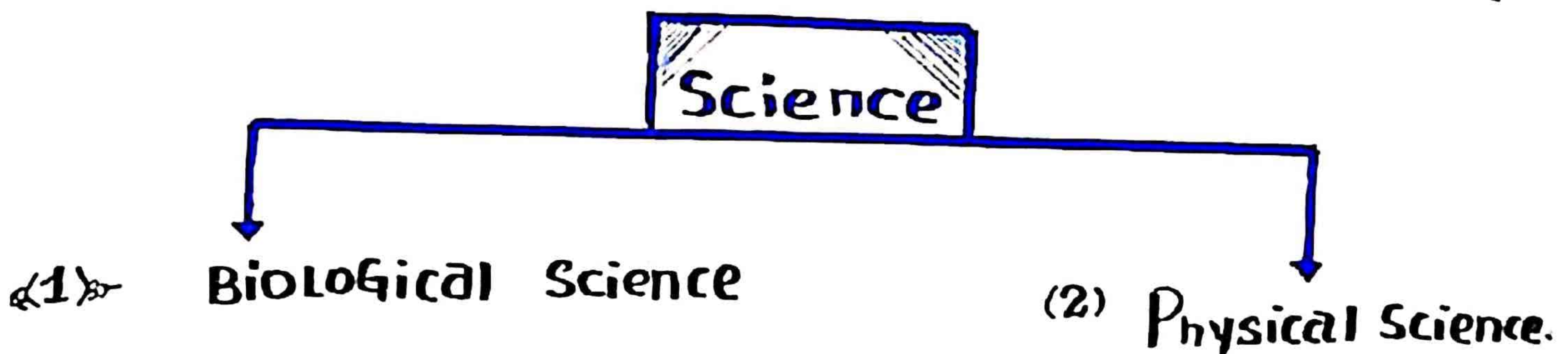
- <i>i</i>- Matter
- <i>ii</i>- Energy
- <i>iii</i>- Mutual relationship

is called Physics.

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Science:- "The knowledge which is gained through
↳ Observation
↳ Experimentation
is called Science."

Note:- "The word Science is derived from the Latin word **Scientia**. Which mean knowledge."



(1) Biological Science: "it is Concerned with the study of Living things."

Divided

(1) Biology → "study of Life is called Biology".

(2) Botany → "Study of plants is called Botany".

(3) Zoology → "Study of Animals is called Zoology".

(2) Physical Science:- "it is Concerned with the study of non-Living things".

(i) Physics → "already define on page (01)".

Chemistry → "is the scientific study of the properties and behavior of matter".

Astronomy → "Study of heavenly Bodies".

Geology → "Study of earth is called Geology".

Astrology → "Rejed By the scientific Community".

(1) Matter:- "Any thing which occupies space and has mass" is called matter.

Examples:

(1) Pen

(2) oil

(3) air

↳ States of Matter:-

States	Examples
<1> <u>Solids</u>	pen, wood, Cup, White board etc
<2> <u>Liquids</u>	oil, Water, milk, Cold-drink etc
<3> <u>Gases</u>	air, Hydrogen gas, Oxygen gas etc
<4> <u>Plasma</u>	Lighting, Welding arcs, Stars etc

<2> Energy:- "The ability of a body to do work" is called Energy.

<1> Kinetic-Energy (K.E):- energy due to motion is called K.E.

<2> potential-Energy (P.E):- "energy due to position of a body is called P.E."

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<3> Mass relation ship:- "Energy can be converted into matter and matter is converted into energy."

Albert Einstein Equation:-

$$E = mc^2$$

Where

↳ E = energy

↳ m = Mass

↳ c = Speed of Light

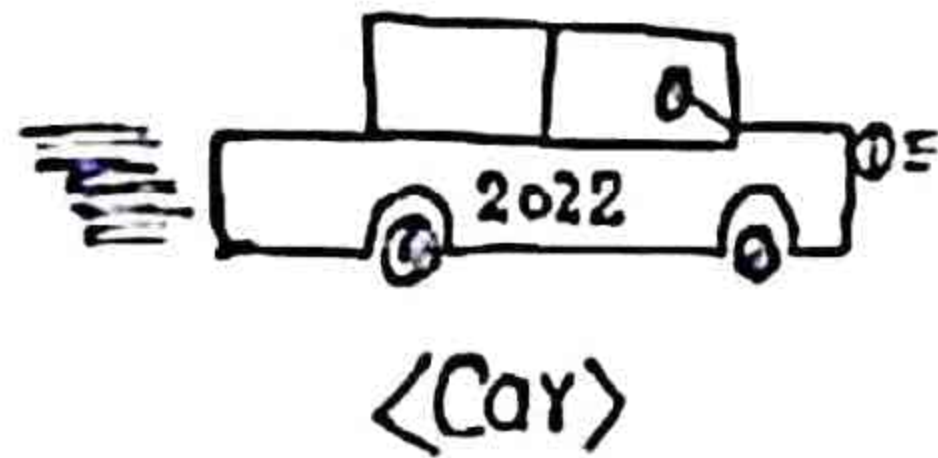
$$c = 3 \times 10^8 \text{ m/sec}$$

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Importance Of Physics:-

Physics play an important role in our daily life.

- 1) Consider the means of transportation such as Car and aero-planes is made on the principle of mechanics.

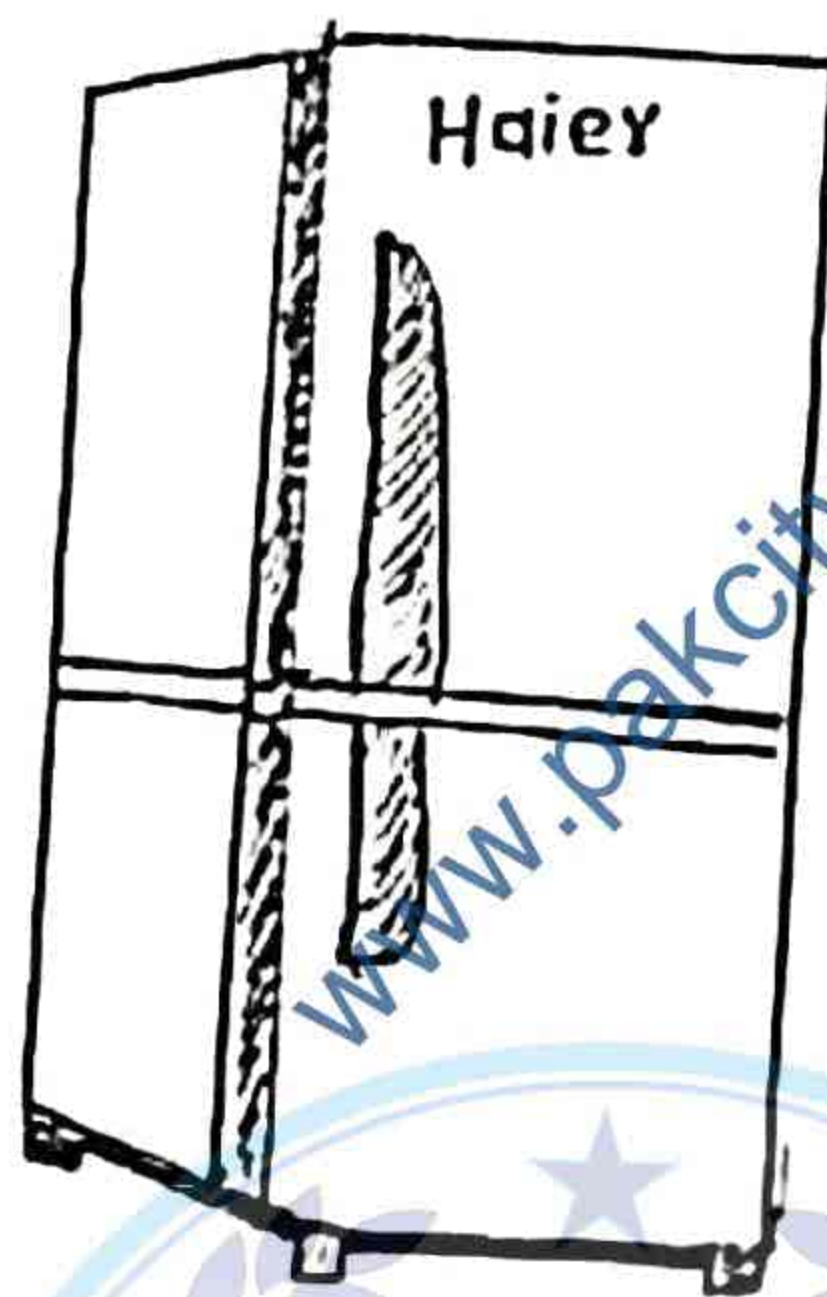


<Car>



<aero plane>

- 2) Refrigerator is based on the principle of thermodynamics.



< Refrigerator >

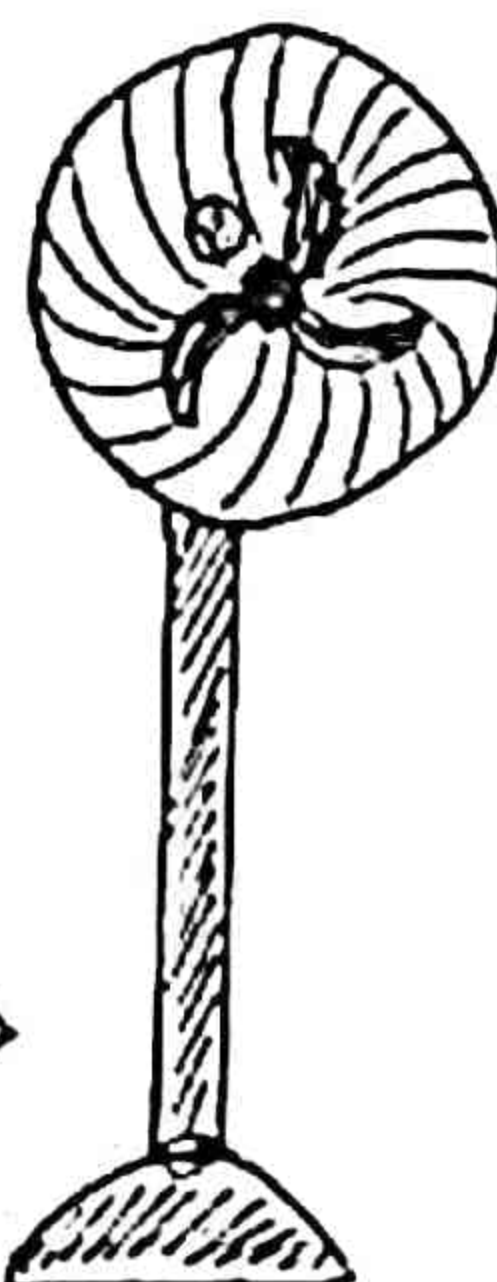
- 3) Electricity is used not only to get Light and heat But also mechanical energy that derives fans and electric motors.



