Physics - IV and Doubt Clearing Session

Complete Course on Physics

Aman Srivastava • Lesson 3 • Aug 14, 2021

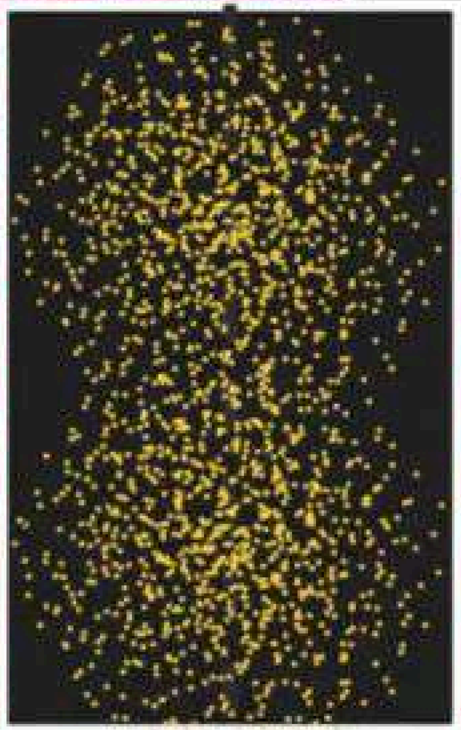
$25 \rightarrow 19 - 21$ ✓

$25 \quad 17 - 18$ ✓

$25 \rightarrow 19 - 21$ ✓

$\boxed{\text{Physics}}$

Physics



Units

PHYSICAL QUANTITIES

: Anything that can be measured.

Scalar Quantities

: magnitude only and no direction

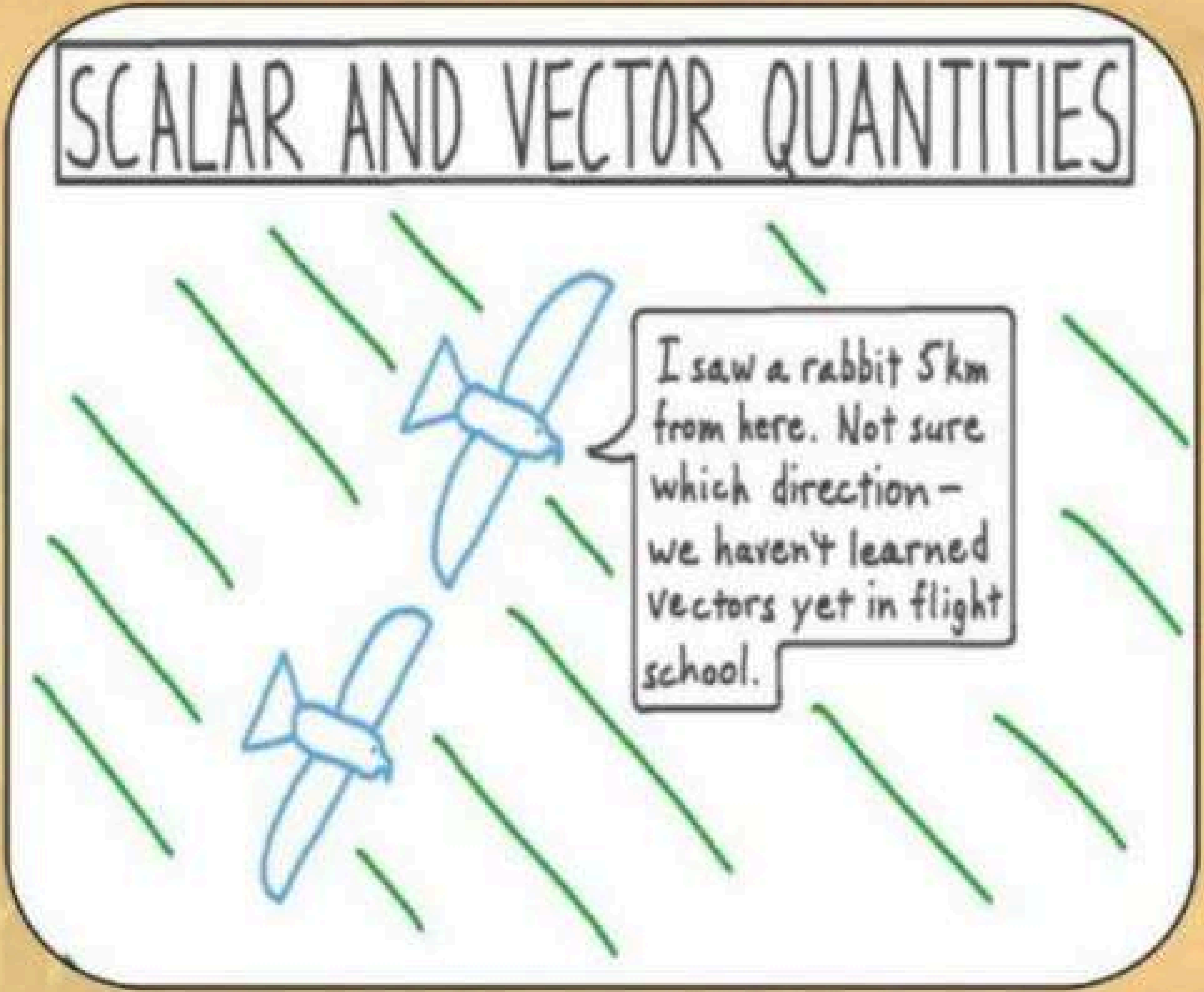
e.g. mass, speed, volume,

Vector Quantities

: have magnitude, and direction both with direction

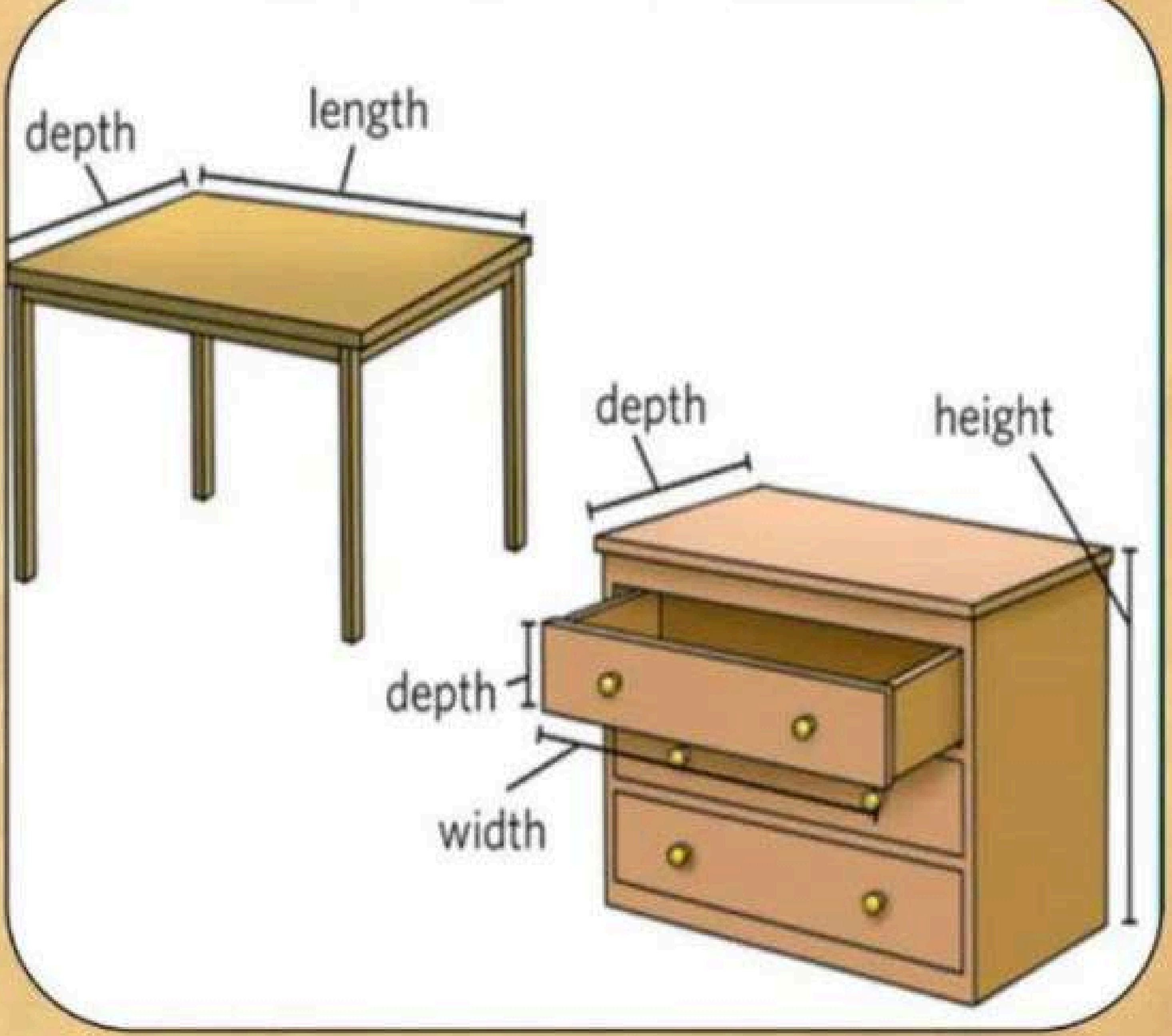
•

e.g. displacement. Velocity, acceleration



Dimensions

In terms of powers of seven fundamental units.



File:Dimensional Formula of Some Physical Quantities.

1	Area	$[L^2]$	$metre^2$
2	Volume	$[L^3]$	$metre^3$
3	Velocity	$[LT^{-1}]$	ms^{-1}
4	Acceleration	$[LT^{-2}]$	ms^{-2}
5	Force	$[MLT^{-2}]$	newton (N)
6	Work or energy	$[ML^2T^{-2}]$	joule (J)
7	Power	$[ML^2T^{-3}]$	$J\,s^{-1}$ or watt
8	Pressure or stress	$[ML^{-1}T^{-2}]$	Nm^{-2}
9	Linear momentum or Impulse	$[MLT^{-1}]$	$kg\,ms^{-1}$
10	Density	$[ML^{-3}]$	$kg\,m^{-3}$
11	Strain	Dimensionless	Unitless
12	Modulus of elasticity	$[ML^{-1}T^{-2}]$	Nm^{-2}
13	Surface tension	$[MT^{-2}]$	Nm^{-1}
14	Velocity gradient	T^{-1}	$second^{-1}$
15	Coefficient of velocity	$[ML^{-1}T^{-1}]$	$kg\,m^{-1}s^{-1}$
16	Gravitational constant	$[M^{-1}L^3T^{-2}]$	Nm^2/kg^2
17	Moment of inertia	$[ML^2]$	$kg\,m^2$
18	Angular velocity	$[T^{-1}]$	rad/s
19	Angular acceleration	$[T^{-2}]$	rad/S^2
20	Angular momentum	$[ML^2T^{-1}]$	$kg\,m^2S^{-1}$
21	Specific heat	$L^2T^{-2}\theta^{-1}$	$kcal\,kg^{-1}K^{-1}$
22	Latent heat	$[L^2T^{-2}]$	kcal/kg
23	Planck's constant	ML^2T^{-1}	J^{s}
24	Universal gas constant	$[ML^2T^{-2}\theta^{-1}]$	J/mol-K

Some Commonly asked units

- Decibel
- Parsec
- Siemens
- Siemens per meter
-

All units of Magnetism

Quality	Symbol	Unit of Measurement and Abbreviation		
		CGS	SI	English
Field Force	mmf	Gilbert (Gb)	Amp-turn	Amp-turn
Field Flux	Φ	Maxwell (Mx)	Weber (Wb)	Line
Field Intensity	H	Oersted (Oe)	Amp-turns per meter	Amp-turns per inch
Field Density	B	Gauss (G)	Tesla (T)	Lines per square inch
Reluctance	$\Re$	Gilberts per Maxwell	Amp-turns per Weber	Amp-turns per Line
Permeability	μ	Gauss per Oersted	Tesla-meters per Amp-turn	Lines per inch-Amp-turn

Difference between Joule & Calorie?

In SI Units, there are seven fundamental units given in the following table:

Physical Quantity	SI Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric Current	ampere	A
Temperature	kelvin	K
Luminous intensity	candela	Cd
Amount of substance	mole	mol

Some important derived units.

Physical Quantity	cgs units	SI unit	Relation
Force	dyne	newton	1 newton = 10^5 dyne
work	erg	joule	1 joule = 10^7 erg

Some practical units of length, mass and time

Length	Light year = distance travelled by light in one year in vacuum. 1LY = 9.46×10^{15} m 1 Astronomical Unit (A.U.) = 1.5×10^{11} m 1 Parsec = 3.26 ly = 3.08×10^{16} m 1 Nautical mile or Seamile = 6076 ft = 1852 m 1 Micron = 1 μm = 10^{-6} m 1 Angstron (Å) = 10^{-10} m 1 Quintal = 10^{2} kg 1 Metric ton = 10^{3} kg 1 Atomic Mass Unit (amu) or Dalton = 1.66×10^{-27} kg
work	1 Slug = 14.59 kg 1 Pound = 0.4537 1 Chandrashekhar limit = 1.4 times the mass of sun = 2.8×10^{30} kg 1 Solar day = 86400 sec. 1 Year = 365½ solar days 1 Lunar month = 27.3 solar days.
Time	Tropical year = It is the year in which total solar eclipse occurs. Leap year = It is the year in which the month of February is of 29 days.

Prefixes used in metric system

Prefix	Symbol	Multiplier
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a	10^{-18}
zepto	z	10^{-21}
yocto	y	10^{-24}

Prefix	Symbol	Multiplier
deca	da	10^{1}
hecto	h	10^{2}
kilo	k	10^{3}
mega	M	10^{6}
giga	G	10^{9}
tera	T	10^{12}
peta	P	10^{15}
exa	E	10^{18}
zetta	Z	10^{21}
yotta	Y	10^{24}

S.	Quantity	Dimensional Formula
1.	Volume	$[M^0L^3T^0]$
2.	Density	$[ML^{-3}T^0]$
3.	Velocity	$[M^0L^1T^{-1}]$
4.	Acceleration	$[M^0L^1T^{-2}]$
5.	Angular Velocity, Frequency	$[M^0L^0T^{-1}]$
6.	Momentum, Impulse	$[MLT^{-1}]$
7.	Force	$[MLT^{-2}]$
8.	Work, Energy	$[ML^2T^{-2}]$
9.	Power	$[ML^2T^{-3}]$
10.	Pressure, Stress, Modulus of Elasticity	$[ML^{-1}T^{-2}]$
11.	Moment of Inertia	$[ML^2T^0]$
12.	Torque/Moment of Force	$[ML^2T^{-2}]$
13.	Angular Momentum, Planck's Constant	$[ML^2T^{-1}]$
14.	Coefficient of Viscosity	$[ML^{-1}T^{-1}]$
15.	Surface Tension	$[M^1L^0T^{-2}]$
16.	Universal Gravitational Constant	$[M^{-1}L^3T^{-2}]$
17.	Latent Heat	$[M^0L^2T^{-2}]$
18.	Specific Heat	$[M^0L^2T^{-2}AK^{-1}]$

Q.1) The unit of measurement of noise is//आवाज की माप का मात्रक क्या है?

(01/09/2016)

1) Decibel // डेसिबल
2) Hertz // हर्ट्ज
3) Amplifier // एंपलीफायर
4) Acoustics // एकॉस्टिक

1) Decibel // डेसिबल

Q.2) 'Parsec' is the unit measurement of
परसैक किसकी मापन इकाई है? (10/09/2016)

1) Density of stars // तारको की सघनता
2) Astronomical distance // खगोलीय दूरी
3) Brightness of heavenly bodies // खगोलीय पिंडो की चमक
4) Orbital velocity of giant stars // विशालकाय तारकों का कक्षकीय वेग

2) Astronomical distance // खगोलीय दूरी

Q.3) What is the SI unit of Force?

बल का SI मात्रक क्या है ?

SSC CGL 5-august-2017

1.Pascal पास्कल

2.Boyle बॉयल

3.Newton न्यूटन

4.Watt वॉट

3.Newton न्यूटन

Q.4) What is the SI unit of pressure?

दाब के आईएएस मात्रक को क्या कहते हैं ?

SSC CGL 6-august-2017

1.Newton न्यूटन

2.Weber बेवर

3.Pascal पास्कल

4.Henry हेनरी

3.Pascal पास्कल

Weber is the SI unit of magnetic flux
The henry is the SI derived unit of electrical inductance

Q.5) What is the unit of resistance?
प्रतिरोध को मापने की इकाई क्या है ?

SSC CGL 6-august-2017

1.ohm ओहम
2.farad फैरड
3.henry हेनरी
4.weber वेबर

1.ohm ओह्म

The farad is the SI derived unit of electrical capacitance

Q.6) What is the SI unit of frequency?
आवृत्ति का SI मात्रक क्या है?

[SSC CGL 9-08-17]

1.Newton न्यूटन
2.Watt वॉट
3.Farad फैरड
4.Hertz हर्ट्ज

4.Hertz हर्ट्ज

The farad is the SI derived unit of electrical capacitance

Q.7) What is the SI unit of electric current? // विद्युत धारा का एस आई (SI) मात्रक क्या है ?

[SSC CGL Physics 10-08-17]

1.Newton न्यूटन
2.Joule जूल
3.Ampere एंपियर
4.Watt वाट

3.Ampere एंपियर

Electric current is the flow of electric charge across a surface at the rate of one coulomb per second. Electric current is measured using a device called an ammeter.