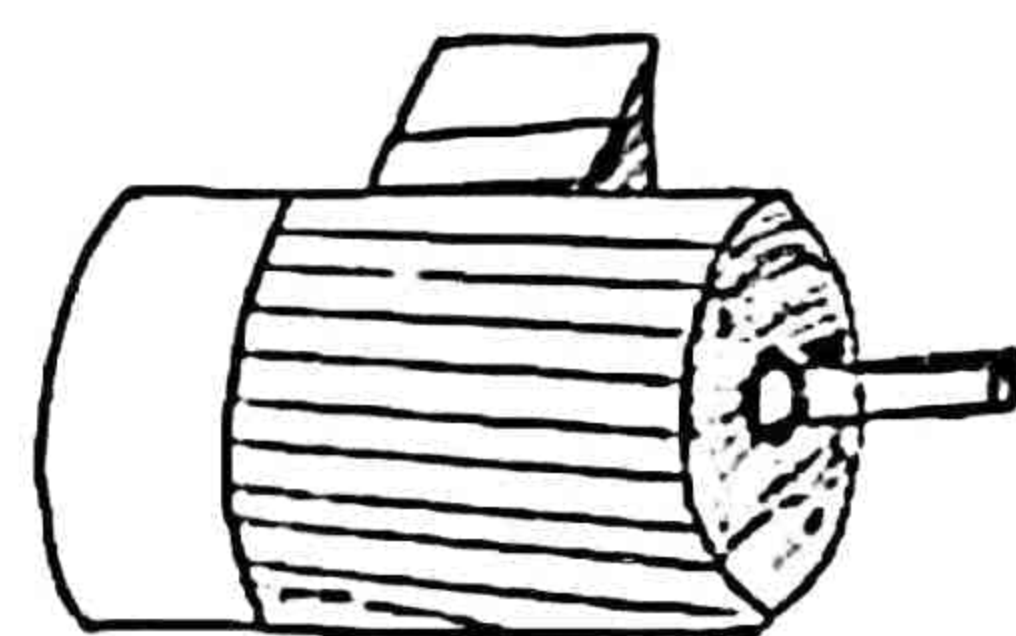
<Light>



<Heat>



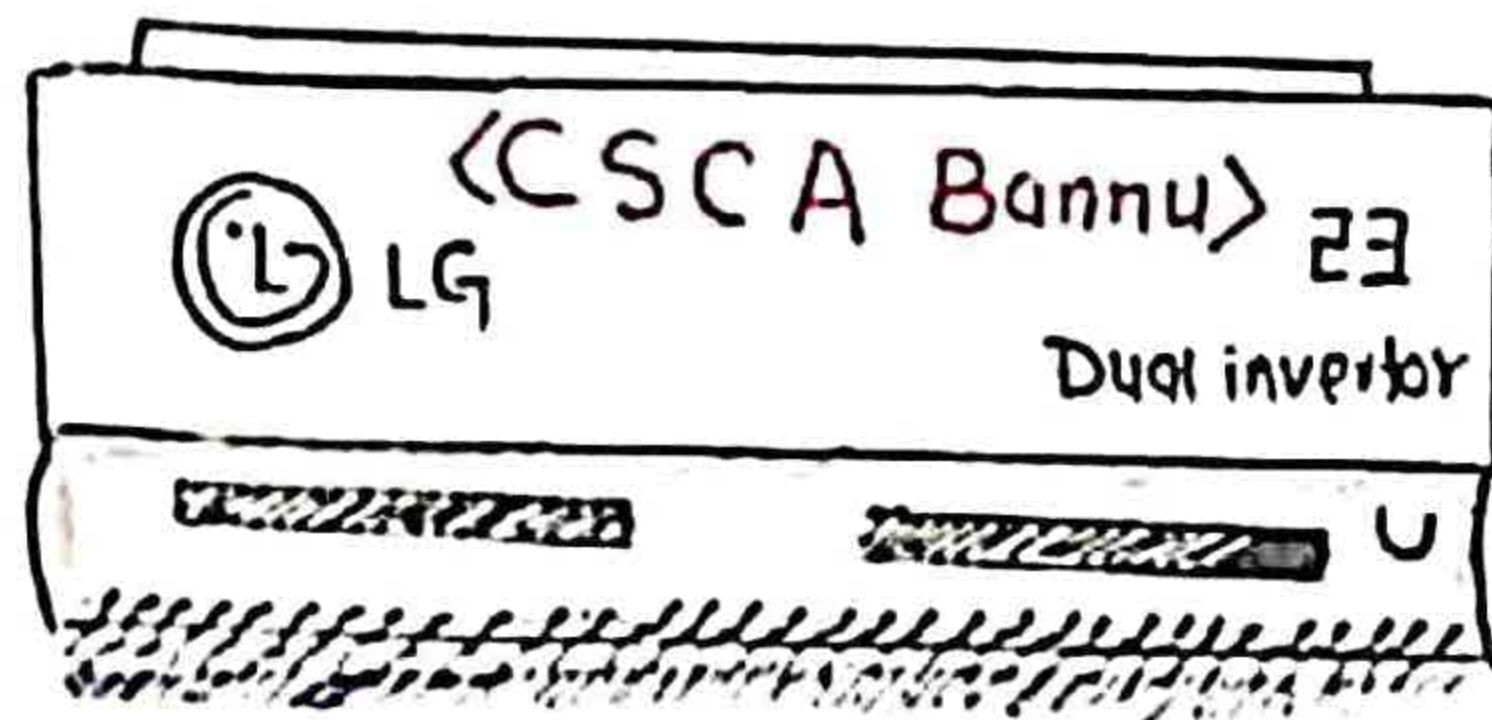
<Fans>



[Electric-Motor]

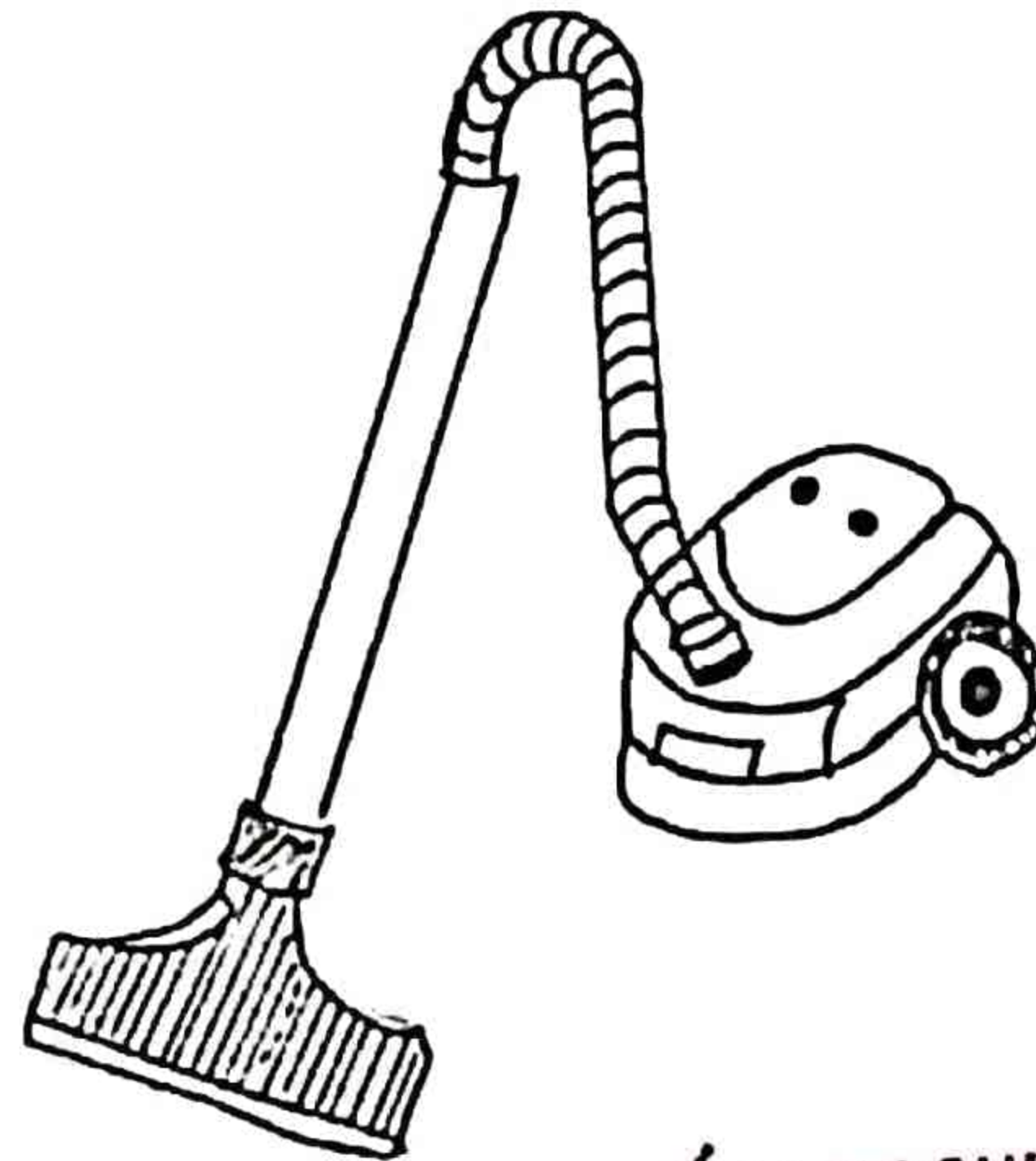
(4) Domestic appliances such as air - Conditioners, vacuum Cleaners, washing machines and microwaves are the fruits of hard work of physicists in the field of Physics.

(a)

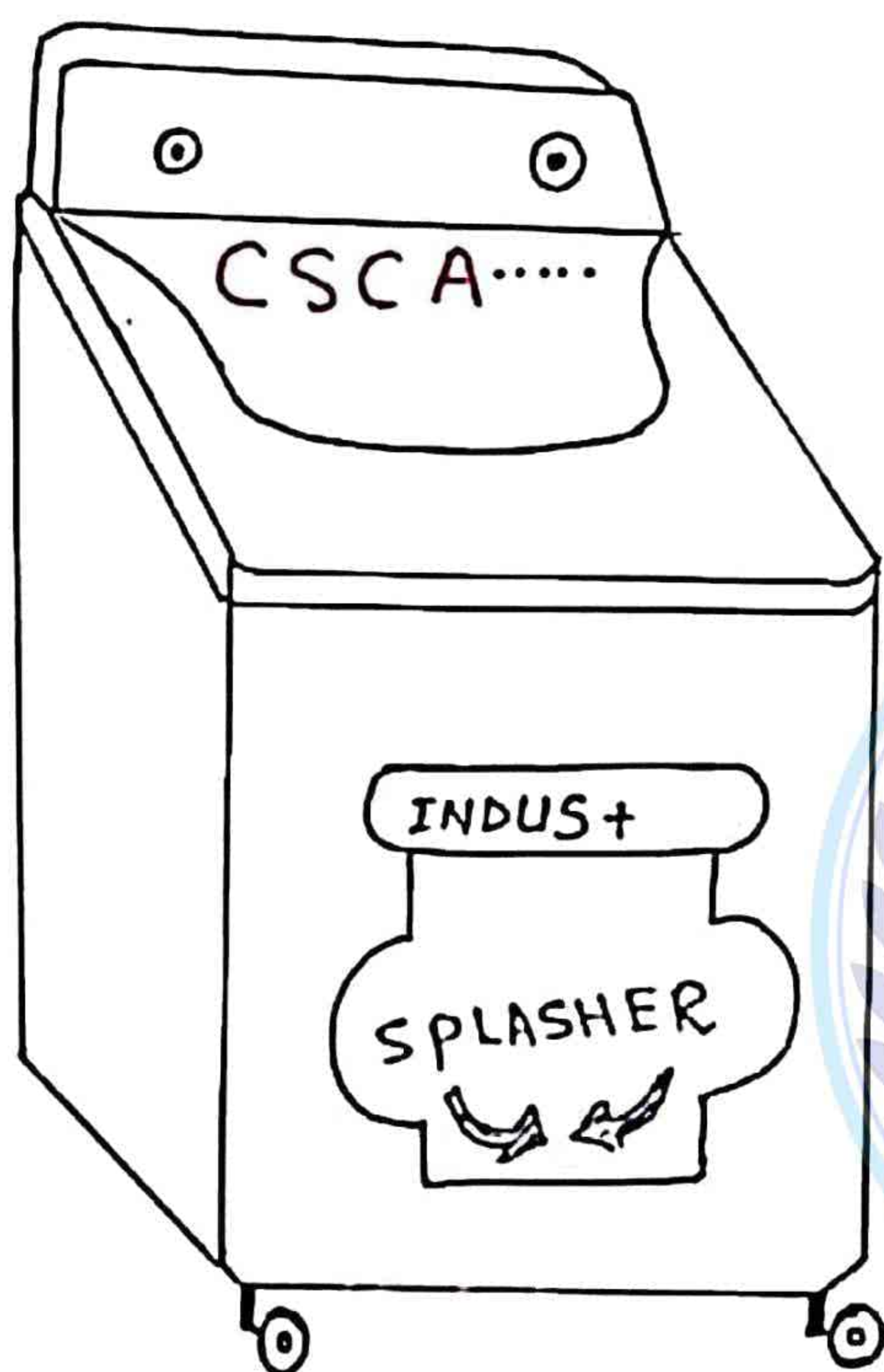


< Air-Conditioners >

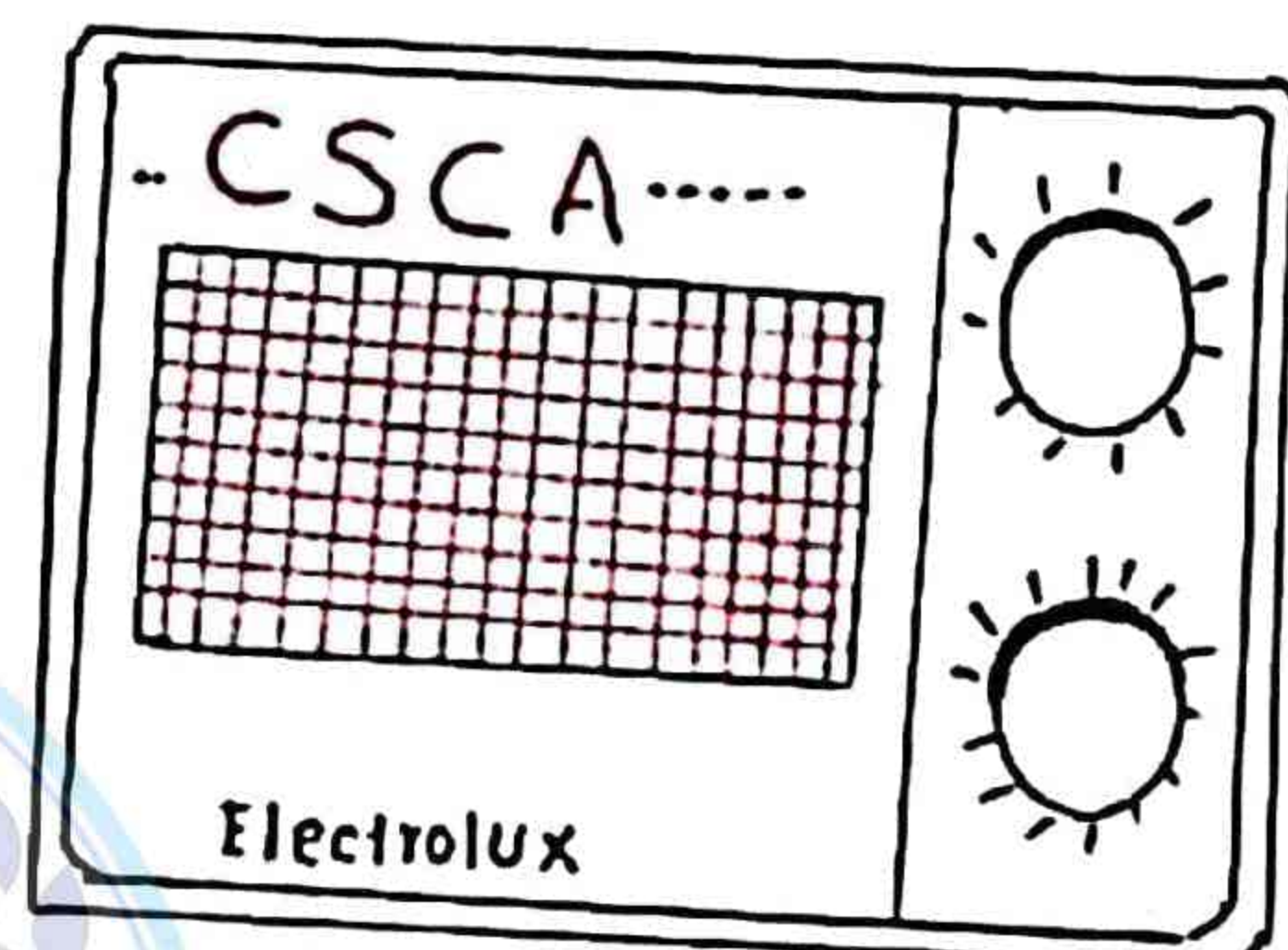
(b)



< vacuum-Cleaner >



< Washing machine >



< Micro ovens >

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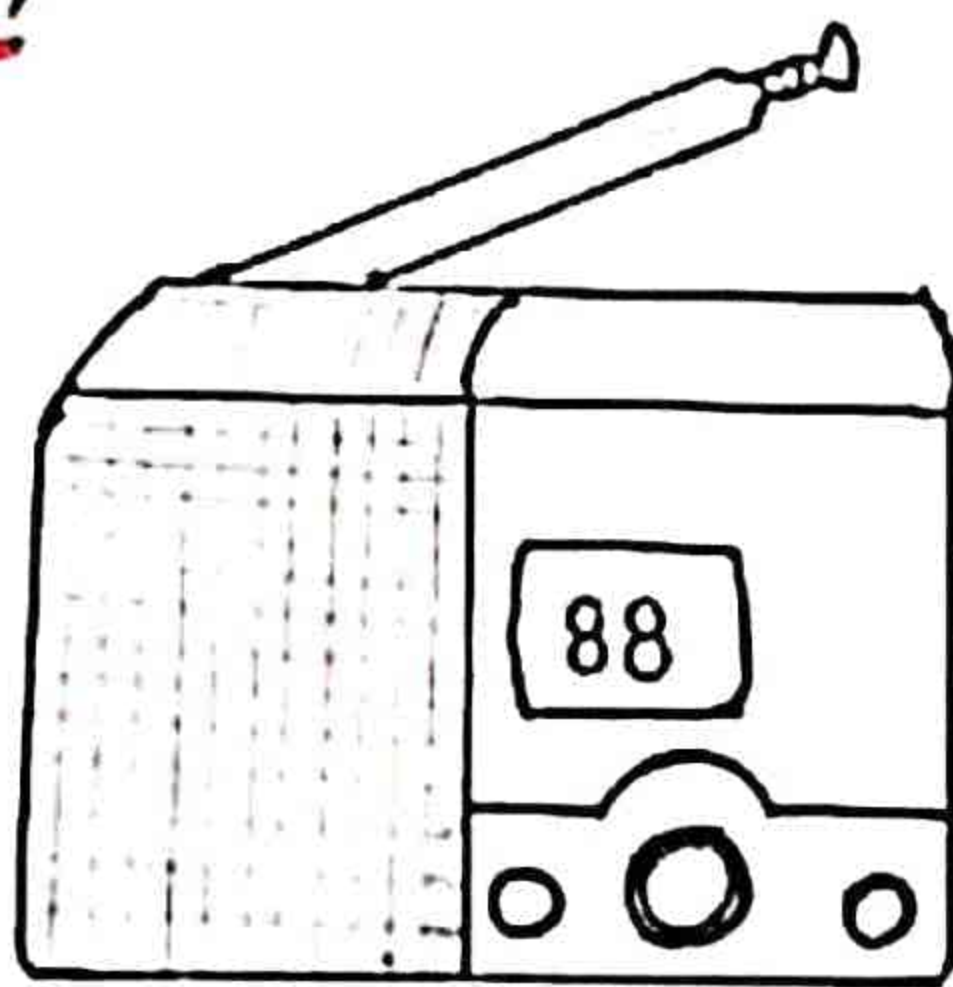
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Similarly the means of Communication such as