Q.8) What is the SI unit of temperature?
तापमान का SI मात्रक क्या है ?

[SSC CGL 11-08-17]

1.Kelvin केल्विन
2.Joule जूल
3.Celsius सेल्सियस
4.Fahrenheit फारेनहाइट

1.Kelvin केल्विन

Q.9) What is the SI unit of intensity of sound?

ध्वनि की तीव्रता का SI मात्रक क्या है ?

[SSC CGL 12-08-17]

1.Decibel डेसीबल

2.Newton न्यूटन

3.Heartz हर्ट्ज

4.Tesla टेस्ला

1.Decibel डेसीबल

The hertz (symbol: Hz) is the derived unit of frequency in (SI) and is defined as one cycle per second.

The tesla (symbol T) is the SI derived unit used to measure magnetic fields

Q.10) What is the SI unit of heat energy?

ऊष्मा का SI मात्रक क्या है?

[SSC CGL 12-08-17]

1.Joule जूल

2.Newton न्यूटन

3.Calorie कैलोरी

4.Kelvin केल्विन

1.Joule जूल

Energy is defined via work, the SI unit for energy is the same as the unit of work – the joule (J),

Q.11) What is the SI unit of Power?
ऊर्जा का SI मात्रक क्या है ?

[SSC CGL 16-08-17]

1.Boyle बॉयल
2.Watt वाट
3.Newton न्यूटन
4.Pascal पासकल

2.Watt वाट

Q.12) Kelvin (K) is the unit of measurement of _________.

केल्विन क्या मापने की इकाई है ?

[SSC CGL 17-08-17]

1.Density घनत्व
2.Pressure दाब
3.Mass द्रव्यमान
4.Temperature तापमान

4.Temperature तापमान

Q.13) What is the unit of calorific value?
ऊष्मीय मान को——————— मात्रक द्वारा प्रदर्शित किया जाता है ?

[SSC CGL 19-08-17]

1.kN/kg
2.kJ/kg
3.kW/sec
4.kCal/sec

2.kJ/kg

The amount of heat released (energy produced) by the complete combustion of a material or fuel. Measured in units of energy per amount of material, e.g. kJ/kg

Q.14) The SI unit of acceleration is ____________________.

त्वरण का SI मात्रक क्या है ?

[SSC CGL 19-08-17]

1.meters per seconds squared मीटर प्रति वर्ग सेकंड
2.meters per second मीटर प्रति सेकंड
3.seconds per meter सेकंड प्रति मीटर
4.seconds per meter squared सेकंड प्रति वर्ग मीटर

Correct Answer [a] : meters per seconds squared मीटर प्रति वर्ग सेकंड

Q.15) The dimension of which of the following is the same as that of impulse?

निम्नलिखित में से किसका आयाम आवेग के समान है?

[a] Volume/आयतन

[b] Momentum/संवेग

[c] Torque/टोक

[d] Change in the rate of momentum/संवेग परिवर्तन की दर

[b] Momentum

Q.16) Dimension of Universal Gravitational constant is :

सार्वत्रिक गुरुत्वीय नियतांक का आयाम है :

[a] $M^{-1} L^{3} T^{-2}$
[b] $M^{-1} L^{3} T^{2}$
[c] $M L^{2} T^{-2}$
[d] M^{-2}

[a] $M^{-1} L^{3} T^{-2}$

The Seven Fundamental Units

NAME OF QUANTITY	UNIT
Length	Metre(m)
Mass	Kilogram (kg)
Time	Second (s)
Electric Current	Ampere (A)
Thermodynamic temperature	Kelvin (K)
Luminous intensity	Candela (cd)
Amount of Substance	Mole (mol)

#GRAPHICS BY - AMAN SRIVASTAVA

TRICK TO REMEMBER

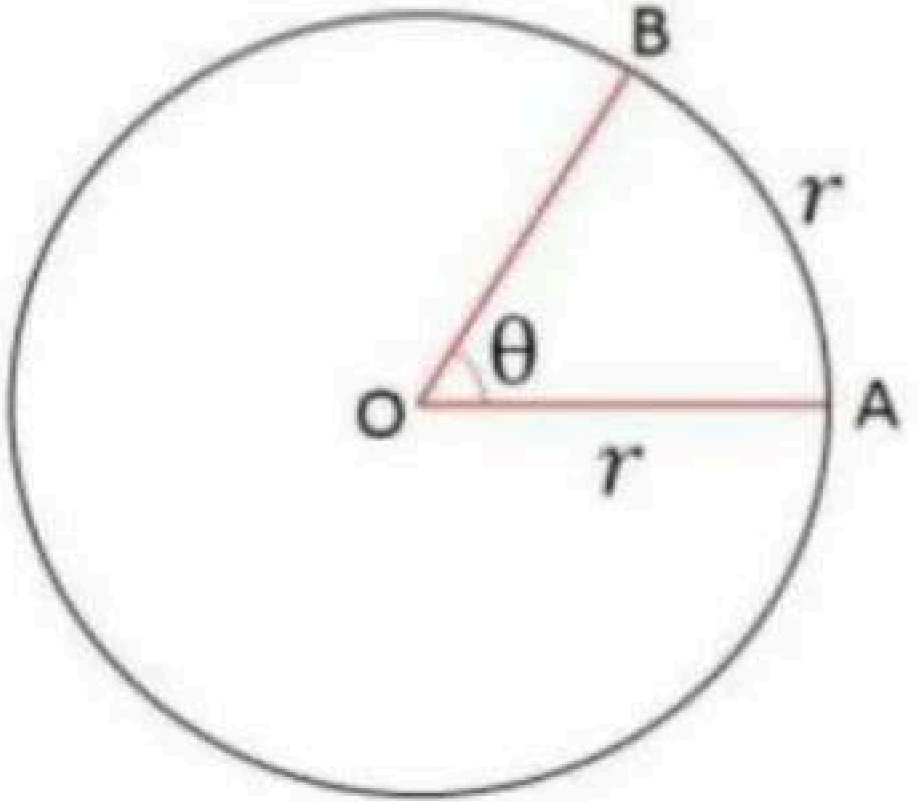
CSK AM
KM

Why do we call Fundamental unit ?

: Because they are not derived from another units. In fact, they are used to derive units for other physical quantities.

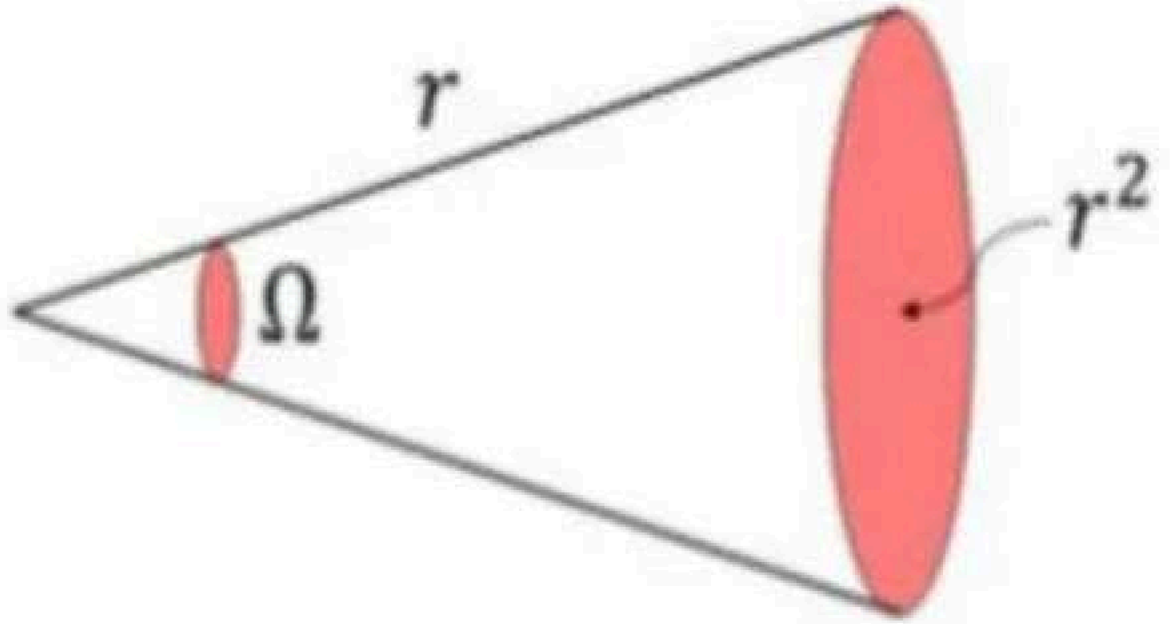
Two supplementary units

1. **Radian:** It is used to measure plane angle



$$\theta = 1 \text{ radian}$$

2. **Steradian:** It is used to measure solid angle

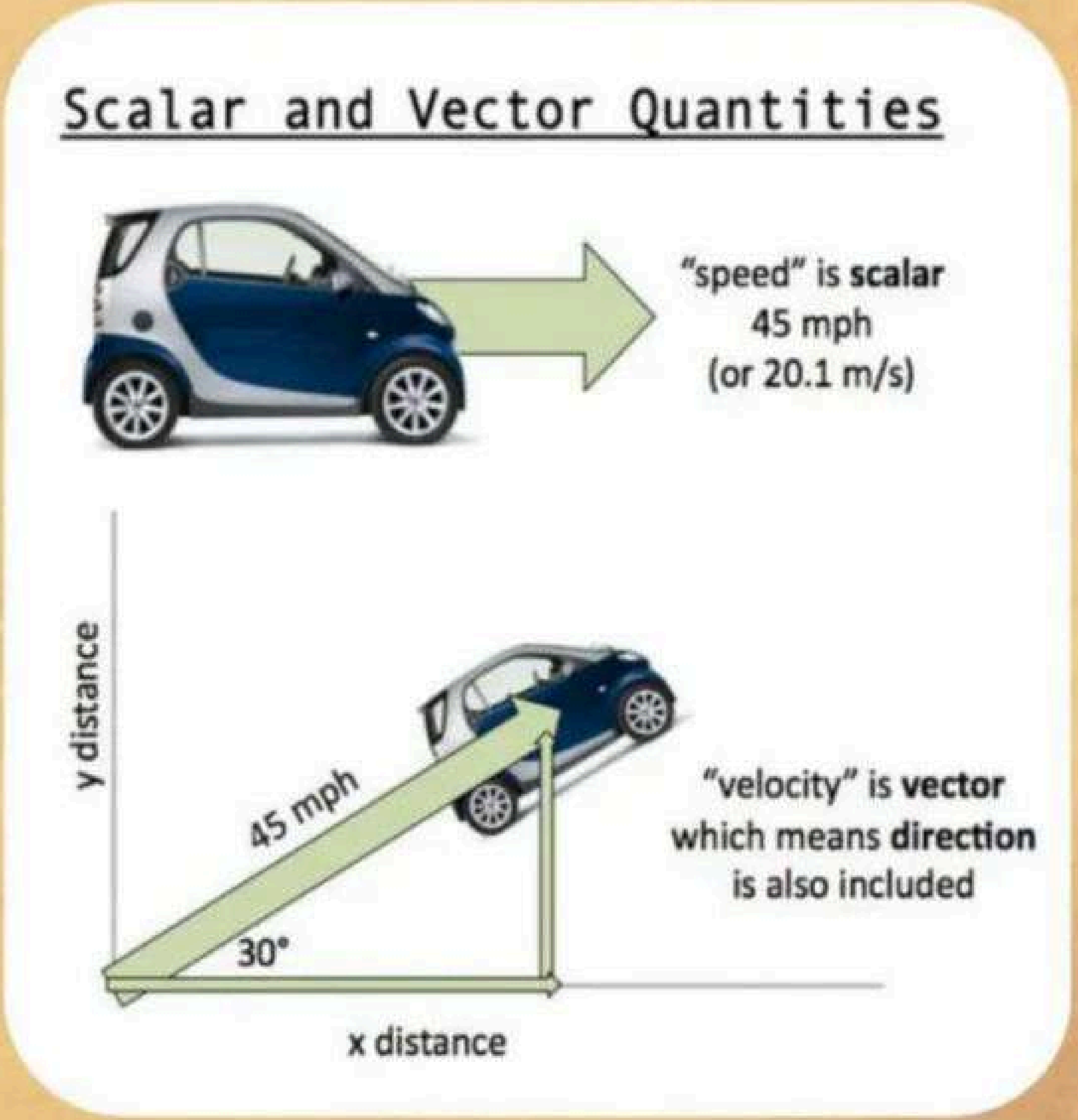


Ω = 1 steradian

Motion

Speed distance covered by a moving body in unit time interval.

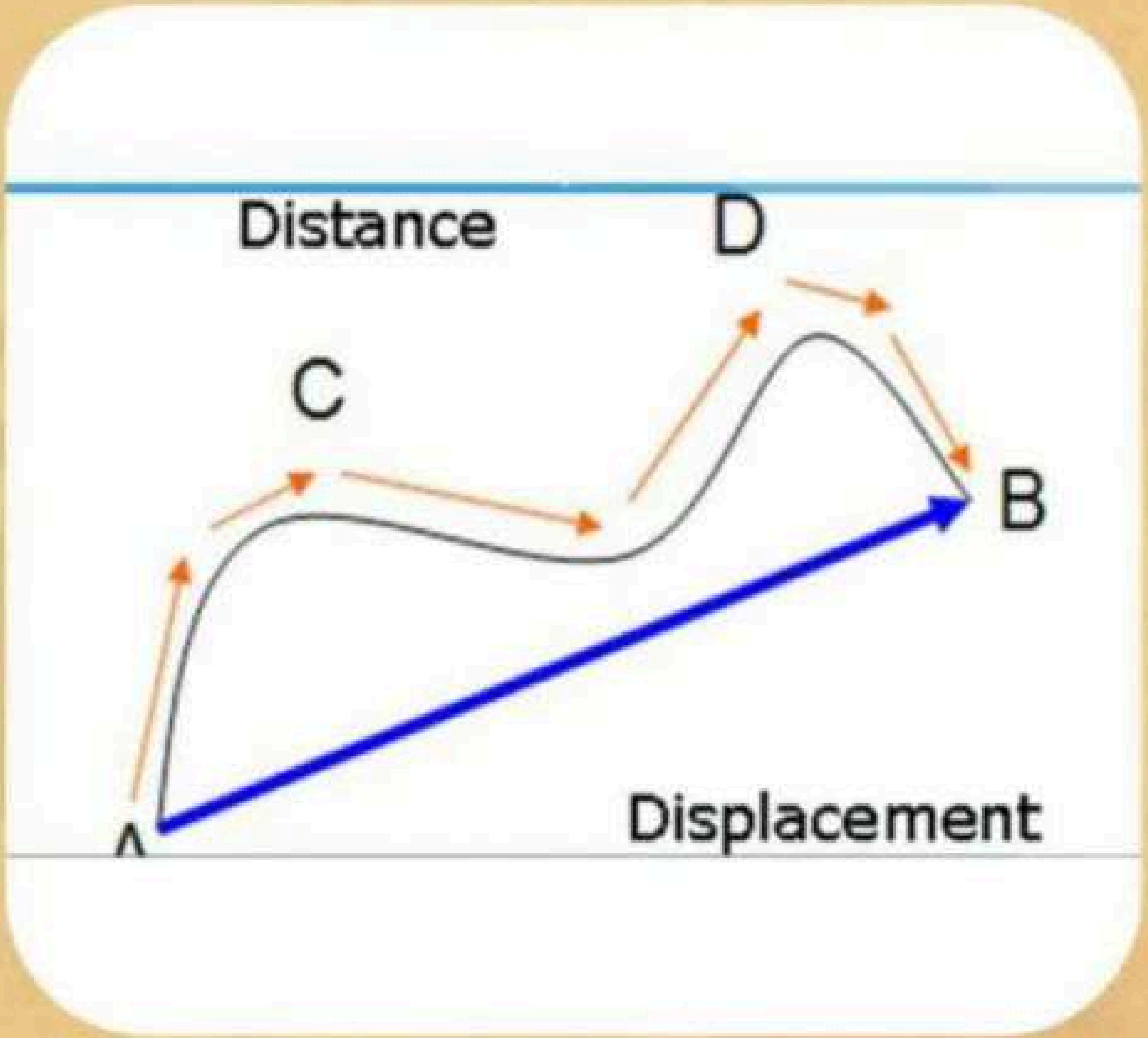
Velocity The rate of change of displacement



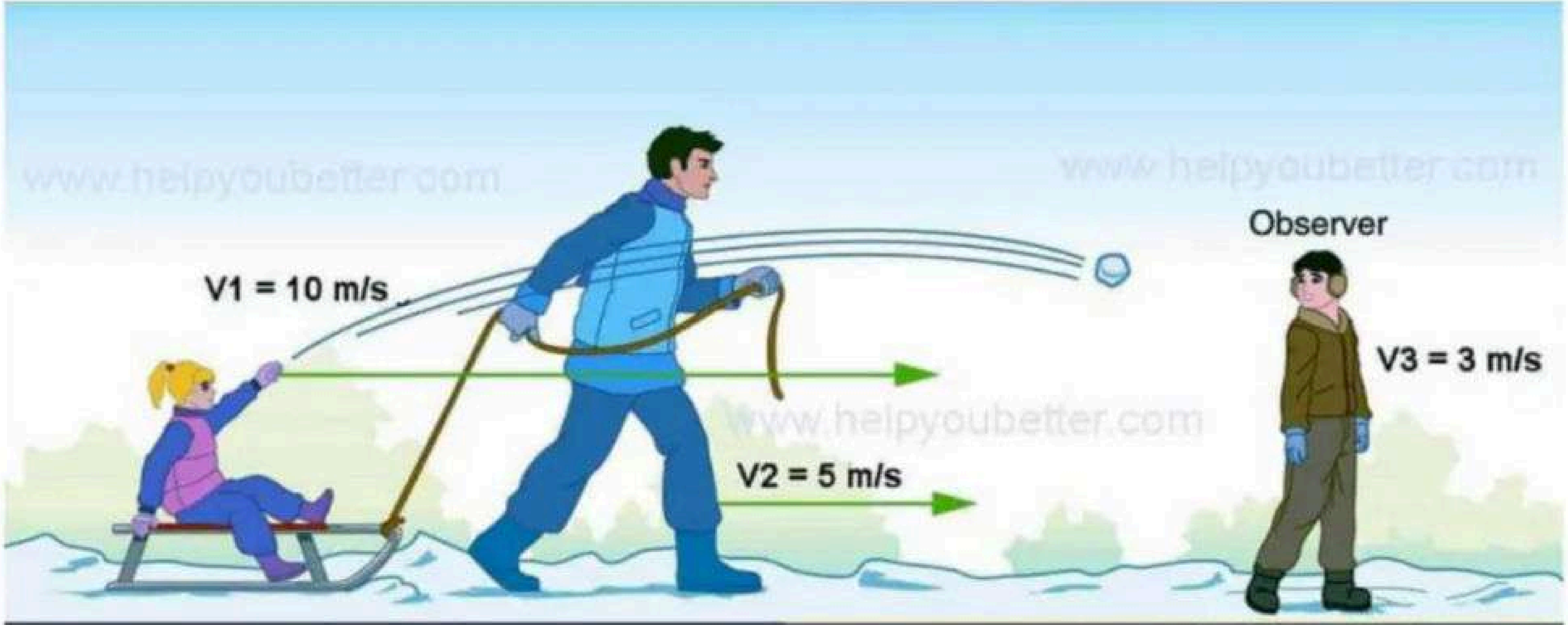
Motion

Distance length of the actual path. It is always (+)ve

Displacement-shortest distance between the final and the initial position. It can be (+)ve/(-)ve or zero.