- <i> Radio
- <ii> Television
- <iii> Telephone and
- <iv> Computer

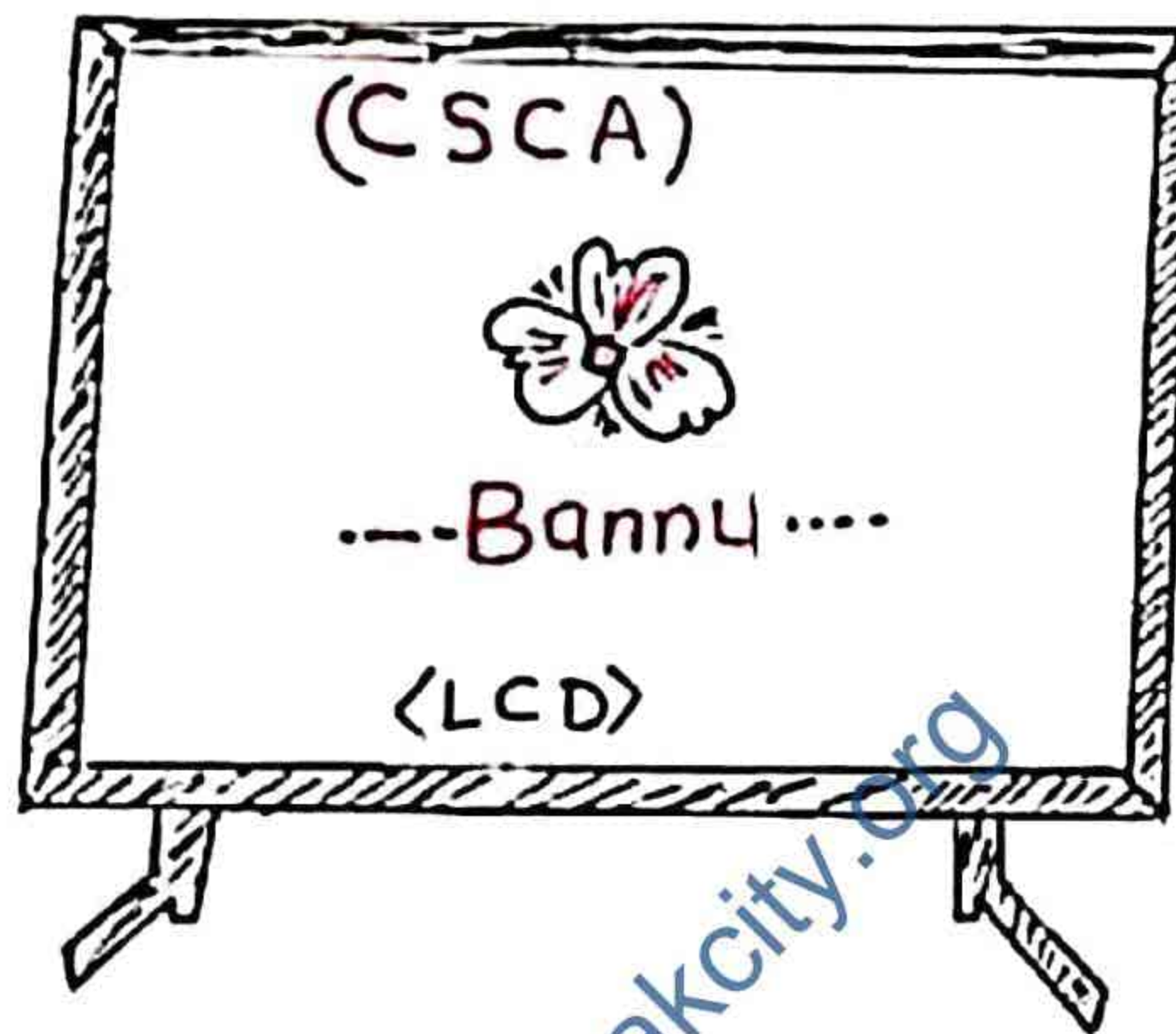
are the result of physics.

<i>

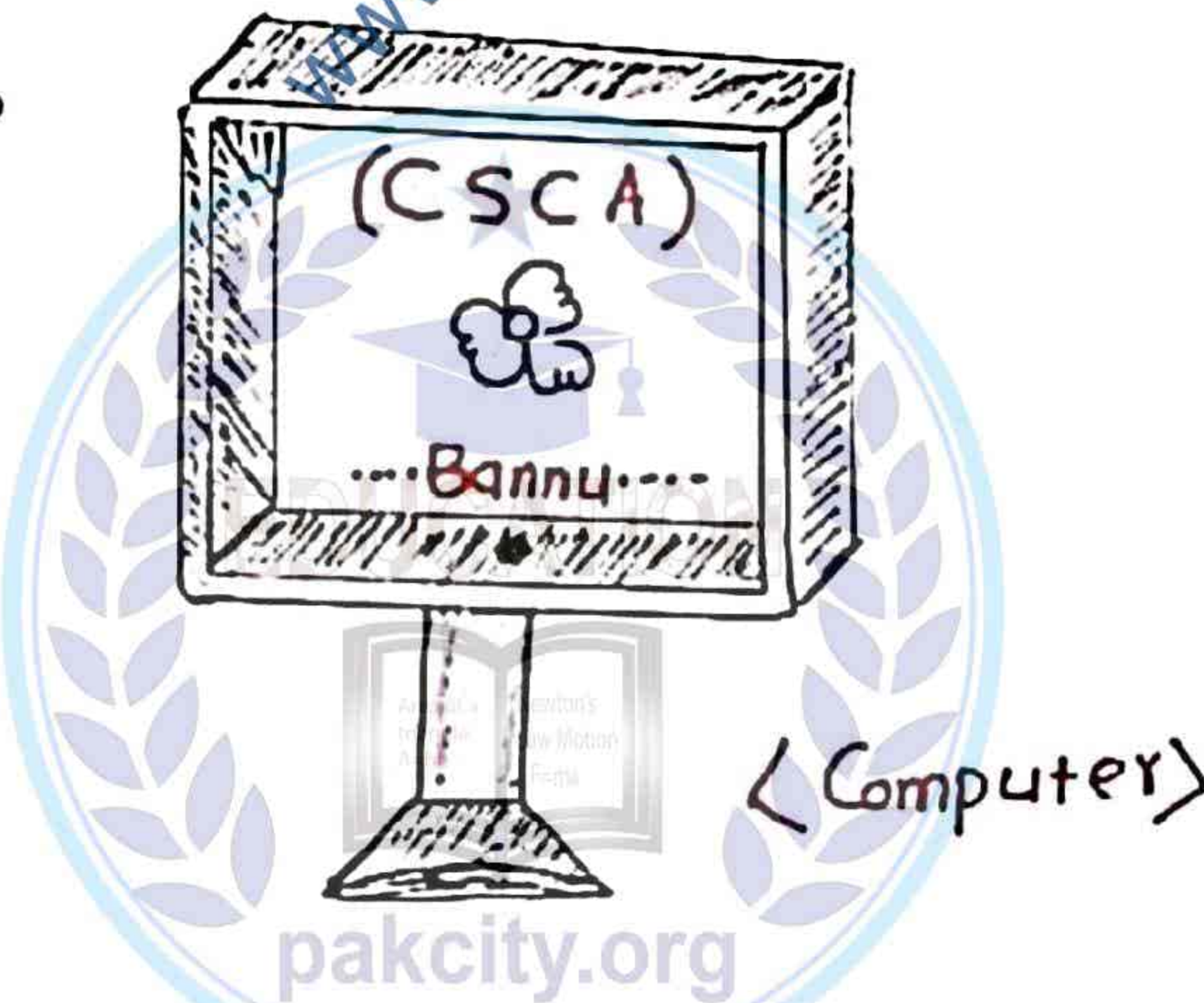


< FM- Radio >

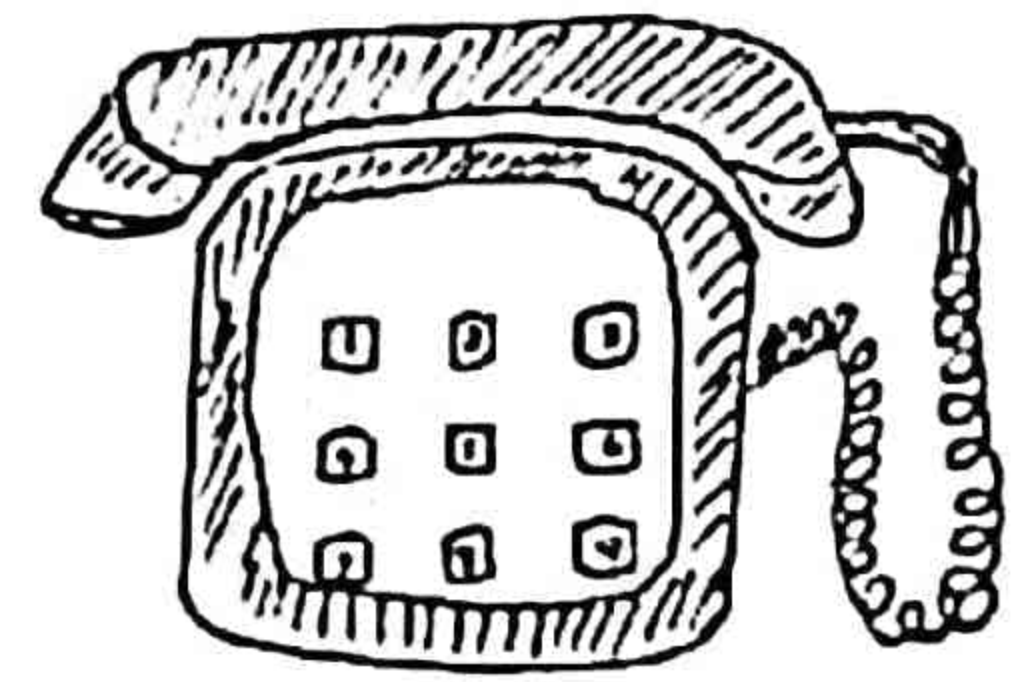
<ii>



<iv>



<iii>



< Telephone >

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6> Capacitors, inductors, Transformers etc are invention of physics. Which plays a vital role in electric Circuits.