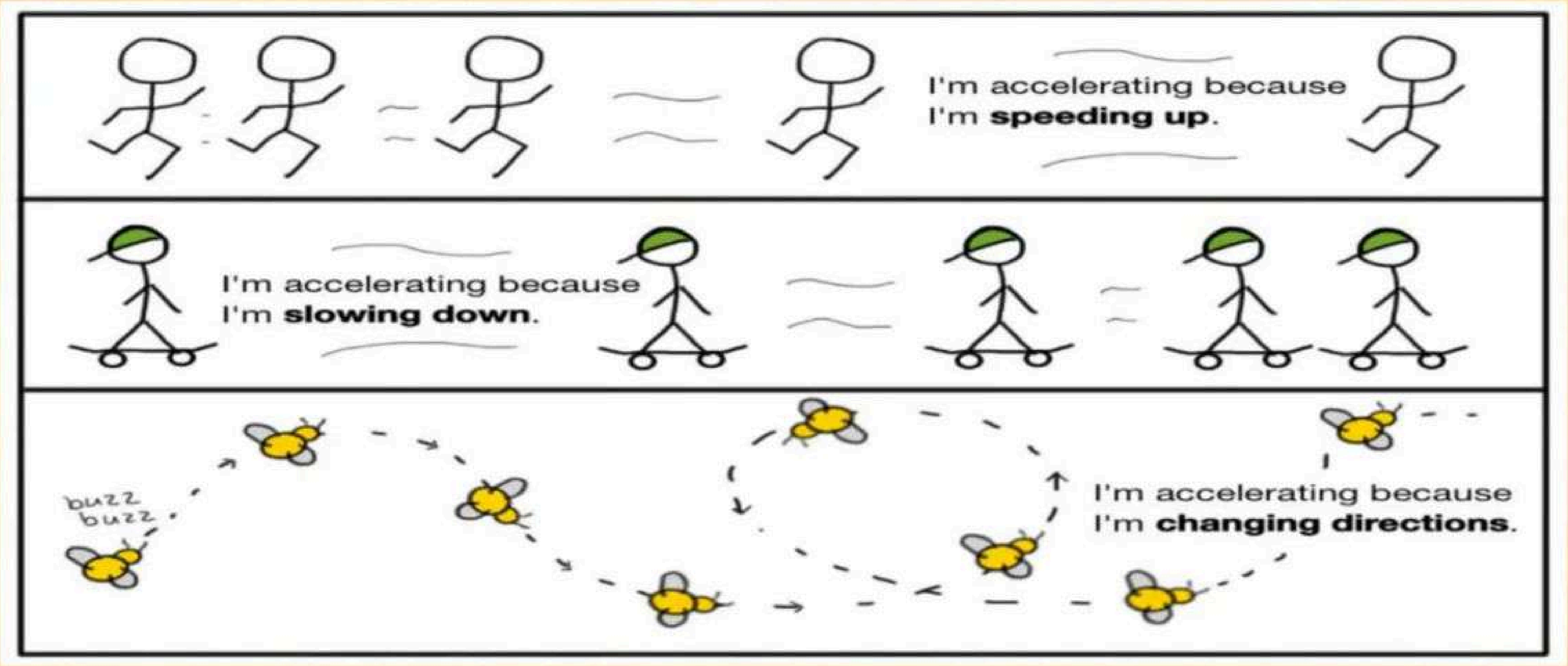


RELATIVE VELOCITY



Relative velocity is the velocity of one body with respect to another body

Acceleration :Rate of change of velocity. Its SI unit is m/s^2. It is a vector quantity



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Equations of Motion in one Dimension

Three equations are:

1. $v = u + at$
2. $s = ut + \frac{1}{2}at^2$
3. $v^2 - u^2 = 2as$

Where,

$v = final\ velocity$

$u = initial\ velocity$

$a = acceleration$

$t = time$

$\boxed{v = at}$

$\boxed{v = gt}$

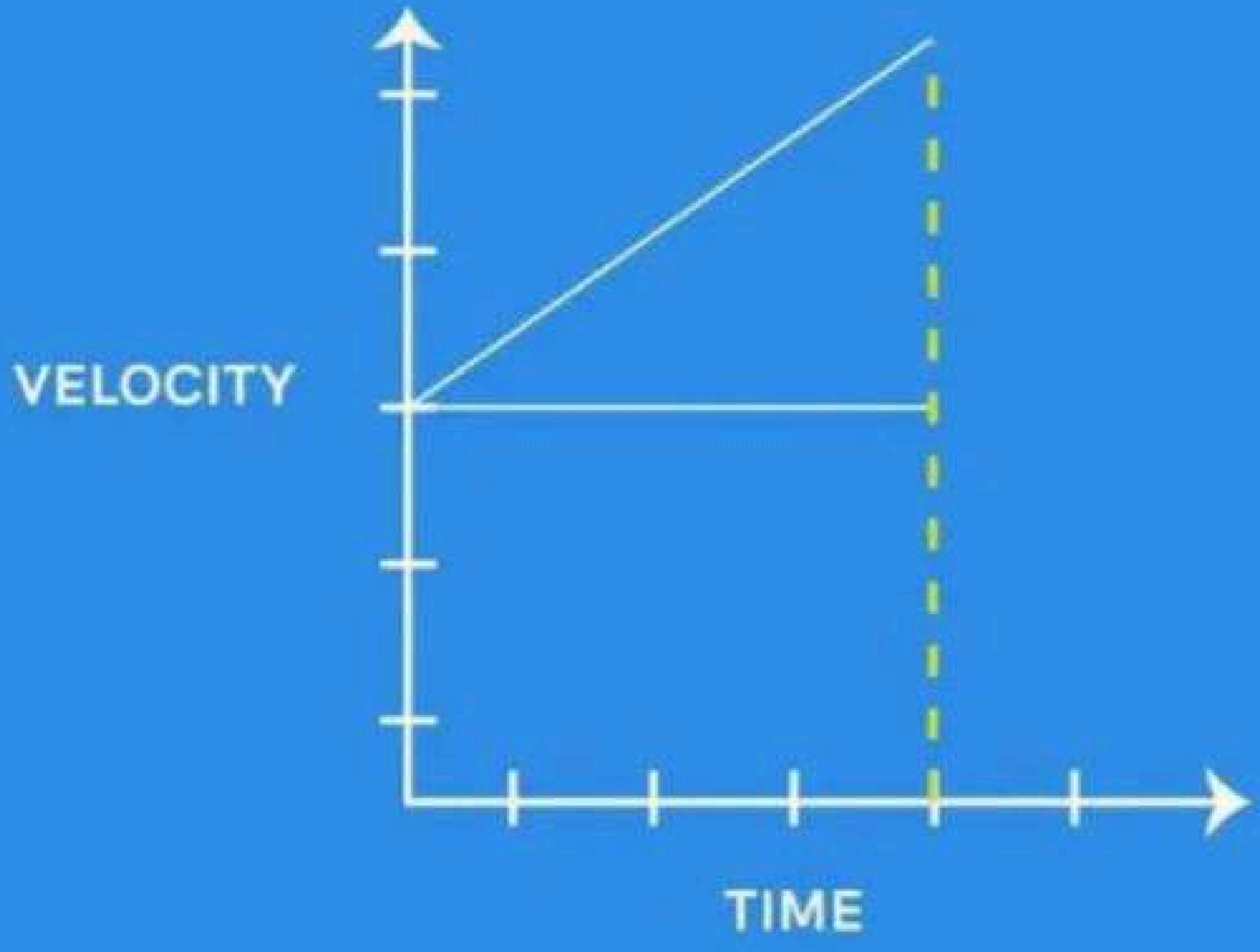
mess

$s = \frac{1}{2}gt^2$

$t^2 = \frac{2s}{g}$

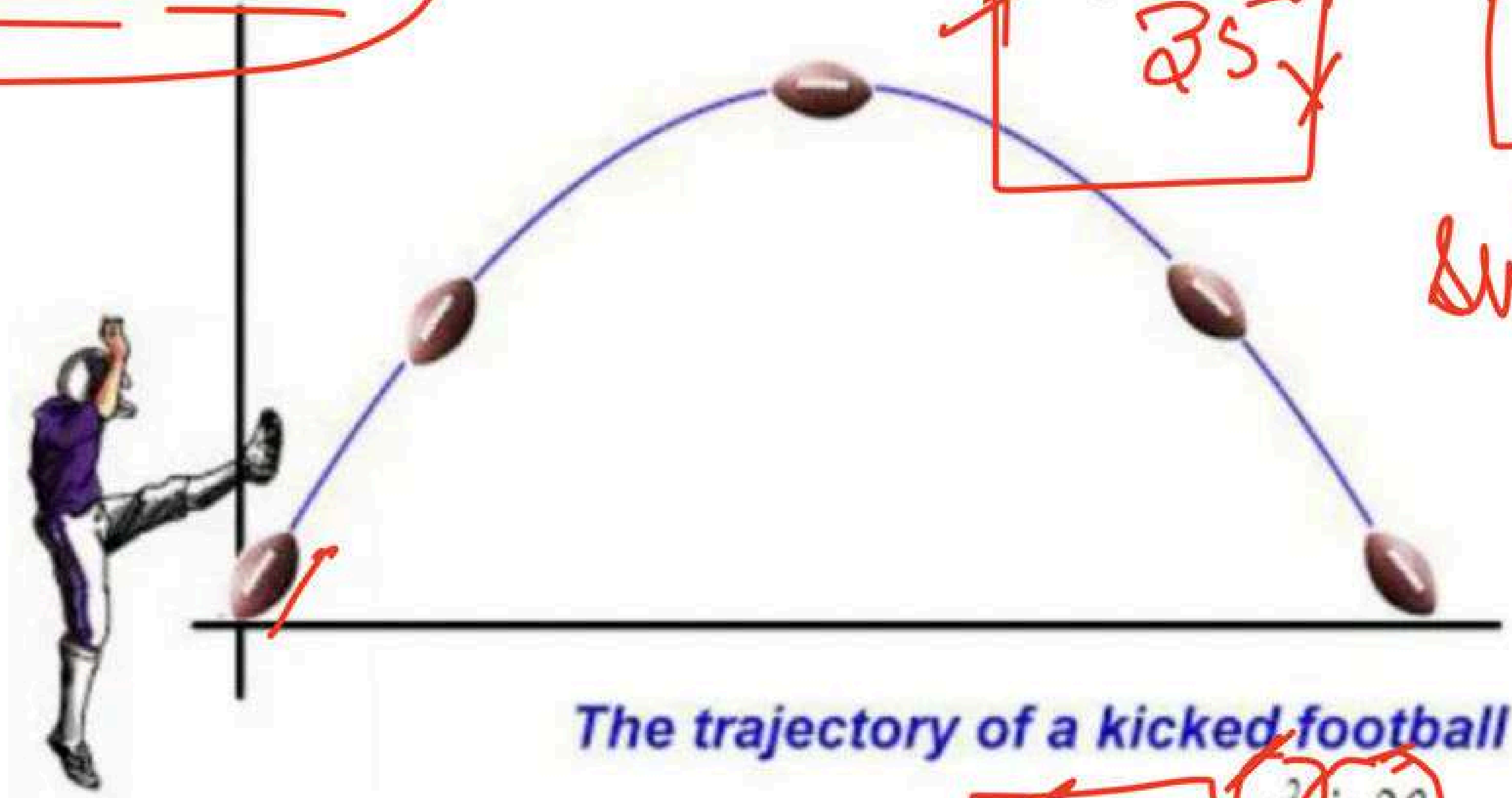
$\boxed{t = \sqrt{\frac{2H}{g}}}$

EQUATIONS OF MOTION



#GRAPHICS BY - AMAN SRIVASTAVA

Projectile Motion



The trajectory of a kicked football

~~25°~~

$\boxed{45^\circ}$

$\sin 2\theta = 1$

$2\theta = 90^\circ$

$\boxed{\theta = 45^\circ}$

Range (R) = $\dfrac{u^2 \sin 2\theta}{g}$; $H_{max} = \dfrac{u^2 \sin^2\theta}{2g}$;

Path of Projectile is a Parabo

Time (T) = $\dfrac{2u \sin\theta}{g}$ → $\dfrac{2u \sin\theta}{g}$

GS 100

60% 20% 20%

concept batch

Practice Batch

Mock Test

20 din

Q.17) Newton's 1st law of motion gives the concept of -

न्यूटन का गति का पहला नियम किसकी अवधारणा देता है -

(A) Energy
(B) Work
(C) Momentum
(D) Inertia

Quants

80% 10% 10%

class

Practice

Mock

(D) Inertia

Q.18) If an object moves in a circular path with uniform __________, its motion is called uniform circular motion.

अगर कोई वस्तु वृत्तीय पथ पर एक समान---- से चलती है तो उसकी गति को एक समान वृत्तीय गति कहा जाता है

[SSC CGL 22-08-17]

Option:-

1.speed चाल

2.Time समय

3.Velocity वेग

4.Acceleration त्वरण

Correct Answer [a] : speed

Uniform circular motion can be described as the motion of an object in a circle at a constant speed.
Examples of circular motion include: an artificial satellite orbiting the Earth at a constant height, a stone which is tied to a rope

Q.19) If the force applied on the object is in the direction of its motion, the speed of the object ____________.

यदि किसी वस्तु पर लगाया गया बल वस्तु की गति की दिशा में हो तो वस्तु की गति →

[SSC CGL 22-08-17]

1.increases बढ़ती है

2.stops रुक जाती है

3.decreases कम होती है

4.no effect कोई प्रभाव नहीं

1.increases बढ़ती है

Q.20) The motion of a freely falling body is an example of ______________________________ motion.

स्वतंत्र रूप से गिर रही एक वस्तु की गति किस गति का उदाहरण है ?

[SSC CGL 23-08-17]

Option:-

1.uniformly accelerated एक समान त्वरित

2.non-uniformly accelerated असमान त्वरित

3.constant velocity स्थिर वेग

4.constant speed स्थिर चाल

Correct Answer [a] : uniformly accelerated एक समान त्वरित

A freely falling object is an object that moves under the influence of gravity only. Neglecting air resistance, all objects in free fall in the earth's gravitational field have a constant acceleration that is directed towards the earth's center, or perpendicular to the earth's surface, and of magnitude. g = 9.8 m/s^2

Q.21) For an object, the state of rest is considered to be the state of _______ speed.
किसी वस्तु की विराम अवस्था को________ चाल की अवस्था माना जाता है

[SSC CGL 23-08-17]

1.increasing बढ़ती हुई
2.decreasing कम होती हुई
3.inverse विपरीत
4.zero शून्य

Correct Answer: [d] zero

Q.22) The laws which govern the motion of planets are called ________________________.
ग्रहों की गति को बताने वाले नियमों को क्या कहा जाता है?

[SSC CGL 23-08-17]

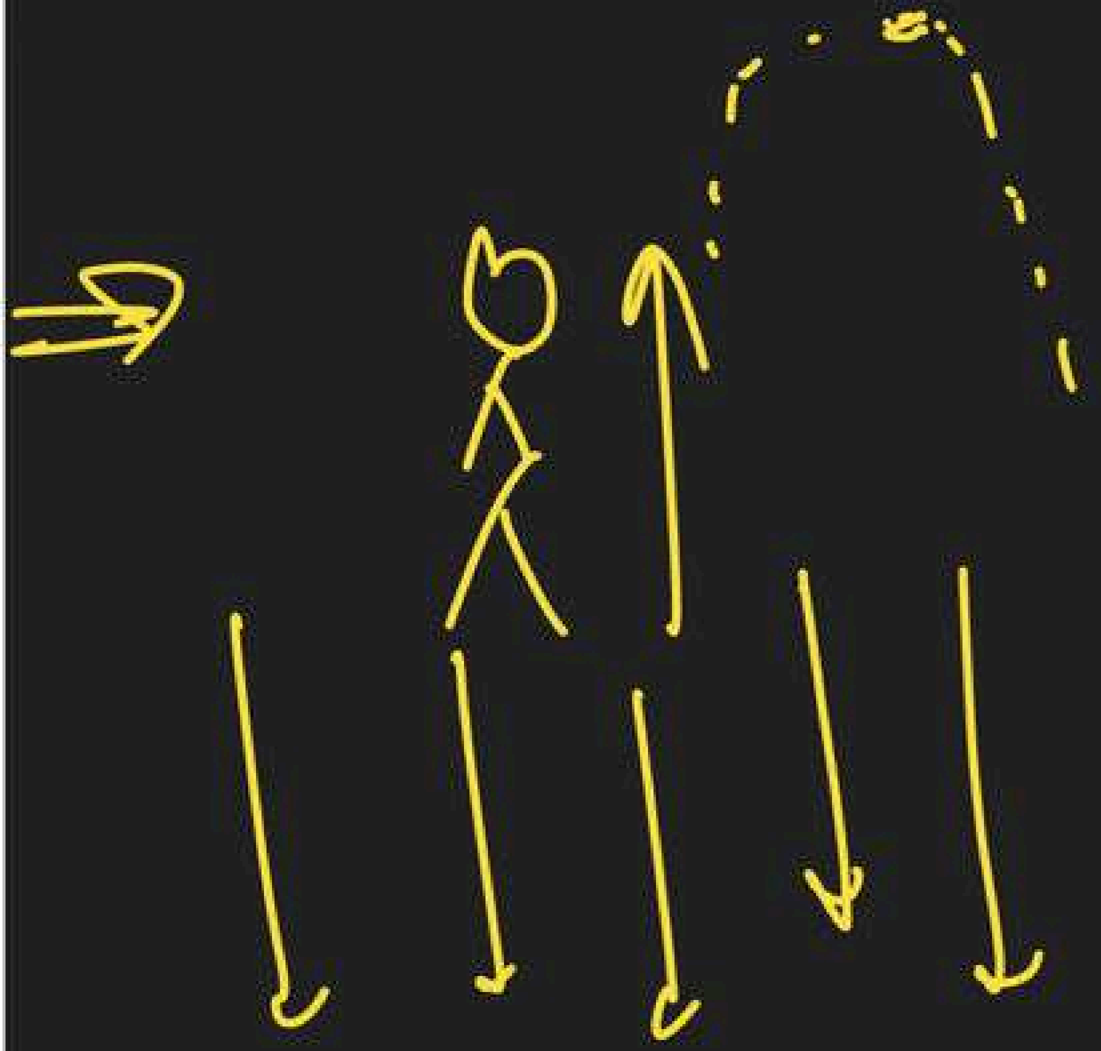
Option:-

1.Newton's Laws न्यूटन के नियम
2.Kepler's Laws केप्लर के नियम
3.Avogadro' s Laws एवोगेड्रो के नियम
4.De Morgan's Laws डी मॉर्गन के नियम

Correct Answer [b] : Kepler's Laws केप्लर के नियम

Avogadro's law states that, "equal volumes of all gases, at the same temperature and pressure, have the same number of molecules"

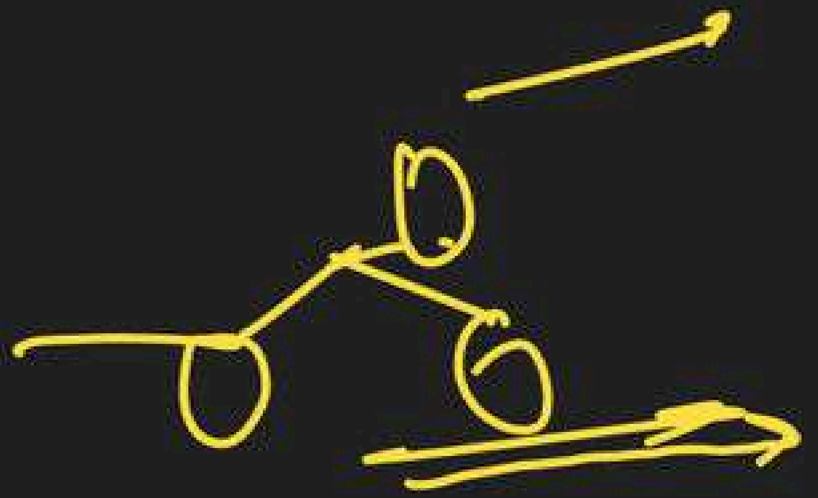
De Morgan's law: The complement of the union of two sets is equal to the intersection of their complements and the complement of the intersection of two sets is equal to the union of their complements.

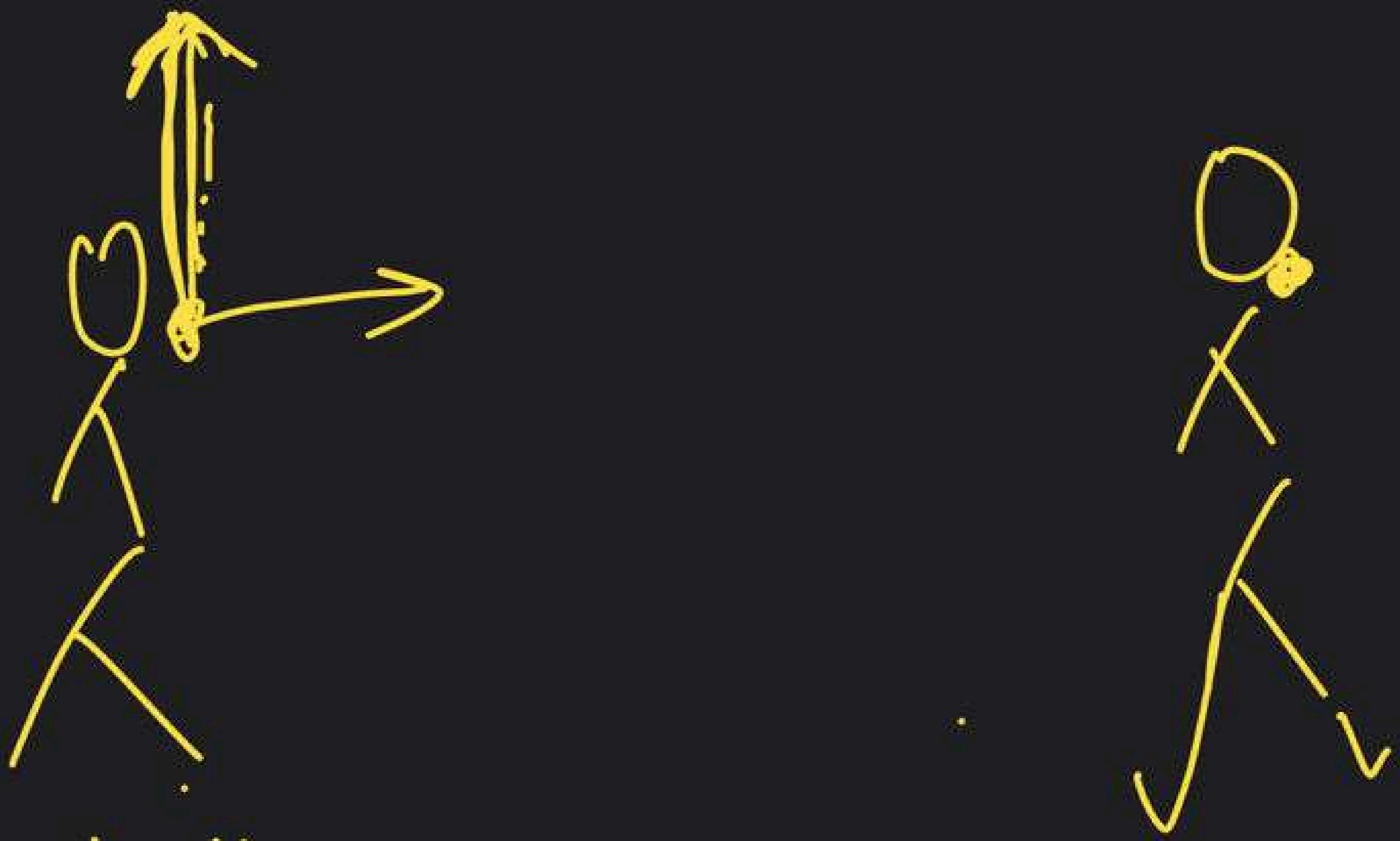


Q.23) A person dropped a ball from a train moving with a uniform speed. An observer standing on platform observes it, what will be the path observed by the observer?

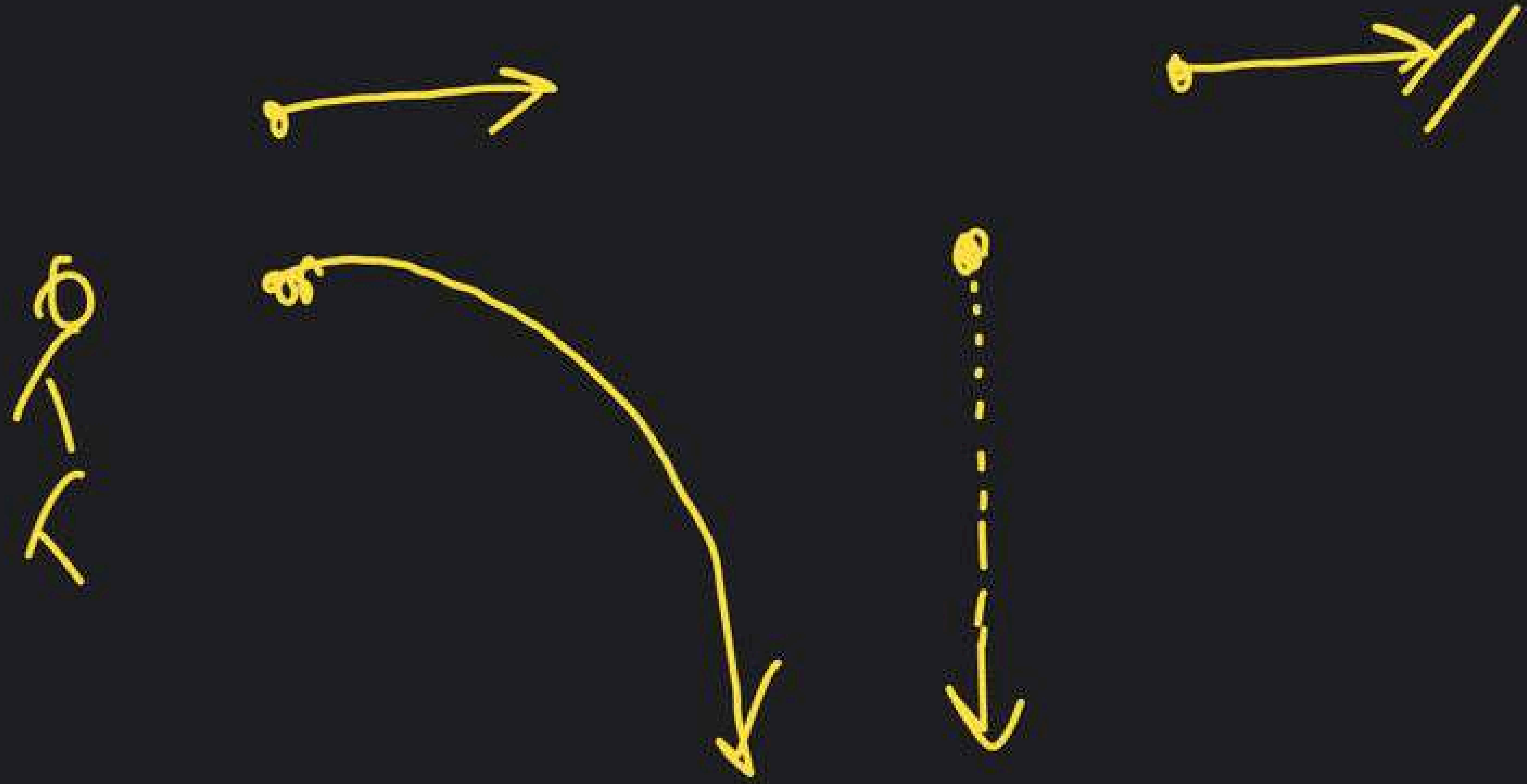
एक व्यक्ति ने एकसमान चाल से चलती हुई रेलगाड़ी से एक गेंद को गिरा दिया। मंच पर खड़ा एक पर्यवेक्षक इसे देखता है, पर्यवेक्षक द्वारा देखा गया मार्ग क्या होगा?

(A) Rectilinear
(B) Circular
(C) Parabolic
(D) None



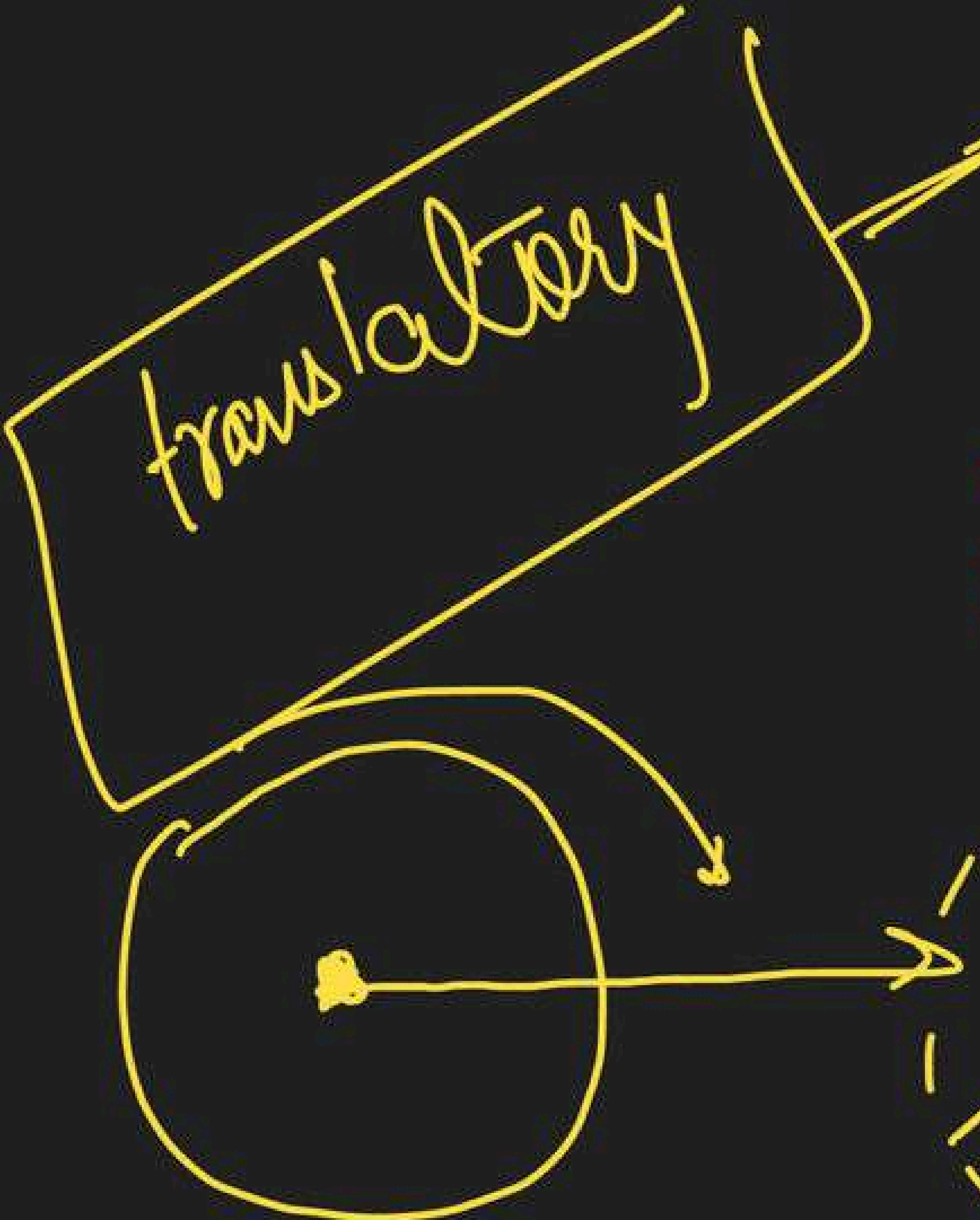


$t=0$



(C) Parabolic

translatory



Q.24) The motion of the wheel of a bull cart while moving on the road is an Example of/ सड़क पर चलते समय एक बैलगाड़ी के पहिये की गति ---- का उदाहरण है