7

Rockets and Satellites are the invention of Physics with the help of which we can get information about upper atmosphere.

Question: " Why we study physics?

Ans:- "the study of physics to understand the world

- *> Around us.
- *> World inside us.
- *> World beyond us.

Range of physics:- " physics Covers a wide range of phenomena , From the smallest Subatomic particles to the largest Galaxies and universe.

Note: " The smallest particles Of matter are called Atomes.

↳ Atome Consist of two regions.

- > i) inner - region. (Nucleus)
- > ii) Outer - region. (shell|orbit|energy level)

(i) inner - region:- " The inner region of atom Consist of Subatomic particles (Fundamental particles) and the particles are protons and neutrons.

- proton Contains +ve charge.
- neutron Contains no charge.

Note:- the protons and neutrons combine to gather are called Atomic mass or mass number.

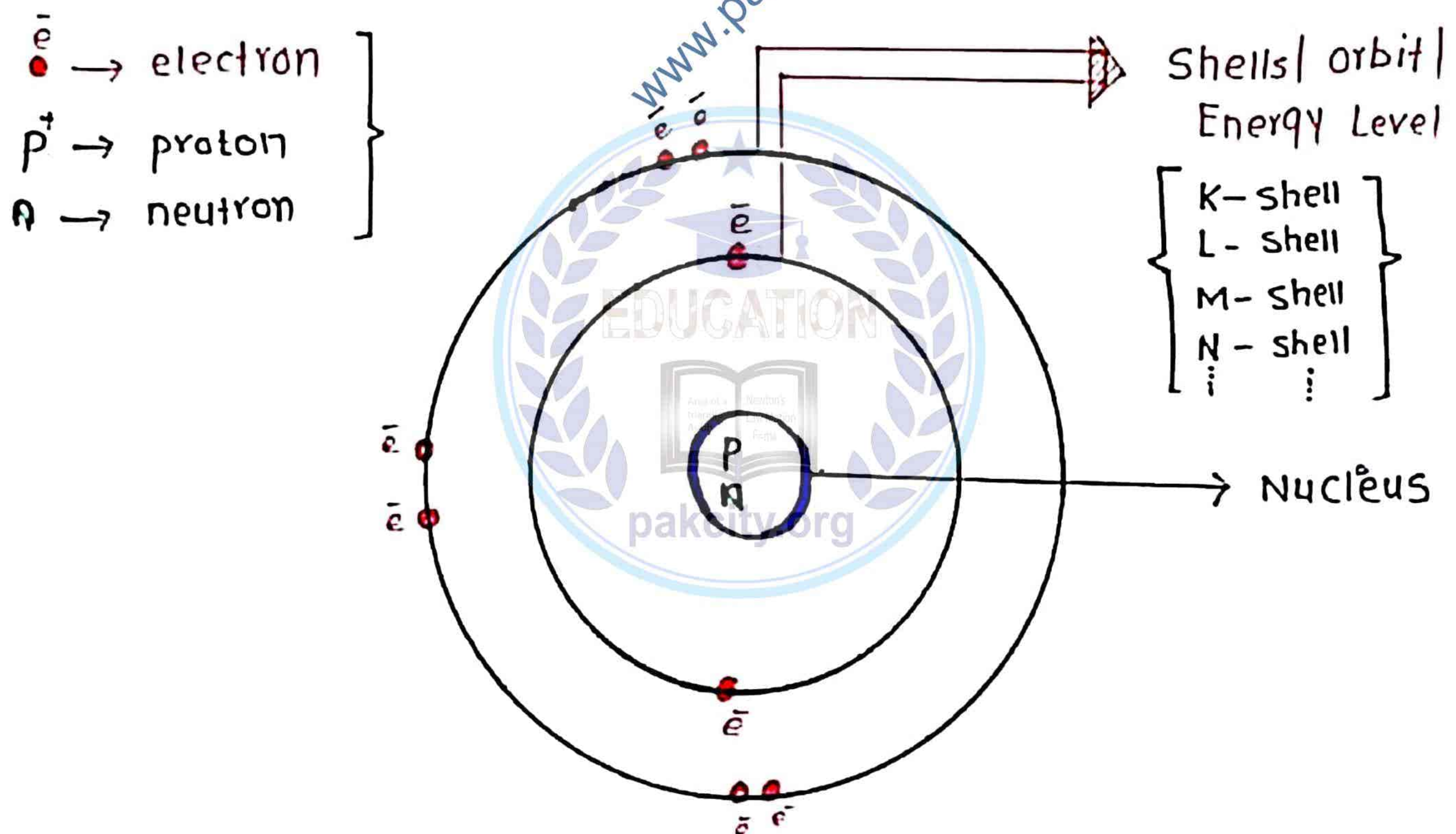
Representation: " Atomic mass is Represented By
a English alphabet <A>

$$\hookrightarrow \text{Atomic Mass} = \text{proton} + \text{Neutron}$$

Charge on Fundamental Particles:

- <1> Electron have negative Charge (-ve)
- <2> proton have positive Charge (+ve)
- <3> neutron have no Charge, so it is
a neutral particle.

Structure OF Atom:



Universe: " The totality of existence or everything that exists everything that has existed, and everything that will exist is Called Universe.

<OR>

" All of Space and time and energy Collectively referred as space-time Universe.

Galaxy: " A Galaxy is a Sprawling Space System Which is Composed of

- Stars
- dust
- interstellar gas
- stellar remnants and
- dark matter.

and all held together by Gravity.



↳ Galaxies are the building blocks of Universe.

Number of Galaxies: an acceptable range is between 100 billion and 200 billion.

Note: Our solar system is located in a large spiral-shaped galaxy called milky way and the sun is just one of at least 100 billion stars in this galaxy.

Names of Galaxies:-

- <1> Milky Way
- <2> Andromeda
- <3> Large Magellanic Cloud
- <4> Whirlpool Galaxy
- <5> Cartwheel Galaxy
- <6> Black Eye Galaxy
- <7> Sunflower Galaxy
- <8> Sombrero Galaxy
- <9> Triangulum Galaxy
- <10> Cigar Galaxy.

etc

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Physics and Science: "Physics is the Root

of every field of Science.

↳ Physics is the King of every field of Science.

↳ Most of the major developments in

- *> Chemistry
- *> Biology
- *> Geology
- *> Agriculture
- *> Environmental Science
- *> Astronomy

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Measurement:- " The Comparison of Un-known Quantity with a known Quantity is Called measurement.

(Measurable Quantity) ← Un-known Quantity → [Mass, Length etc]
 • Known Quantity → [Standard i.e Kilogram, meter etc]

Unit:- " The Standard with which things are Compared are Called Unit.

↳ Before a measurement Can be made, a Standard or Unit must be Chosen.

Magnitude:- " Number with a proper Unit is Known as magnitude.

i.e
 5 Kg Sugar → (thing)
 ↓ ↓
 Number Unit

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Number + Unit = Magnitude

Instrument:- " It is a device through which the size (magnitude) of a Quantity to be measure is than found with an instrument having a scale marked in the unit.

Examples:-

1) vernier Caliper
 2) screw Guage

3) Physical Balance
 4) Meter rule etc.

PHYSICAL QUANTITIES:- " All Quantities that Can be measured are Called Physical Quantities.

↳ In physics we study only those Quantities Which Can be defined and measured.

Examples:-

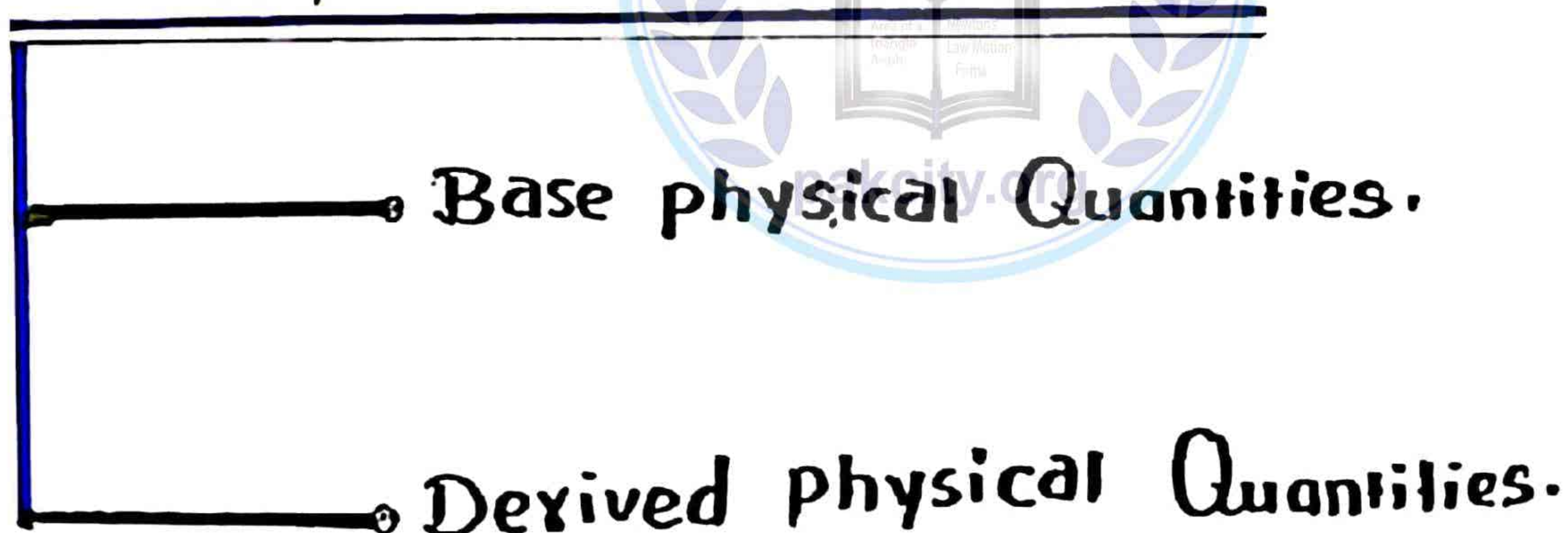
- <1> Length
- <2> Mass
- <3> Time
- <4> Electric Current
- <5> Temperature
- <6> Speed
- <7> Velocity etc are all physical

Quantities.

Explanation:- A physical Quantity possesses at least two Characteristic in Common.

- ① One is numerical Magnitude
- ② One is the unit in which it is measured.

Types of Physical Quantities:-



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i **Base physical Quantities:-** "The minimum number of physical Quantities which are the based for other physical Quantities.

OR

"Base Quantities are the Quantities on the basis of which other quantities are expressed".

Expiation:- these are seven (7) in number.
the seven physical Quantities are following.

- 1) Length
- 2) Mass
- 3) Time
- 4) Temperature
- 5) Electric Current
- 6) Amount of Substance
- 7) Intensity of Light.

S.I Based Unit:- The unit of Base physical Quantity is known as base unit.

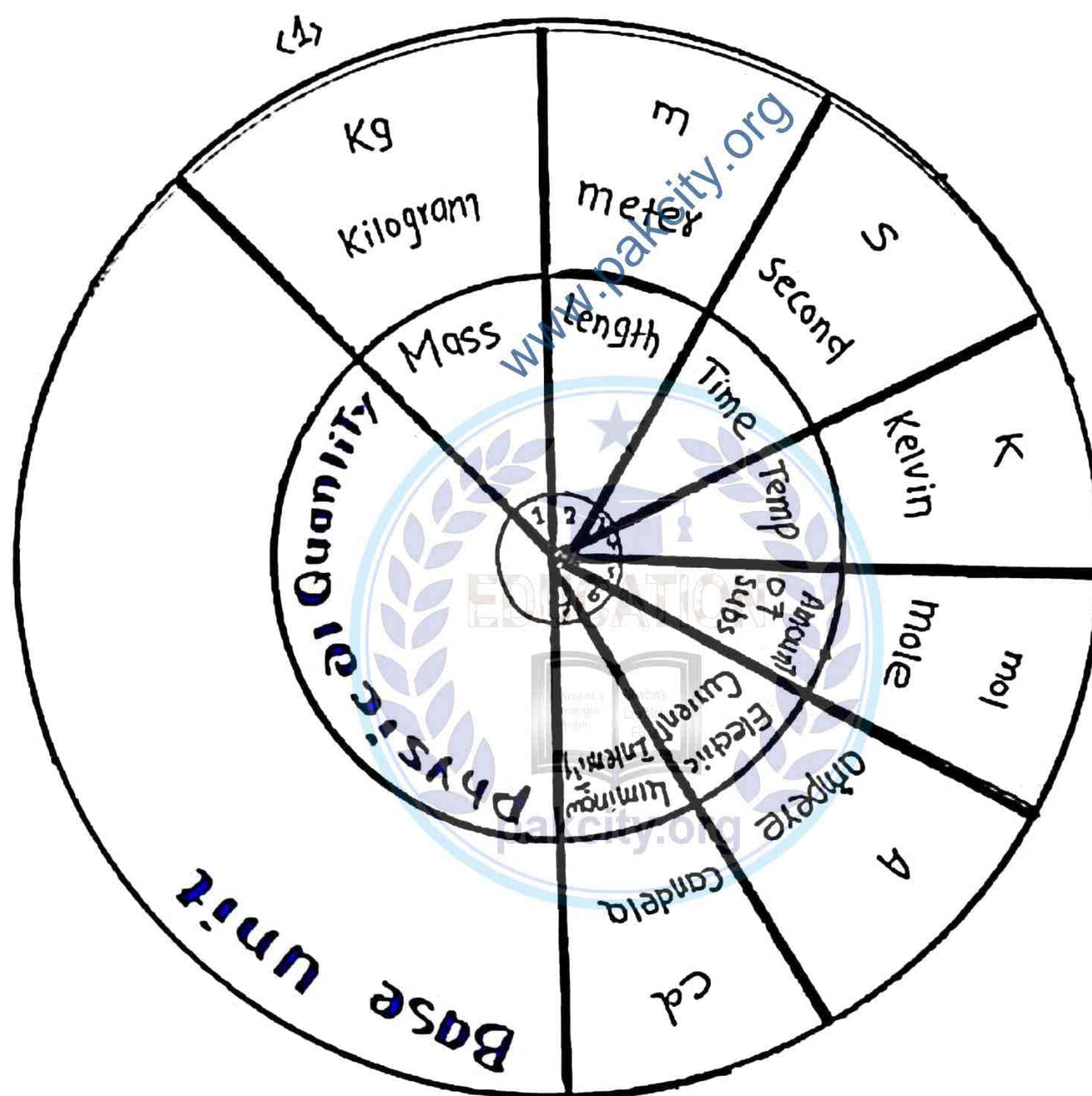
"the name of Seven base quantities, their units and symbols are given in the following table.

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Base Quantity	Symbol	Unit of Base Quantity	Symbol
Length	l, x, d, r, s, d	metre	m
Mass	m	kilogram	kg
Time	t	second	s
Electric Current	I	ampere	A
Temperature	T	Kelvin	K

Intensity of Light	I_y	Candela	cd
Amount of Substance	n	mole	mol

Note:- " Those units which are not made from the other units and cannot be resolved further into other units are called Base units .



**< S.I Base Quantities
and s-I Base unit >**

2. Derived Physical Quantities:

" Those physical Quantities which are derived from other physical Quantities (Based physical Quantities) are called derived physical Quantities.

(OR)

" The physical Quantities defined in term of Base Quantities are called derived physical Quantities.

(OR)

" Derived Quantities are those Quantities which are made from two or more than two base Quantities

Examples of Derived Physical Quantities:-

- ↳ Area
- ↳ volume
- ↳ Speed, velocity
- ↳ acceleration
- ↳ density
- ↳ force
- ↳ pressure
- ↳ Energy
- ↳ Capacitance
- ↳ Resistance etc

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Note:- " There are infite numbers of derived physical Quantities.

Derived Units:- " The units of derived physical Quantity is known as derived units

<OR>

" Those units which are formed by multiplying or dividing two or more than two base units are Called derived units.

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Table:- <Derived Physical Quantities and their Unit>

S/No	Quantity name	Symbol	Unit name	Symbol
<1>	Area	A	Square meter	m^2
<2>	volume	V	Cubic meter	m^3
<3>	Speed , velocity	v	meter per second	ms^{-1}
<4>	accelaration	a	meter per second square	$msec^{-2}$
<5>	density	ρ	Kilogram per cubic meter	$kg\ m^{-3}$
<6>	force	F	newton	$N = kg\ m\ sec^{-2}$
<7>	pressure	P	pascal	$Pa = kg\ m^{-1}\ s^{-2}$
<8>	energy	E, U	Joul	$J = kg\ m^2\ s^{-2}$
<9>	Capacitance	C	farad	$F = kg^{-1}\ m^{-2}\ s^4\ A^2$
<10>	Resistance	R	ohm	$\Omega = kg\ m^2\ s^{-3}\ A^{-2}$