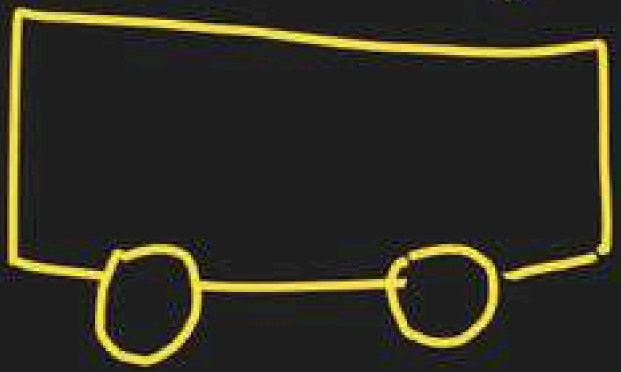
(A) Oscillatory and rotatory motion
(B) Oscillatory and translatory motion
(C) Translatory and rotatory motion
(D) Translatory motion only

(C) Translatory and rotatory motion

Q.25) A tennis ball and a cricket ball with Heavy mass throw with same velocity, then to stop the cricket ball we need out of the following:

एक टेनिस गेंद और एक क्रिकेट गेंद भारी द्रव्यमान के साथ समान वेग से फेंकी जाती है, फिर क्रिकेट गेंद को रोकने के लिए हमें निम्नलिखित में से आवश्यकता होती है:

COSCO



TRUCK

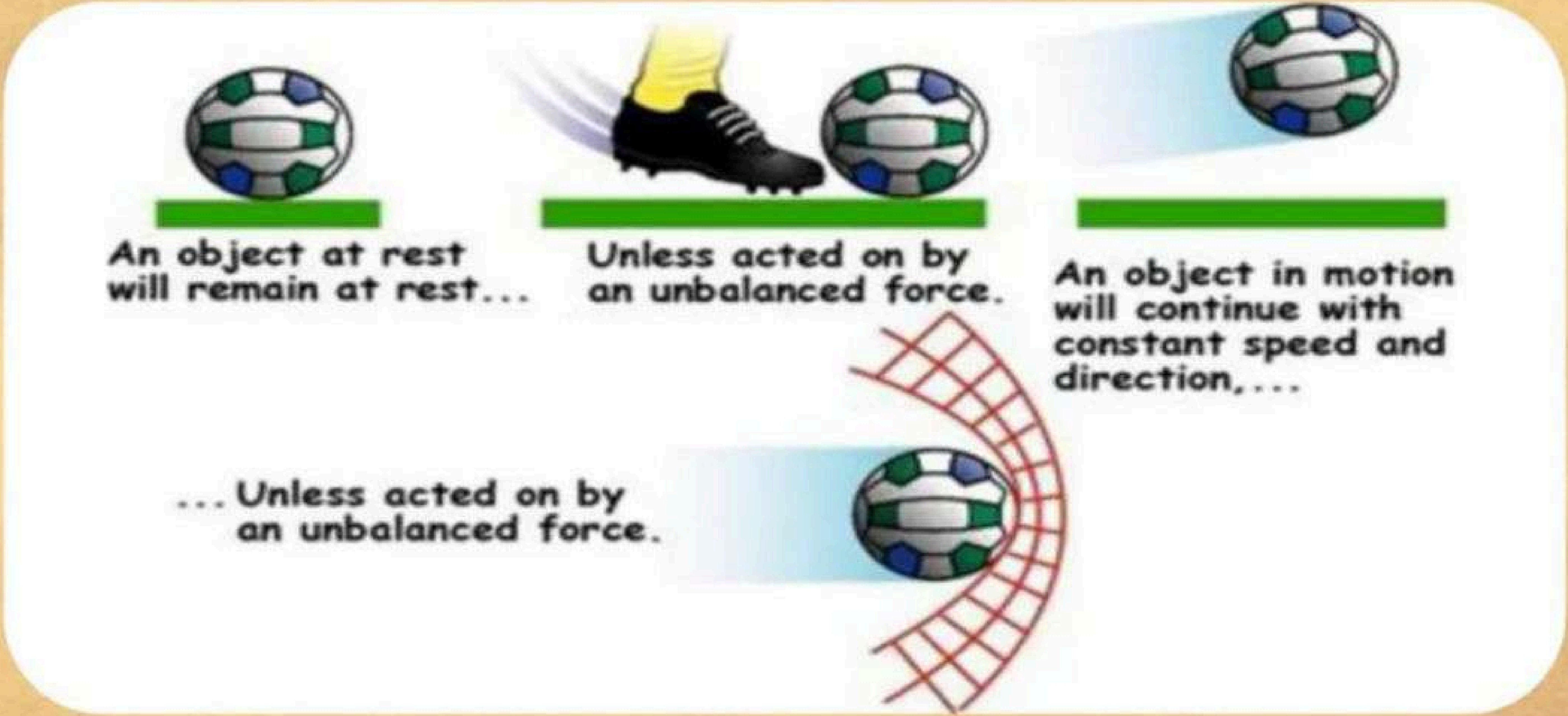
$$F = \frac{dmv}{\Delta t}, \; m\frac{\Delta v}{\Delta t}$$

[a] More force
[b] Less force
[c] Equal force
[d] Infinite force

[a] More force

Newton’s Law

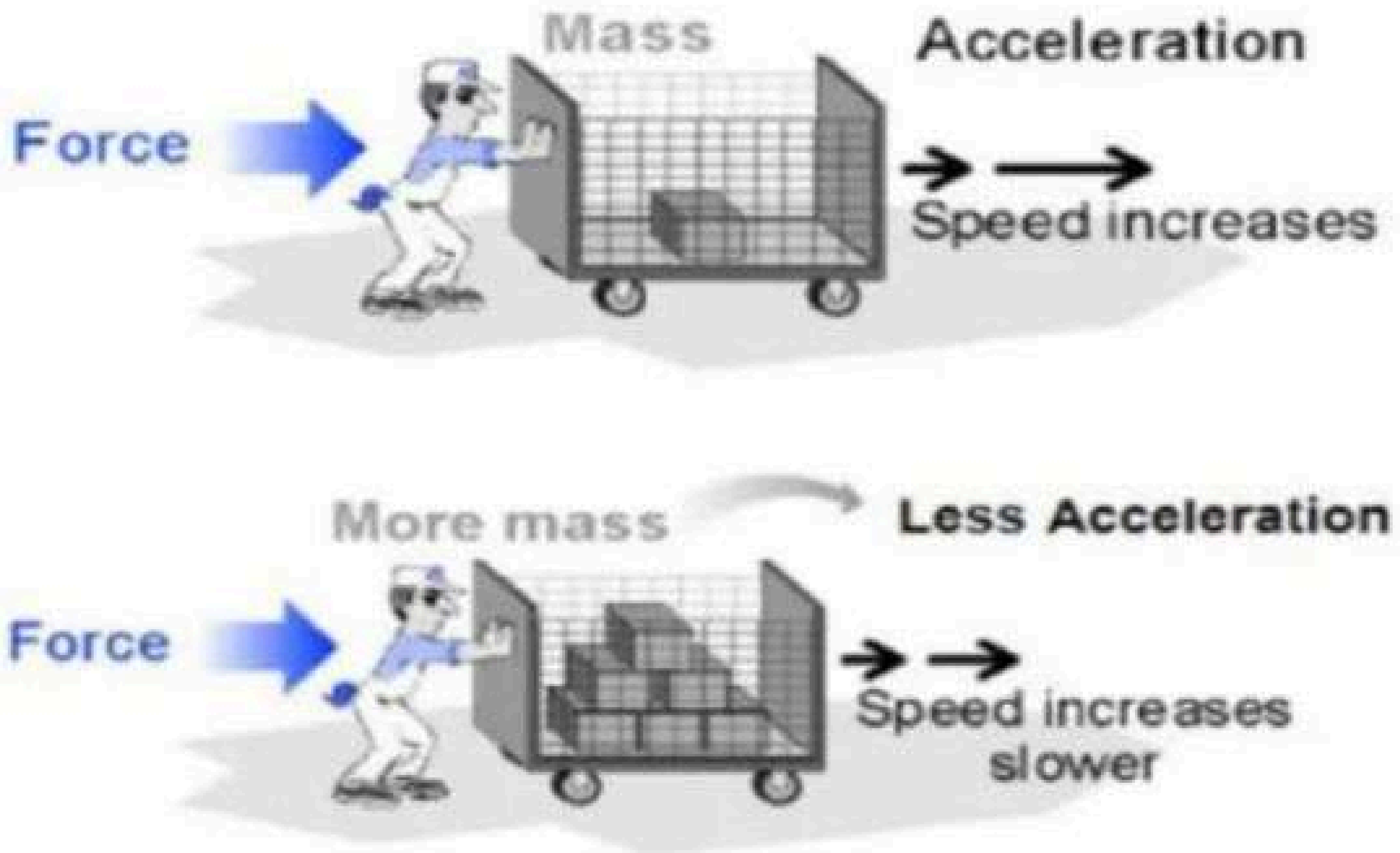
Newton's First Law Of Motion



Also known as law of inertia or law of Galileo.

Newton's Second Law Of Motion
Law Of acceleration

- If an object has <u>more</u> mass it accelerates at a lower rate because mass has inertia.



Newton's 3rd Law Of Motion

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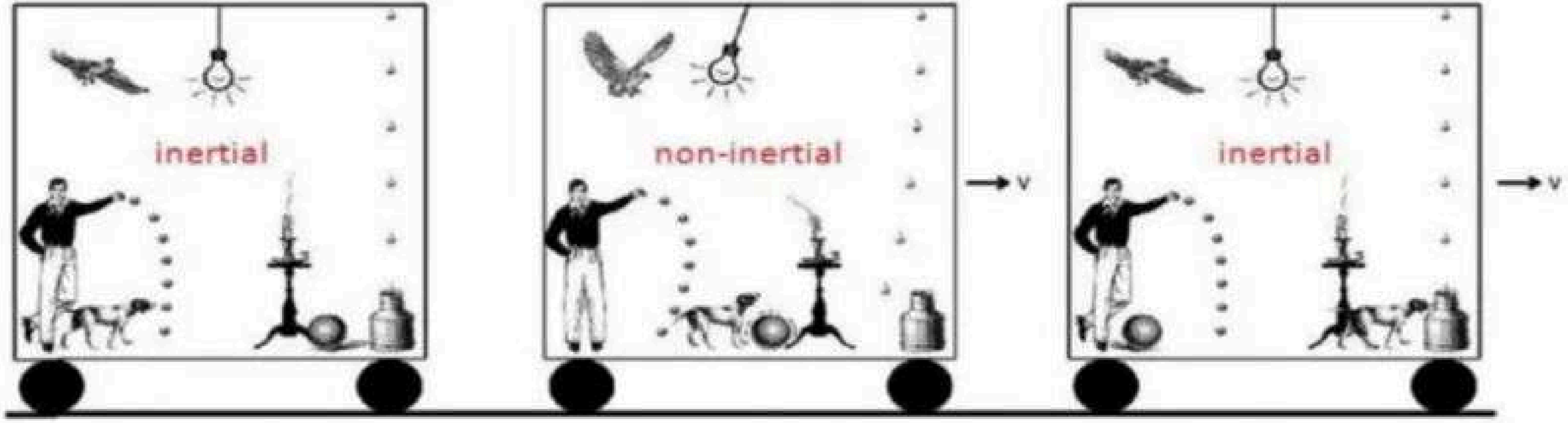
Inertial Reference Frames

These reference frames are said to be **inertial**.



A. Carriage standing still

B. carriage accelerating

C. carriage moving uniformly

Momentum

Examples:

- A moving boulder has more momentum than a stone rolling at the same speed.
- A fast boulder has more momentum than a slow boulder.
- A boulder at rest has no momentum.

Momentum = Mass × Velocity

$$F = \boxed{m \cdot g V}$$

ρf

mv

$$\boxed{m \times v}$$

+5 -5

Conservation of momentum

$$\boxed{\boxed{mv} = Mv}$$

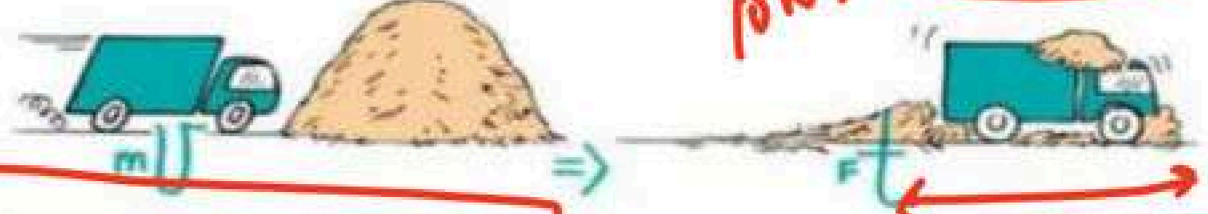
Impulse Changes Momentum

Examples:

When a car is out of control, it is better to hit a haystack than a concrete wall.

Physics reason: Same impulse either way, but extension of hitting time reduces the force.

10N ⇒ 3000 N



Impulse = Change in momentum

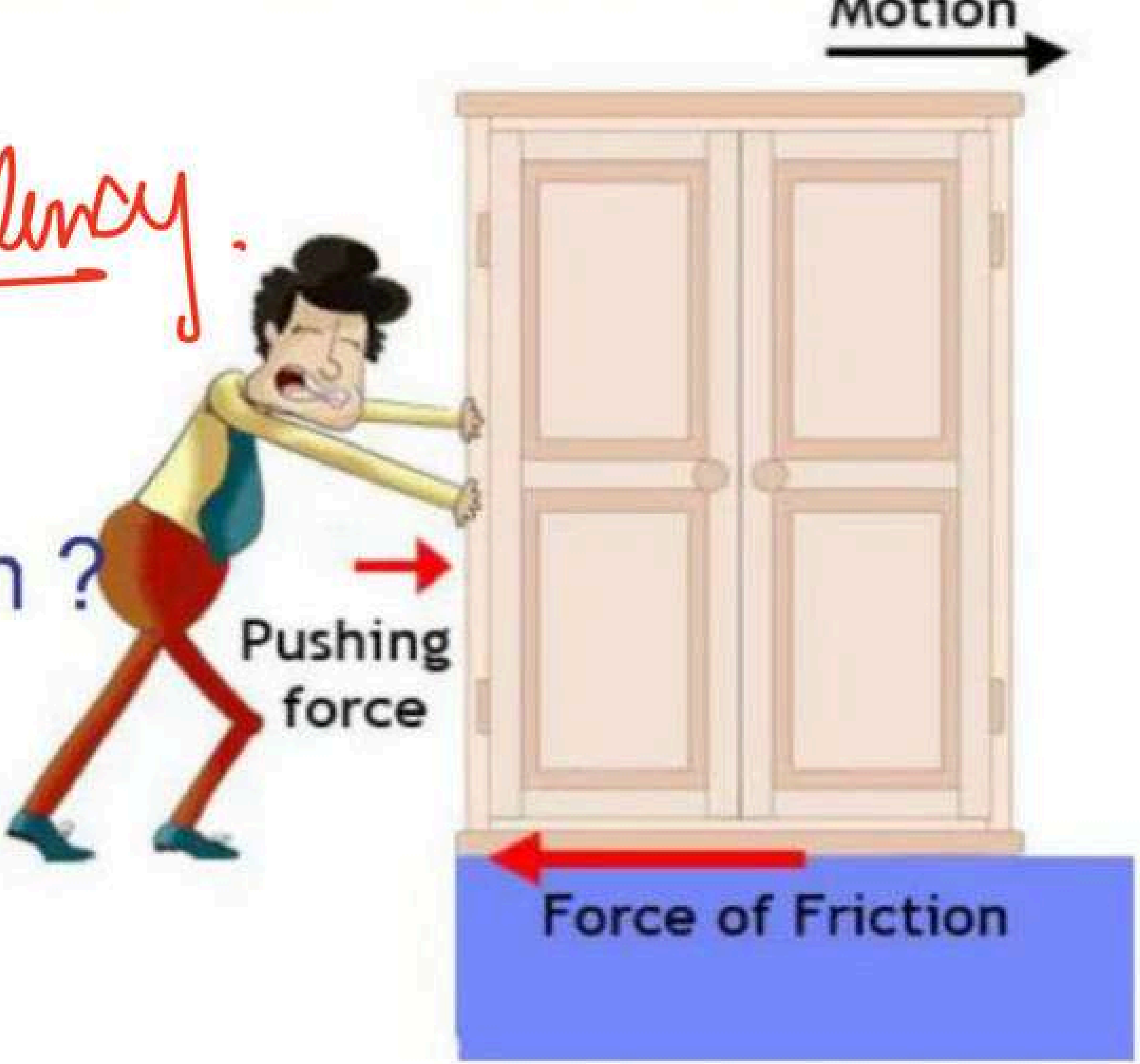
= Force × Time interval

0.01

What is Friction ?

→ Slipping Tendency.

Can we feel friction ?