Explanation Of derived Physical Quantities

1) Area :- $\langle A \rangle$:: Area = Length x width

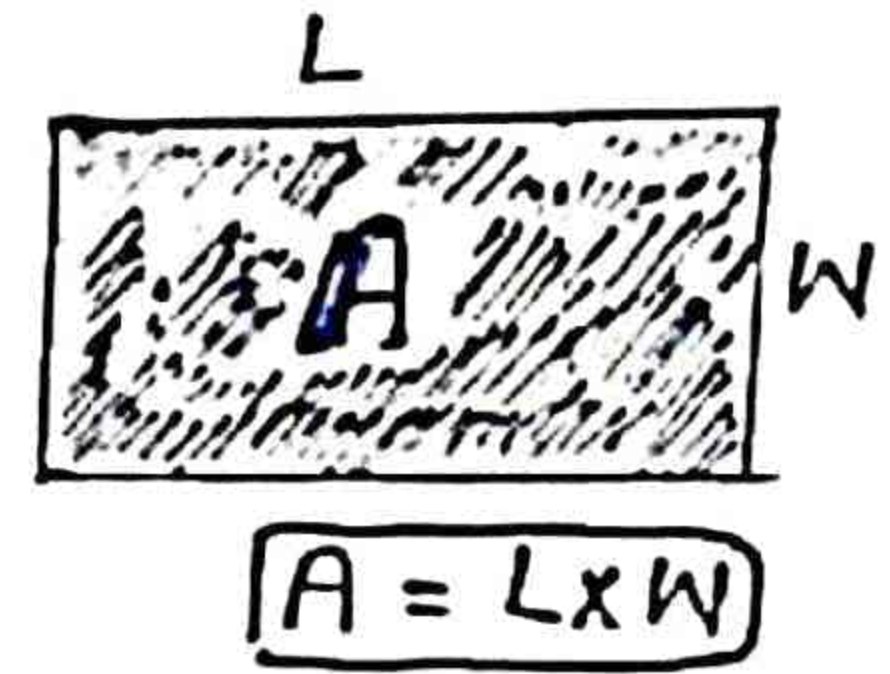
Symbol: $A = L \times L$

Unit: $A = \text{meter} \times \text{meter}$

$A = m \times m = m^2$

$$A = m^2$$

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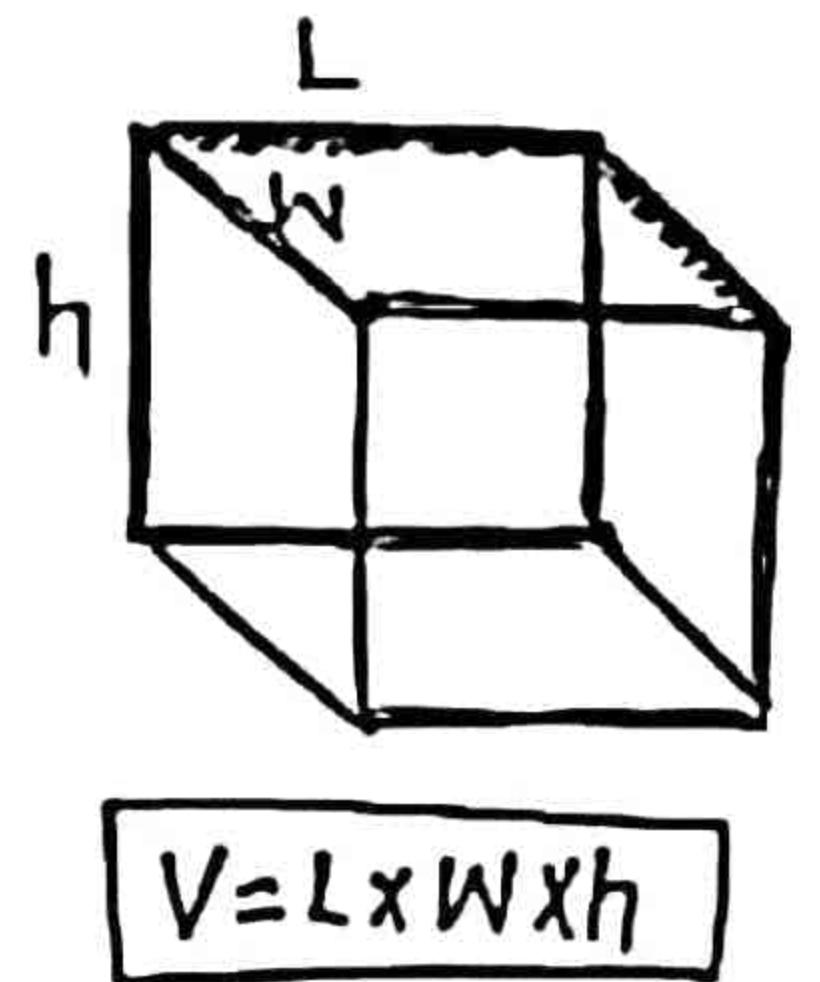
2) Volume :- $\langle V \rangle$:: Volume = Length x width x height

Symbol: $V = L \times W \times h$

Unit: $V = \text{meter} \times \text{meter} \times \text{meter}$

$V = m \times m \times m = m^{1+1+1}$

$$V = m^3$$



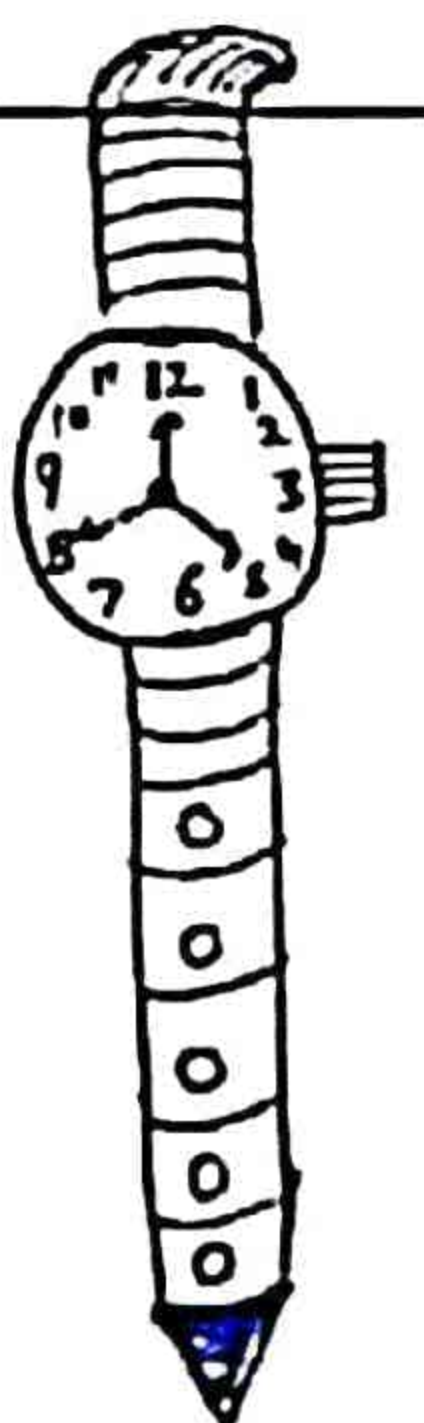
3) Speed / Velocity $\langle v \rangle / \langle \vec{v} \rangle$::

$$\vec{v} = \frac{\text{distance}}{\text{time}}$$

Mathematically: $\vec{v} = \frac{\Delta d}{\Delta t}$

Unit: $\vec{v} = \frac{\text{meter}}{\text{second}} = \frac{m}{s} = m s^{-1}$

$$\vec{v} = m s^{-1}$$



4 Acceleration:- $\langle \vec{a} \rangle$:-
Equation:- acceleration = $\frac{\text{Change in velocity}}{\text{total time}}$

Mathematically:- $\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$

Unit:- $\vec{a} = \frac{\text{m/s}}{\text{s}} = \frac{\text{meter per second}}{\text{second}}$

$\vec{a} = \text{m/sec}^2$

$\vec{a} = \text{msec}^{-2}$



5 Density $\langle \rho \rangle$:-

Equation:-

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

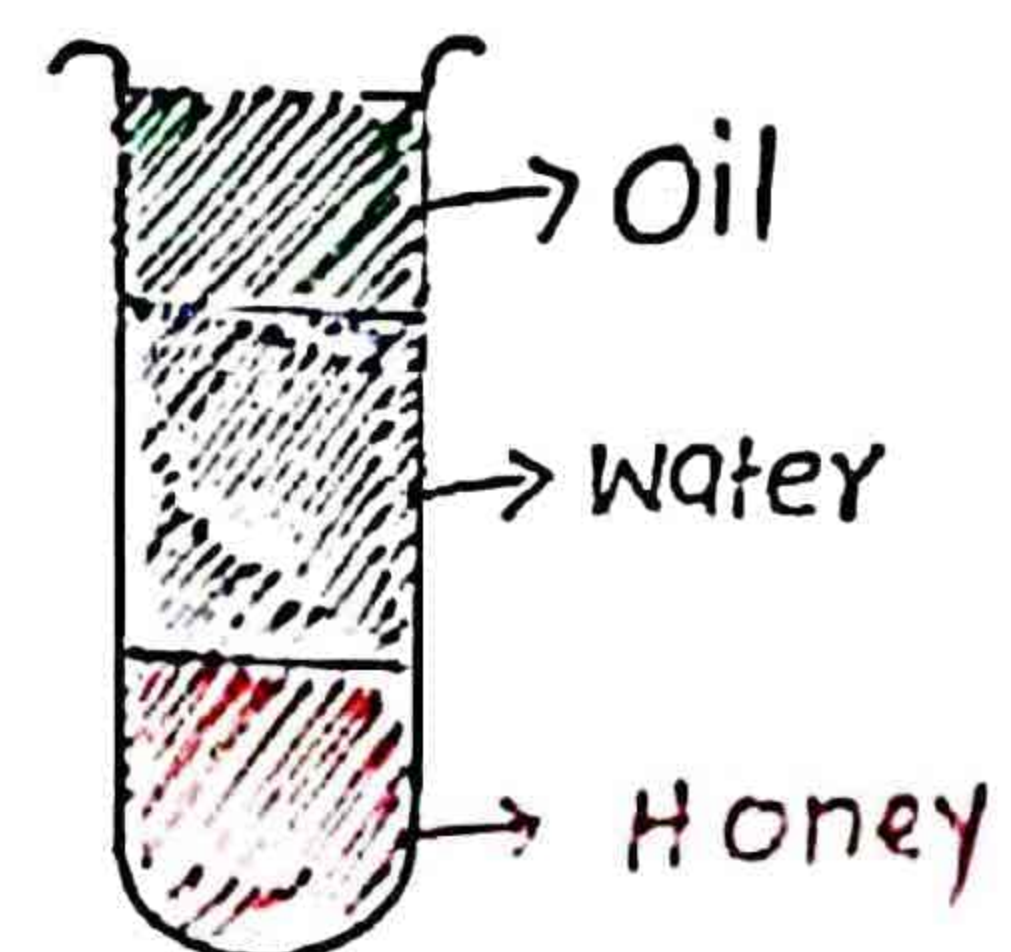
Mathematically:-

$\rho = \frac{m}{V}$

Unit:-

$\rho = \frac{\text{Kilogram}}{\text{Cubic meter}} = \frac{\text{Kg}}{\text{m}^3} = \text{Kg} \cdot \text{m}^{-3}$

$\rho = \text{Kg m}^{-3}$



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<6> Force $\vec{F}$:-

Equation:-

Force = Mass $\times$ acceleration

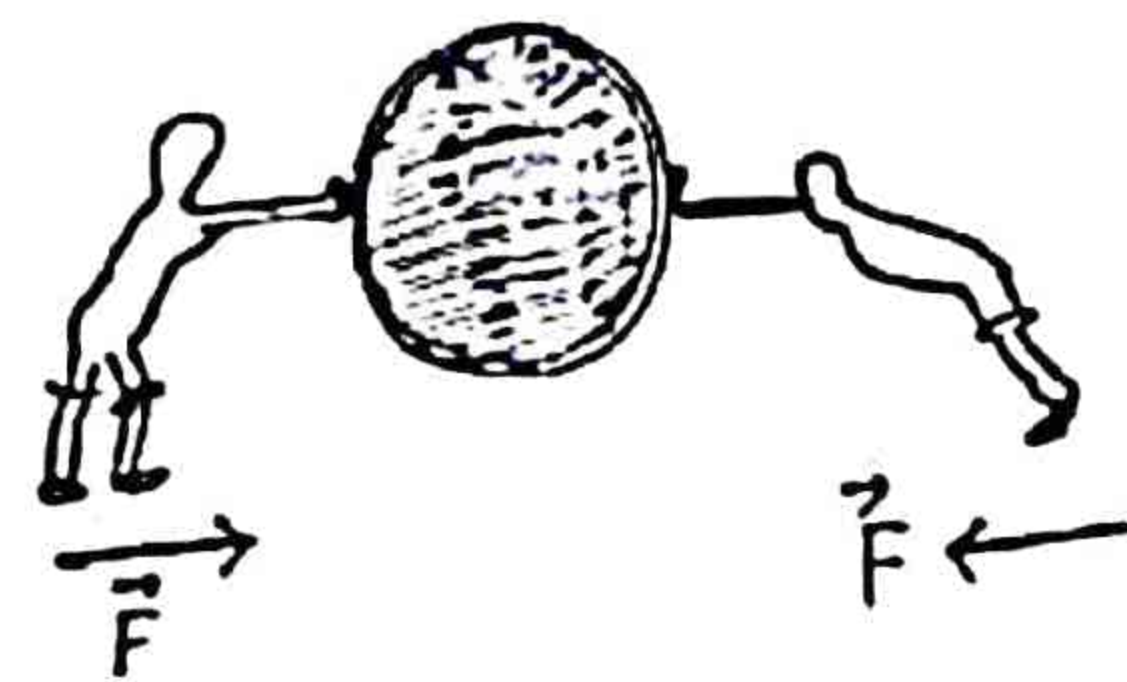
Mathematically:-

$$F = m\vec{a}$$

Unit:-

$$N = \text{Kg} \frac{\text{m}}{\text{sec}^2} = \text{Kg m sec}^{-2}$$

$$N = \text{Kg m sec}^{-2}$$



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<7> Pressure P:-

Equation:-

Pressure = $\frac{\text{Force}}{\text{area}}$

Mathematically:-

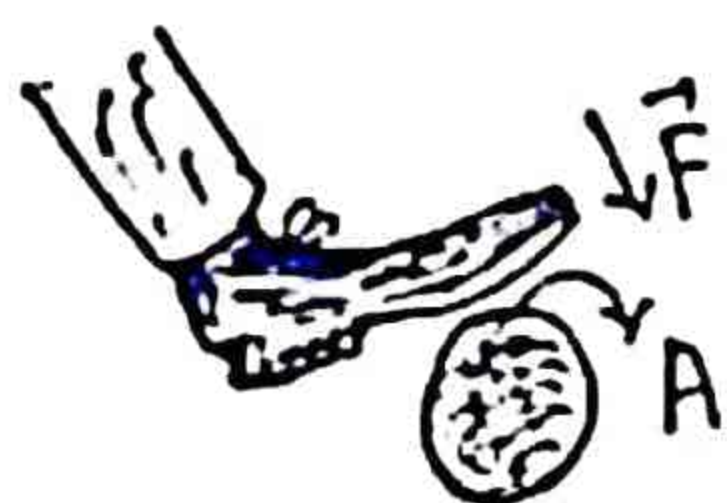
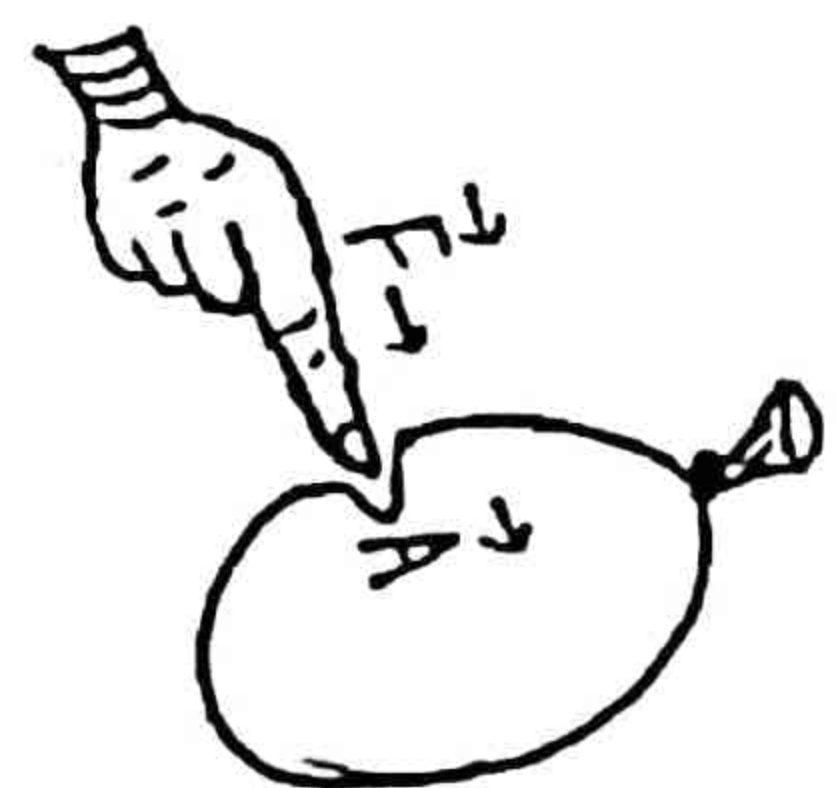
$$P = \frac{\vec{F}}{A}$$

Unit:-

$$P = \frac{N}{m^2} = \frac{\text{Kg m}}{s^2 m^2}$$

$$P = \frac{\text{kg m}}{s^2 m^2} = \text{kg m}^{-1} \text{s}^{-2}$$

$$P = \text{kg m}^{-1} \text{s}^{-2}$$



(8) Energy (E, U) :-

- (i) Kinetic energy (K.E) = $\frac{1}{2} mv^2$
- (ii) Potential energy (P.E) = mgh

Equation:-

- $K.E = \frac{1}{2} (\text{mass}) (\text{velocity})^2$
- $P.E = (\text{Mass}) (\text{acceleration due to gravity}) (\text{height})$

Mathematically:-

(i) $K.E = \frac{1}{2} mv^2$

(ii) $P.E = mgh$

Unit:-

Joule (J)

→ $K.E = \frac{1}{2} mv^2$

$K.E = (\text{Kg}) \left(\frac{\text{m}}{\text{sec}} \right)^2$

$K.E = \text{Kg} \frac{\text{m}^2}{\text{sec}^2} = \text{Kg m}^2 \text{sec}^{-2}$

$K.E = \text{Kg m}^2 \text{s}^{-2}$

→ $P.E = mgh$

$P.E = (\text{Kg}) \left(\frac{\text{m}}{\text{sec}^2} \right) (\text{m})$

$P.E = \text{Kg} \frac{\text{m}^2}{\text{s}^2} = \text{Kg m}^2 \text{s}^{-2}$

$P.E = \text{Kg m}^2 \text{s}^{-2}$



Light

(9) Capacitance:- (C):-

Equation:-

Capacitance = $\frac{\text{Charge}}{\text{voltage}}$

Mathematically:-

$C = \frac{Q}{V}$

Unit:-

$C = \frac{\text{Coulomb}}{\text{Voltage}} = \frac{C}{V} = CV^{-1}$

$$C = C \bar{V} = \text{farad}$$

Resistance (R) $\therefore$ A/c to Ohm Law

$$V = IR$$

Equation Resistance = $\frac{\text{Voltage}}{\text{Current}}$

Mathematically $R = \frac{V}{I}$

Unit $R = \frac{V}{A} = V \bar{A} = \Omega \text{ (ohm)}$

$$\Omega = \text{kg m}^2 \text{s}^{-3} \text{A}^{-2}$$



derivation:

$$R = \frac{V}{I} \quad \because \left\{ V = \frac{\text{Work}}{\text{Charge}} \right\} \rightarrow V = \frac{W}{Q} = \frac{J}{C}$$

$$\Rightarrow R = \frac{\frac{W}{Q}}{I} = \frac{\frac{F \cdot d}{It}}{I} = \frac{ma \cdot d}{\frac{It}{t}}$$

$$R = \frac{\frac{\text{kg m s}^{-2} \cdot \text{m}}{\text{A} \cdot \text{s}}}{\text{A}} = \frac{\text{kg m}^2 \text{s}^{-2} \cdot \text{s}^{-1} \bar{\text{A}}^{-1} \cdot \bar{\text{A}}^{-1}}{\text{A}} = \text{kg m}^2 \text{s}^{-2+(-1)} \text{A}^{-1+(-1)}$$

$$R = \text{kg m}^2 \text{s}^{-2-1} \text{A}^{-2}$$

$$R = \text{kg m}^2 \text{s}^{-3} \text{A}^{-2}$$

$$\therefore \left\{ \begin{array}{l} W = F \cdot d \\ F = ma \end{array} \right\}$$

Scientific Notation:- Standard Form:

:- " The representation of very small number or very large number in power of **ten** is called scientific notation or standard form.

---(OR)---

" The representation of very small number or very large number in decimal form, is called Scientific notation or Standard form.

Explanation:- Standard form or Scientific notation has a number of useful properties and it is commonly used by scientists, mathematicians and engineers.

Advantage of Scientific notation:-

↳ the advantage of Scientific notation is the saving of space and time.

Examples:-

Mathematical Form:-

$$N = M \times 10^{\pm n}$$

where,

N = number

M = mantissa

$\pm n$ = power, exponent

$\pm$ = (negative or positive)

Examples:-(A) Representation of very Large NumbersExample No 01:-

Mass of Moon:- " the mass of a moon is approximately 70,000,000,000,000,000,000,000 kilograms.

So, this number is very Complex if we use it often. So, we write such a Complex notation in Scientific notation or standard form.

$$N = M \times 10^{\pm n}$$

$$N = 70\,000\,000\,000\,000\,000\,000\,000$$

if number is greater than Fraction will be displaced toward left.

$$7 \times 10^{22} \text{ kg}$$

Where • Mantissa = 7
• Exponent = 22

Example No2:- " Average distance b/w earth and moon

$$\text{distance} = 384,400,000 \text{ m}$$

So, in Standard or Scientific notation

$$d = 384,400,000 \text{ m}$$

$$d = 3.844 \times 10^8 \text{ m}$$

Note

Zero will be moved to 1st non-zero digit

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Example 03:-

" The mass of earth is

5,980,000,000,000,000,000,000,000 Kg

Write this number in scientific notation?

↳ Mass of earth = $m_E = 5,980,000,000,000,000,000,000,000$
in Scientific form = $N = M \times 10^{+n}$

5.9 0 000 000 000 000 000 000 000 000.

$$m_E = 5.9 \times 10^{23} \text{ Kg}$$

Where

5.9 → Mantissa
23 → Exponent/power

Example 04:-

For Example if Some one
Writes that human body contains approximately

7,000,000,000,000,000,000,000,000 atoms

So, the above number can be write in
Scientific notation as.

7.000 000 000 000 000 000 000 000 000.

$$7 \times 10^{27} \text{ atoms}$$

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