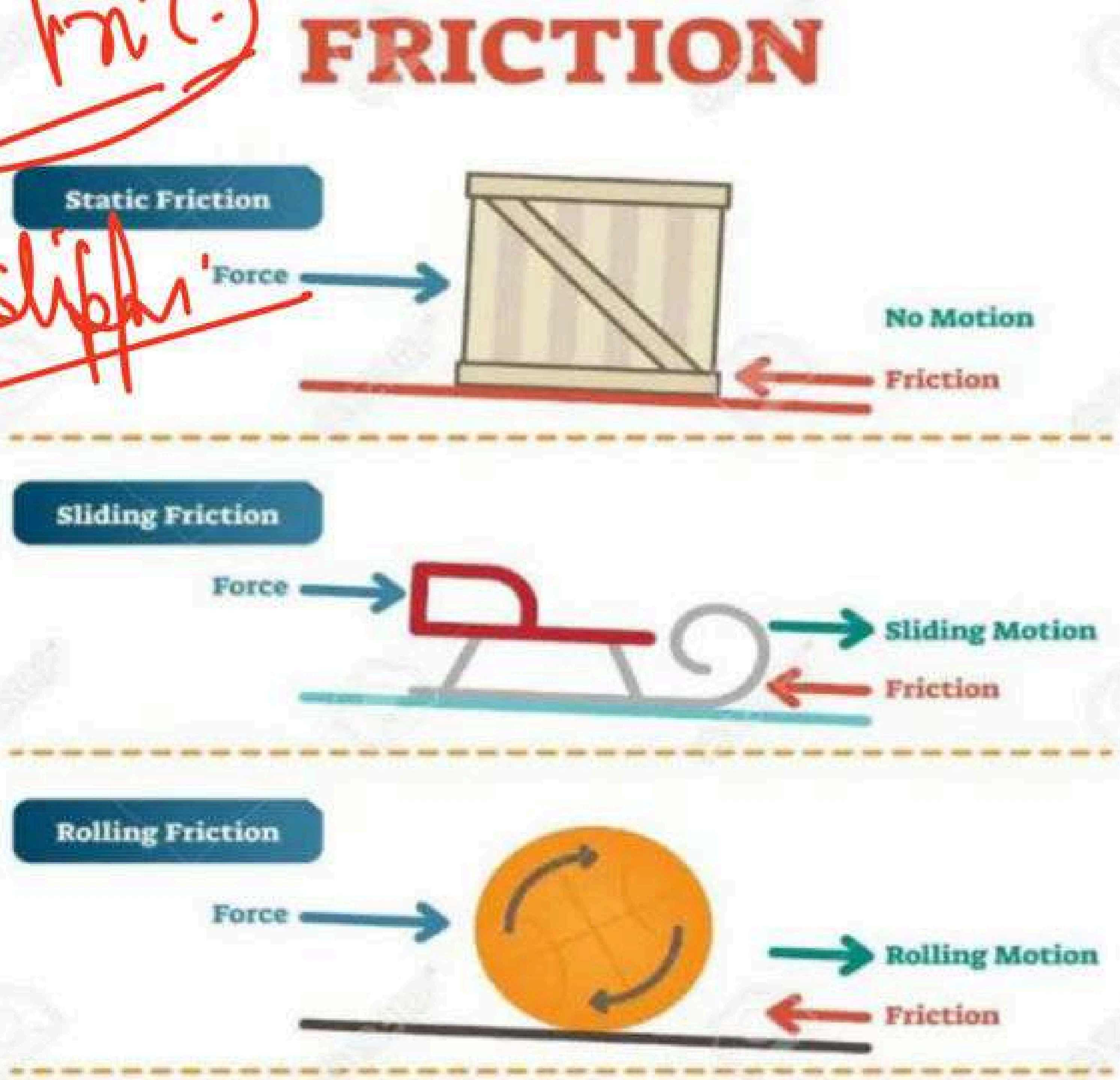
- Types Of Friction

static. fric.

kinetic / slipping

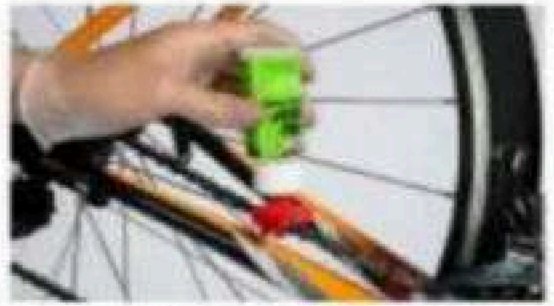
- Advantage and disadvantage of friction

$\mu_s > \mu_k$

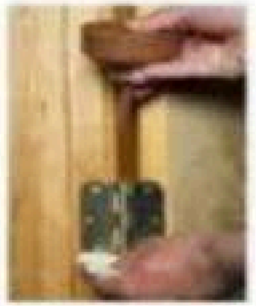


Increase

Reducing Friction



Applying Lubricants



Applying Oil

Polishing Surface

Adding wheels

Tyre

Shoe

Increase Friction

Q.26) In a qualitative way, the tendency of undisturbed objects to stay at rest or to keep moving with the same velocity is called __________.

गुणात्मक रूप में किसी वस्तु के विराम अवस्था में रहने या समान वेग से गतिशील रहने की प्रवृत्ति को क्या कहते हैं?

[SSC CGL 18-08-17]

1.force बल
2.acceleration त्वरण
3.friction घर्षण
4.inertia जड़त्व

4.inertia जड़त्व

Q.27) Why does a cannon recoil after firing?
एक तोप फायरिंग के बाद पीछे क्यों हटती है?
(10/09/2016)

1) Conservation of energy
ऊर्जा का संरक्षण
2) Backward thrust of gases produced
उत्सर्जित गैसों का पीछे की और धक्का लगने से
3) Newton's third law of motion
न्यूटन का गति का तीसरा नियम
4) Newton's first law of motion
न्यूटन के गति का प्रथम नियम

Correct Answer [c] : Newton's third law of motion

न्यूटन का गति का तीसरा नियम

Q.28) What is the other name of Galileo's law of falling bodies?

गैलीलियो के गिरते शरीर के नियम को और किस नाम से जाना जाता है?

SSC CGL Physics 8-august-2017

Option:-

1.Law of motion गति का नियम

2.Newton's first law न्यूटन का पहला नियम

3.Newton's second law न्यूटन का दूसरा नियम

4.Newton's third law न्यूटन का तीसरा नियम

Correct Answer: [a] Newton's first law गति का नियम

Galileo's law of falling bodies :- Bodies fall on the surface of the earth at a constant acceleration, and that the force of gravity which causes all bodies to move downward is a constant force.

Q.29) According to the Second Law of Motion, for a given force, acceleration is inversely proportional to the ____ of an object.

गति के दूसरे नियम के अनुसार किसी दिए हुए बल के लिए त्वरण वस्तु के ________ के व्युत्क्रमानुपाती होता है-

[SSC CGL 20-08-17]

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

1.density घनत्व
2.volume आयतन
3.force बल
4.mass द्रव्यमान

$F = ma.$

$F \propto a$

4.mass द्रव्यमान

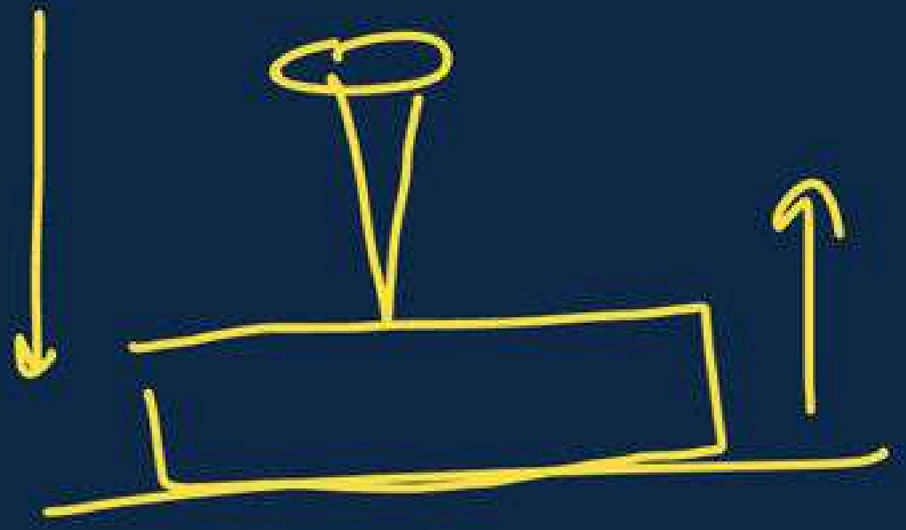
Q.30) The strength of a force is usually expressed by its ___________.

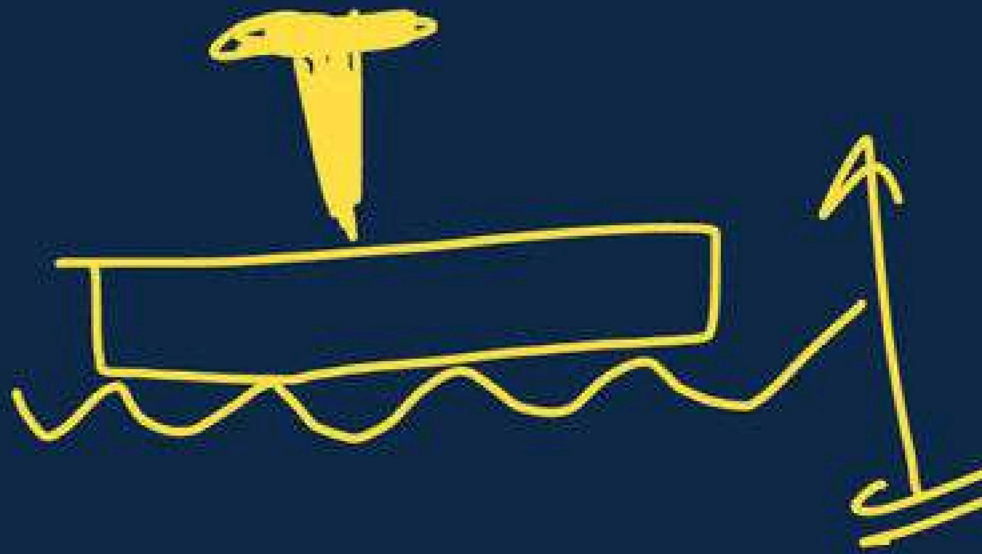
बल की प्रबलता प्राय: इसके ––––से मापी जाती है

[SSC CGL 18-08-17]

1.Motion गति
2.Direction दिशा
3.Interaction अन्योन्यक्रिया
4.Magnitude परिमाण

4.Magnitude परिमाण





Q.31) It is difficult to fix a nail on a freely suspended wooden frame. Which law supports this statement?

स्वतंत्र रूप से लटके हुए लकड़ी के एक ढांचे में कील ठोकना कठिन होता है कौन सा नियम इस कथन का समर्थन करता है?

[SSC CGL 9-08-17]

1.Law of inertia जड़ता का नियम
2.Newton’s second law न्यूटन का दूसरा नियम
3.Newton’s third law न्यूटन का तीसरा नियम
4.Pascal’s law पास्कल का नियम

Correct Answer [c] : Newton's third law न्यूटन का तीसरा नियम

When the wooden frame is held firmly against a support, and the nail is hit, an equal reaction of the support drives the nail into the block.

Q.32) If the mass of an object is 60 kgs, what will be its weight on the moon? (N=Newton)

यदि किसी वस्तु का द्रव्यमान 60 किलोग्राम है तो चंद्रमा पर उसका वजन क्या होगा ?(N=न्यूटन)

[SSC CGL 18-08-17]

1.60N
2.600N
3.100N
4.10N

$g = 9.8\ ms^{-2}$

$F = m \times a$

$= 60 \times 10$

$= 600\ N$

$= \frac{600}{6} = 100\ N$

Weight = force = $m \times a$.

$\cancel{60}^{10} \times \frac{10}{\cancel{6}}$

$100\ N$

3.100N

Friction

Repose

Q.33) Angle of Friction and angle of Repose found to be as -

घर्षण कोण और विराम का कोण-------- पाया जाता है-

(A) Equal to each other

(B) Not equal to each other

(C) Proportional to each other

(D) None of these

(A) Equal to each other

Q.34) Rocket acts on Law of conservation of

राकेट किसके संरक्षण के नियम पर कार्य करता है?

(A) Angular momentum
(B) Mass
(C) Energy
(D) Linear Momentum

(D) Linear Momentum

Q.35) A bullet hits and gets embedded in a solid block resting on a horizontal Frictionless table. Which quantity conserved in this process?

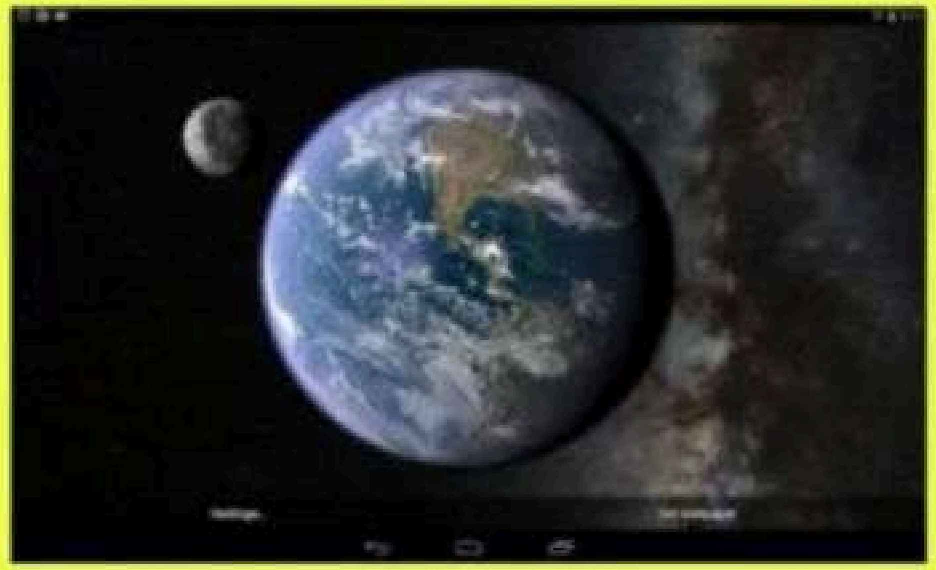
एक गोली एक क्षैतिज घर्षण रहित टेबल पर टिके हुए एक ठोस ब्लॉक में टकराती है और अंतःस्थापित हो जाती है। इस प्रक्रिया में कौन सी मात्रा संरक्षित है?

(A) Momentum and kinetic Energy
(B) Momentum alone
(C) Kinetic Energy alone
(D) Neither momentum nor Kinetic Energy

(B) Momentum alone

CIRCULAR MOTION EXAMPLES

Sun and Planets



Earth and Moon

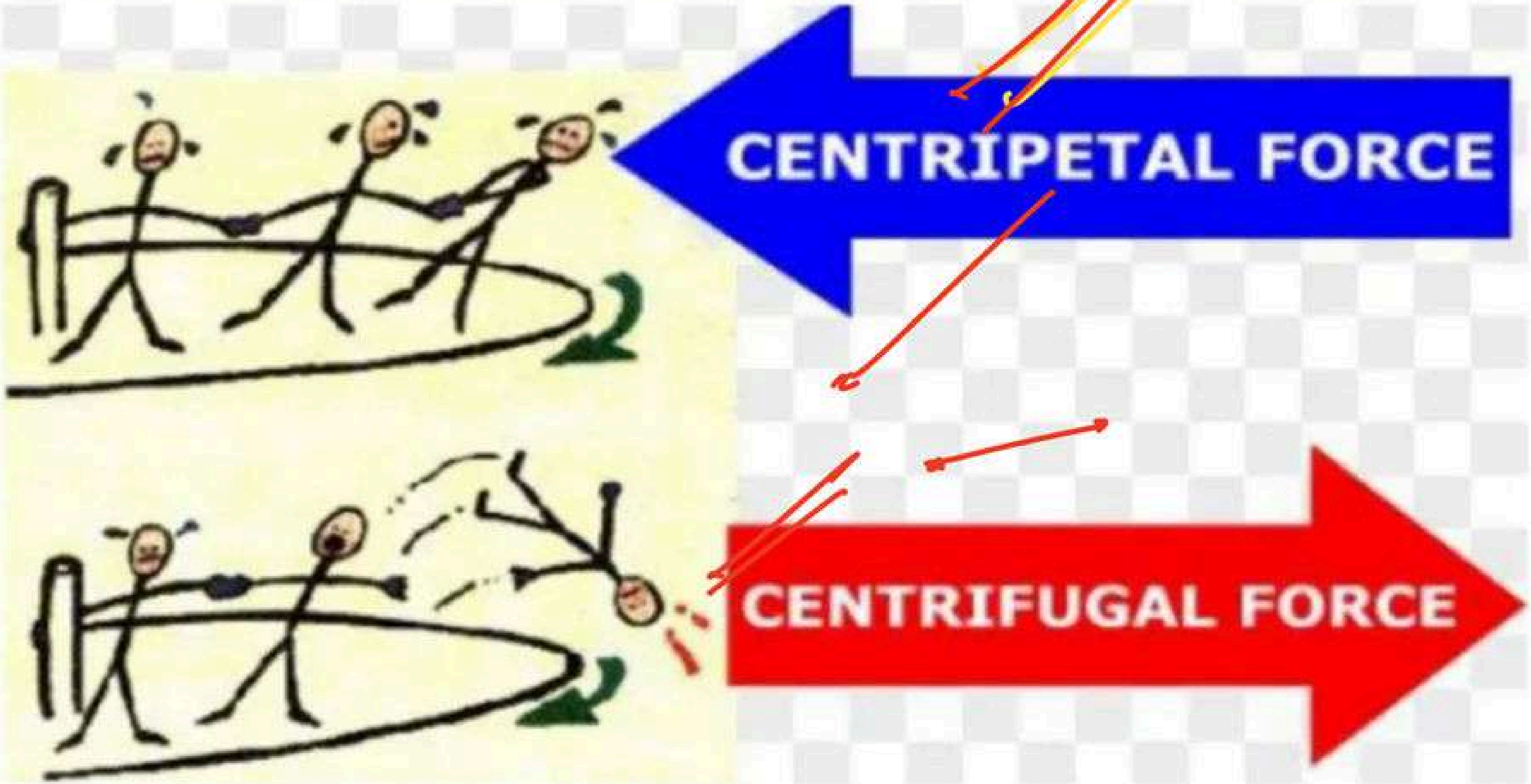
Atom and electrons

Circular track

Circular ride

Examples of circular motion all

Centripetal force and Centrifugal Force



Centrifugal force is Pseudo force

Application

Q.36) Which of the following force is a virtual force?

निम्नलिखित में से कौन सा बल आभासी बल है?

(A) Centripetal force
(B) Centripetal Reaction force
(C) Centrifugal force
(D) Strong Nuclear force

(C) Centrifugal force

Q.37) A cyclist should lean in a circular motion

एक साइकिल चालक को गोलाकार गति में झुकना चाहिए

(A) Forward
(B) Backward
(C) Sidewise towards the center
(D) Sidewise away from the center

(C) Sidewise towards the center

Q.38) Motion of a train is an example of

रेलगाड़ी की गति किसका उदाहरण है?

(A) Rotatory motion

(B) Spin motion

(C) Projectile motion

(D) Translatory motion

(D) Translatory motion

Kineti

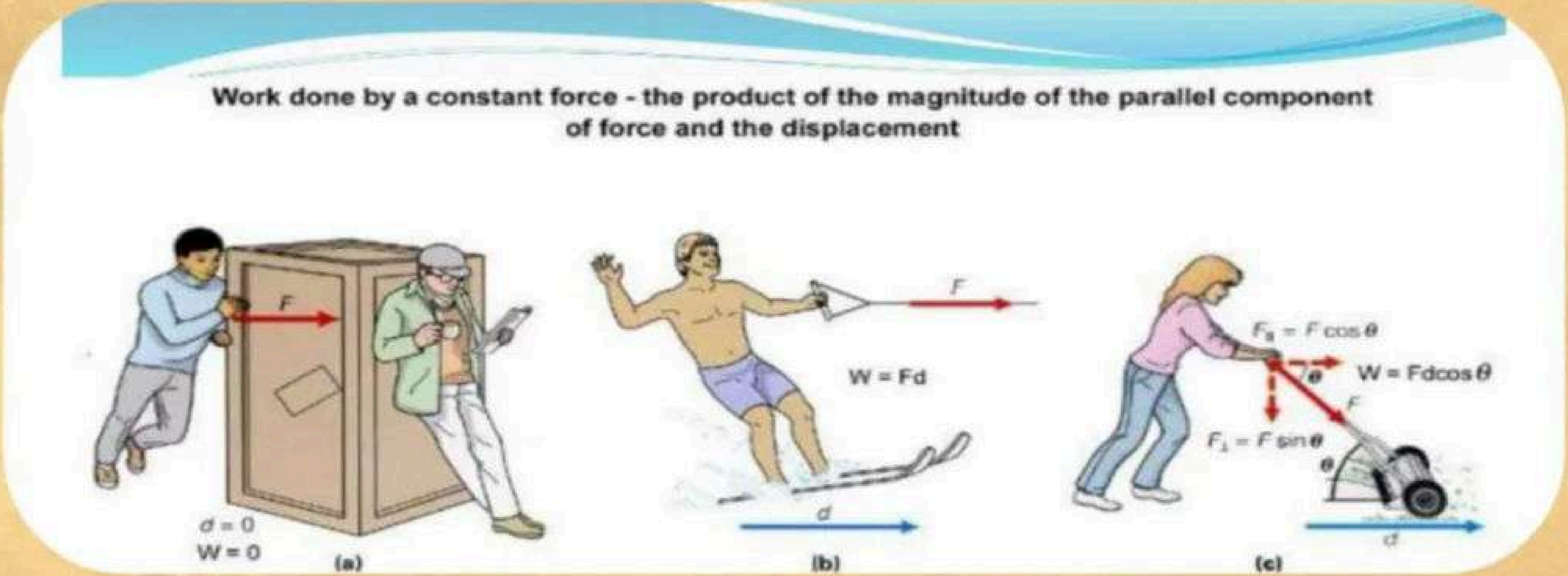
Q.39) The sliding friction is __________ than the static friction.

फिसलने वाला घर्षण स्थैतिक घर्षण से __________ होता है।

(A) Double
(B) Same
(C) Greater
(D) Smaller

(D) Smaller

Work , Power , Energy



If a body is displaced by a distance (s) on applying a force (F) on it, then work done W = F,S = Fs cosθ

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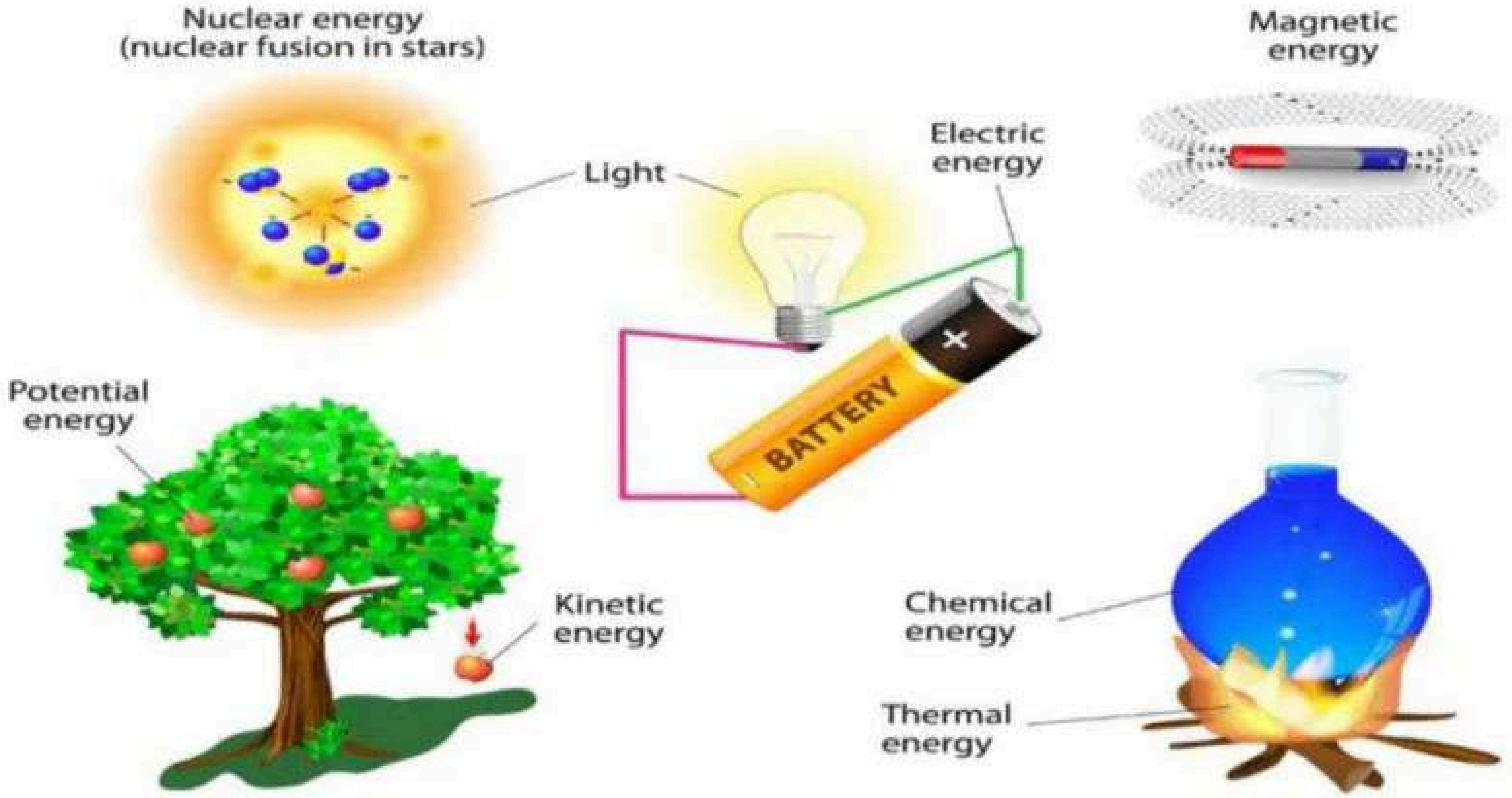
FORMS OF ENERGY



Energy :- It is defined as capacity of doing a work.

Its SI unit is joule and erg in CGS system.

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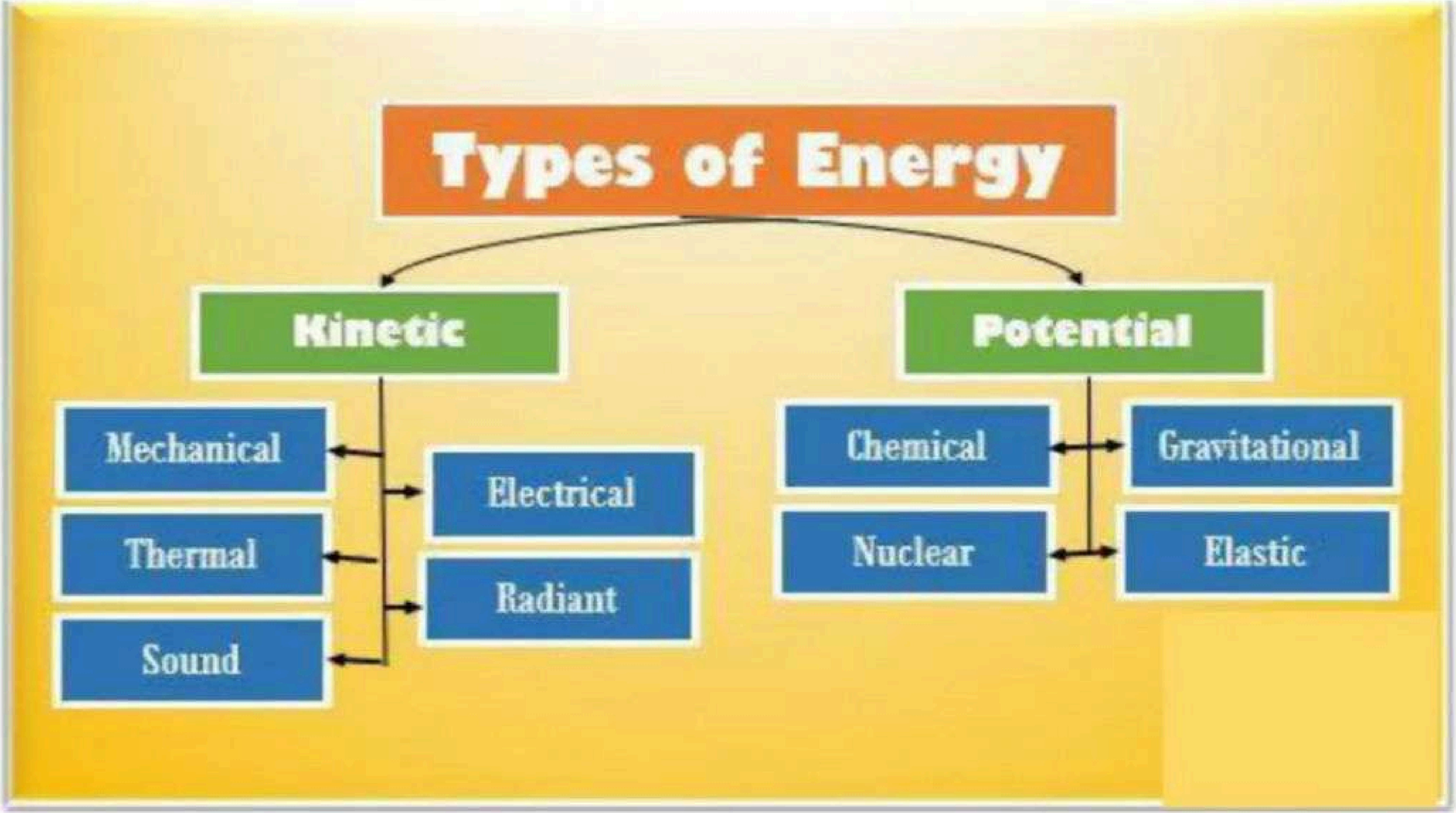

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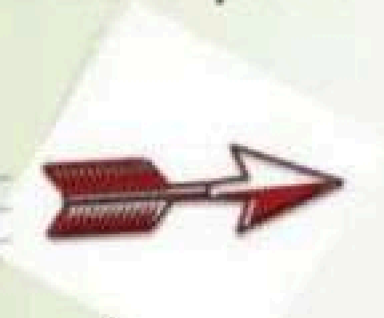
Kinetic Energy

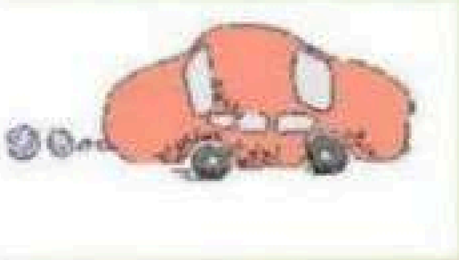
- The energy of motion that is released from stored energy.
- Examples:



An arrow released from the bow, flying through the air.

An object rolling down a hill.

Muscles moving.



A car moving.

- What similarities do you notice about all these examples?

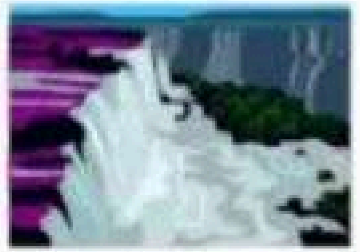
$$KE = \frac{1}{2}mv^2 = \frac{v^2}{2m} \qquad (p = mv)$$

Where, p is the momentum.

Examples of Potential Energy

Stretching a rubber band..

-Stores energy



Water at the top of a waterfall..

-Stores energy

Yo–Yo in held in your hand..

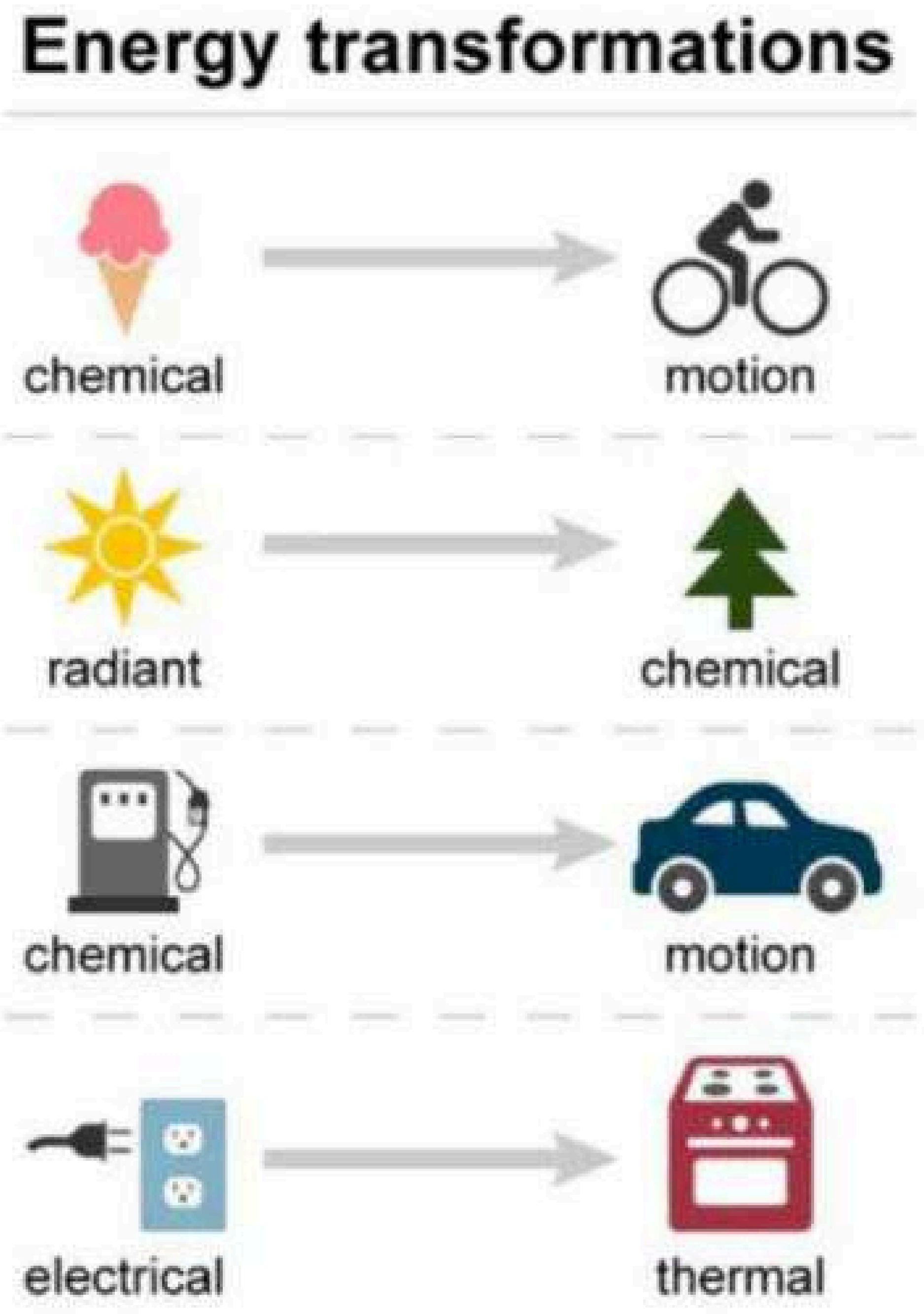
-Stores energy because of position

Drawing a Bow...

-Stores energy because of position

- **Body is raised to a height (h) above the surface of the Earth, then change in potential energy of body = mgh.**

Law of conservation of energy



Power !! What is this ??

The resting human body uses around 100 W of power—similar to an incandescent light bulb.

A desktop computer + monitor uses 150-200 W.

A laptop uses only 50 W.

Everyday examples of power

Can We Measure Power ??

$1W = 1J/s$

$1kW = 10^3W$

1 horse power = 746W

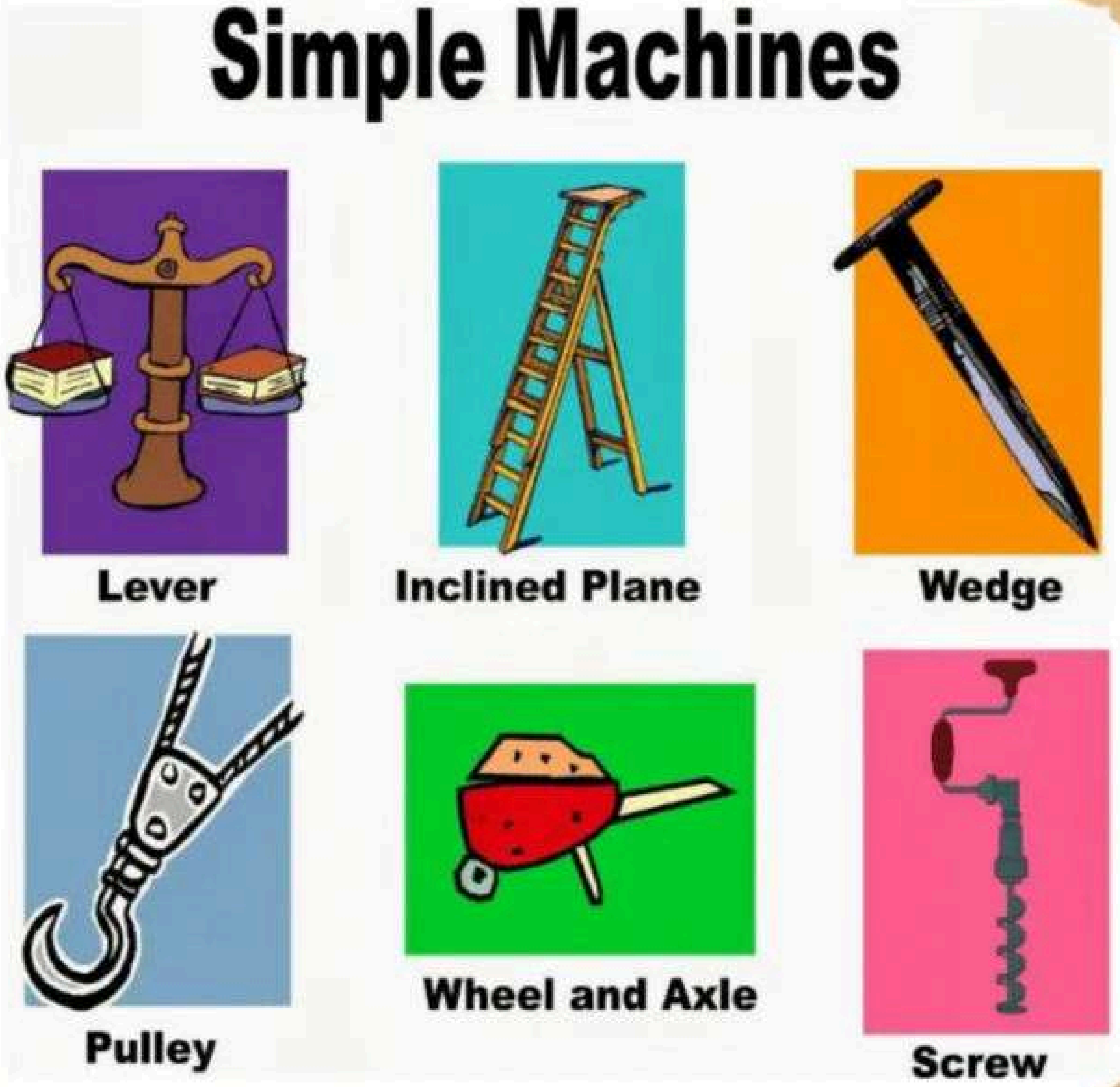
1 kilowatt hour (kWh) = 3.6×10^6.

$$\text{Power} = \frac{\text{Work}}{\text{Time}} = \frac{\text{Force} \cdot \text{Displacement}}{\text{Time}}$$

$$\text{Power} = \text{Force} \cdot \frac{\text{Displacement}}{\text{Time}}$$

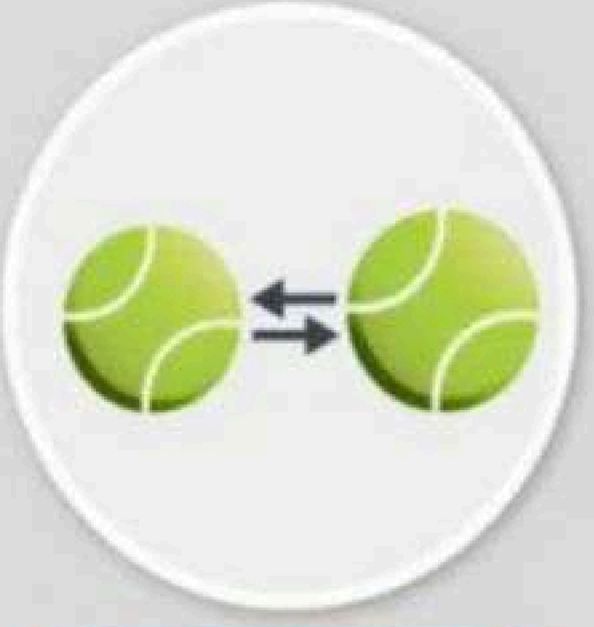
$$\boxed{\text{Power} = \text{Force} \cdot \text{Velocity}}$$

Moment of force
= Force×Length of arm



GRAVITATION

In 1686, Newton stated that in the universe each particle of matter attracts every other particle



GRAVITATION

GRAVITATION IS THE FORCE OF ATTRACTION ACTING BETWEEN ANY TWO BODIES OF THE UNIVERSE.

GRAVITY

GRAVITY IS THE EARTH'S GRAVITATIONAL PULL ON A BODY, LYING ON NEAR THE SURFACE OF EARTH.

Gravity is a force that acts between any 2 masses.

Two factors affect the gravitational attraction between objects: mass and distance.

Gravitational Force

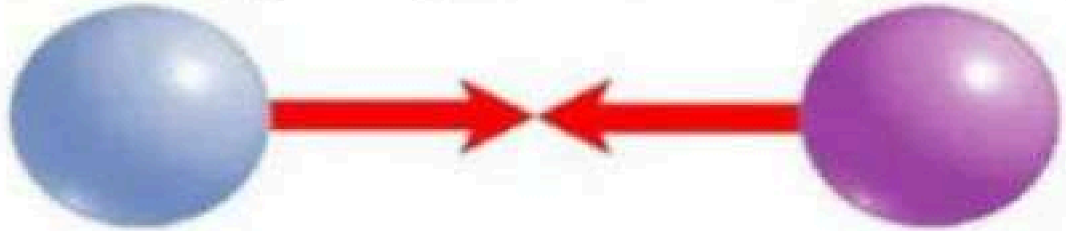
Always attractive in na

$$F_G = \frac{GM_1M_2}{r^2}$$

The value of G is

$= 6.67\times10^{11}\text{N-m}^2//\text{kg}^2$.

The force of gravity acts between all objects.



If mass increases, the force of gravity increases.

If distance increases, the force of gravity decreases.

Acceleration Due to Gravity (g)

g is maximum at poles and g is minimum at equator.

VARIATION OF g WITH HEIGHT ABOVE GROUND

Height, h	Example	g (m/s^2)
0 m	Sea level	9.83
5 900 m	Kilimanjaro	9.81
10 000 m	Jet airliner	9.80
350 000 m	International Space Station	8.85
35 900 000 m	Geosynchronous satellite	0.22

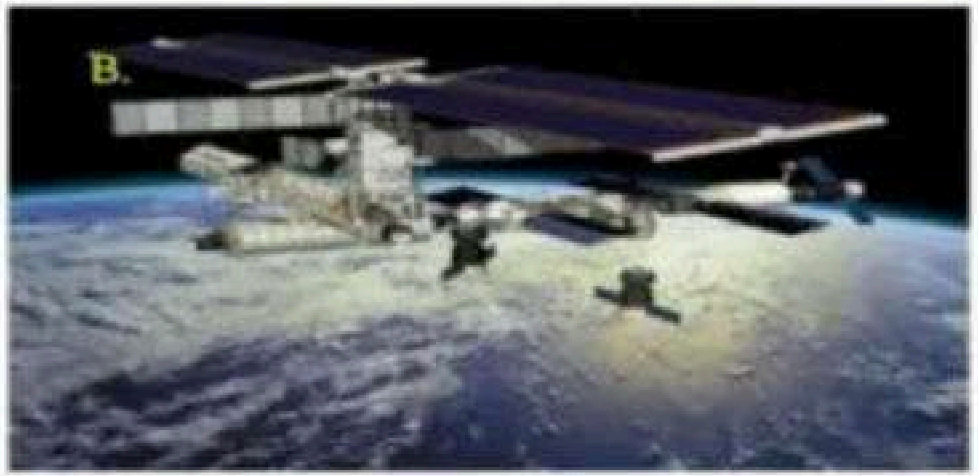
For a satellite a distance h above the earth's surface:

$$g = \frac{GM_e}{(R_e + h)^2} = \frac{GM_e}{R_e^2(1 + h/R_e)^2} = \frac{g_{earth}}{(1 + h/R_e)^2}$$

Types of Satellite

Natural: Such as the moon orbiting around the earth

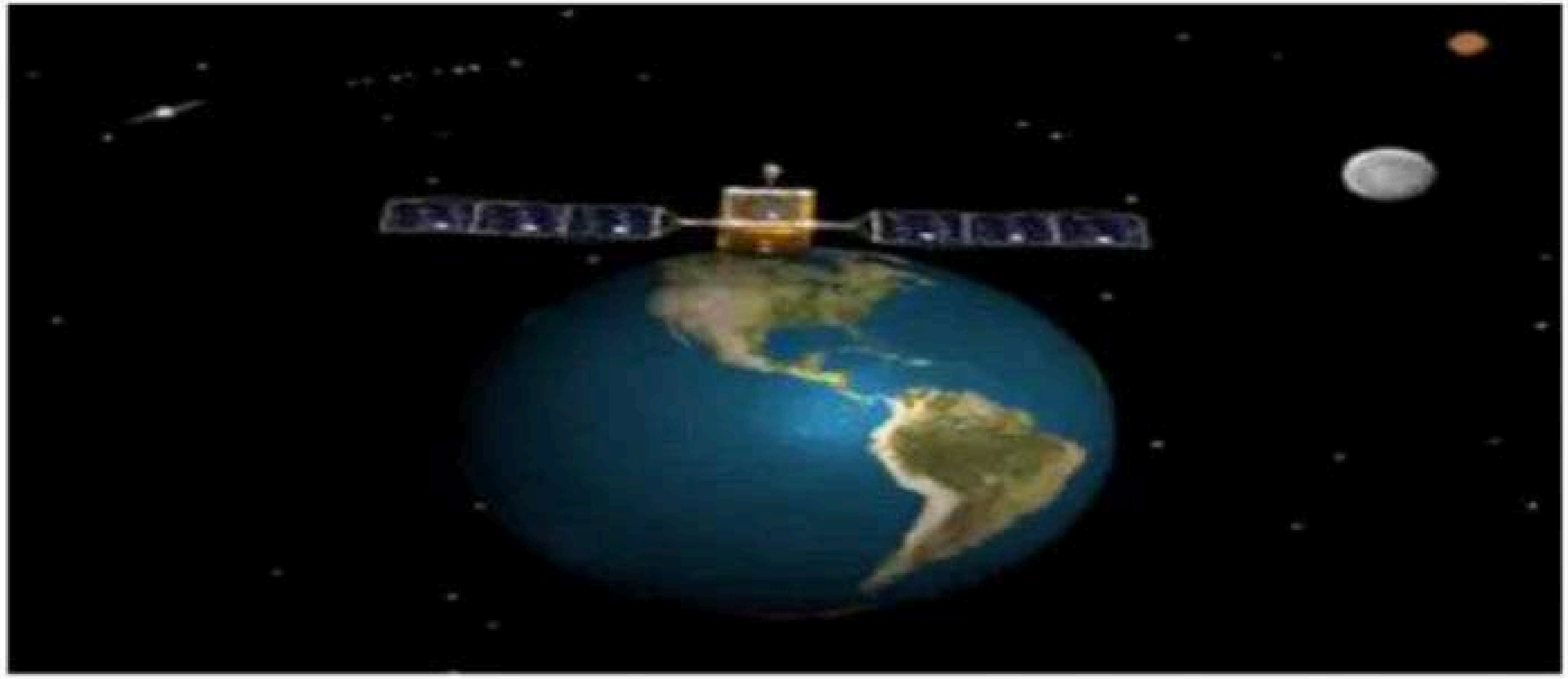
Artificial: The international space station orbiting the earth



Satellite revolving around earth

A satellite revolving very close to Earth's surface has a period of revolution about 84 min and its speed is nearly 8 km/s.

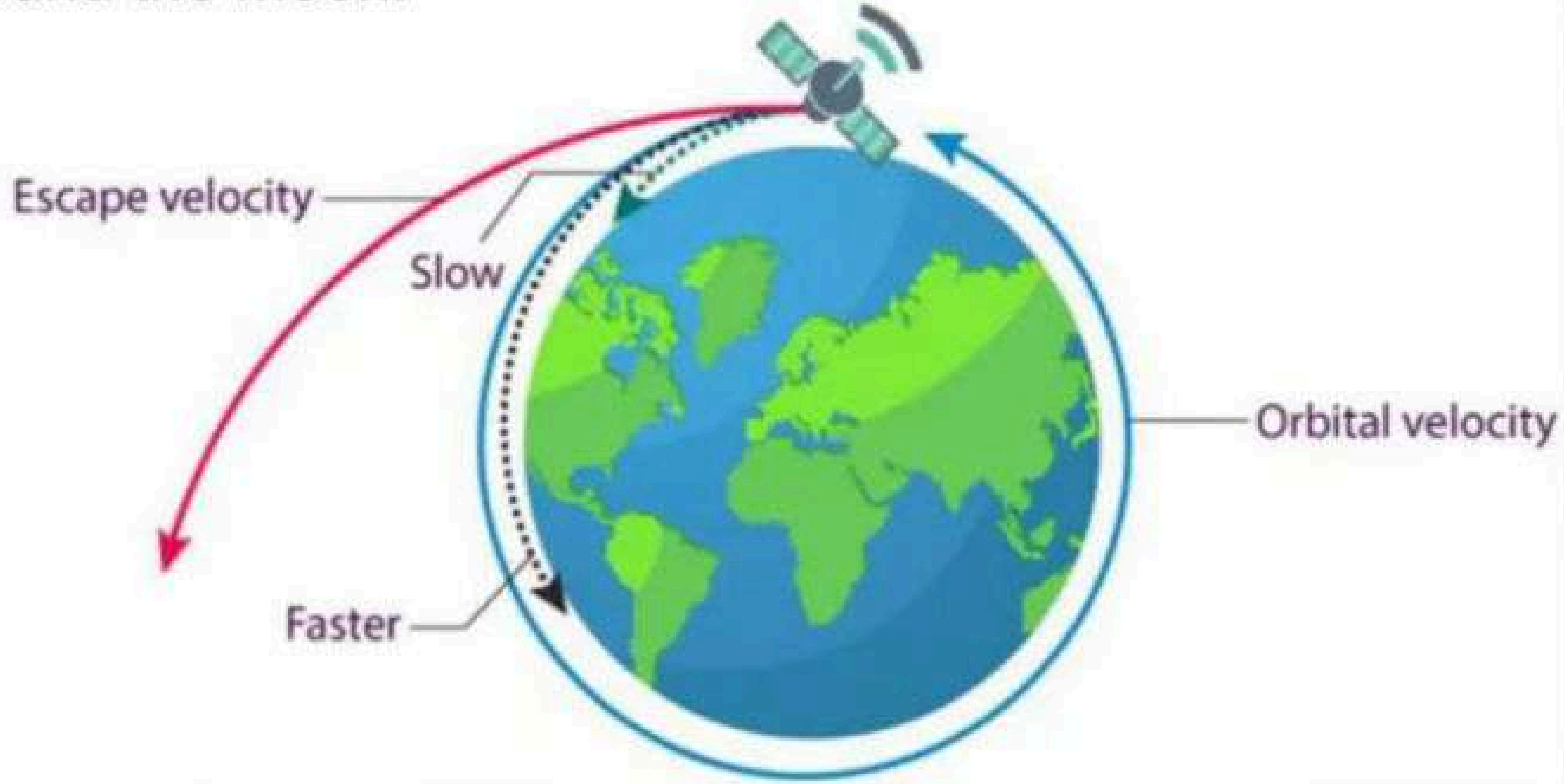
The satellite, whose time period is 24h, is called Geostationary Satellite

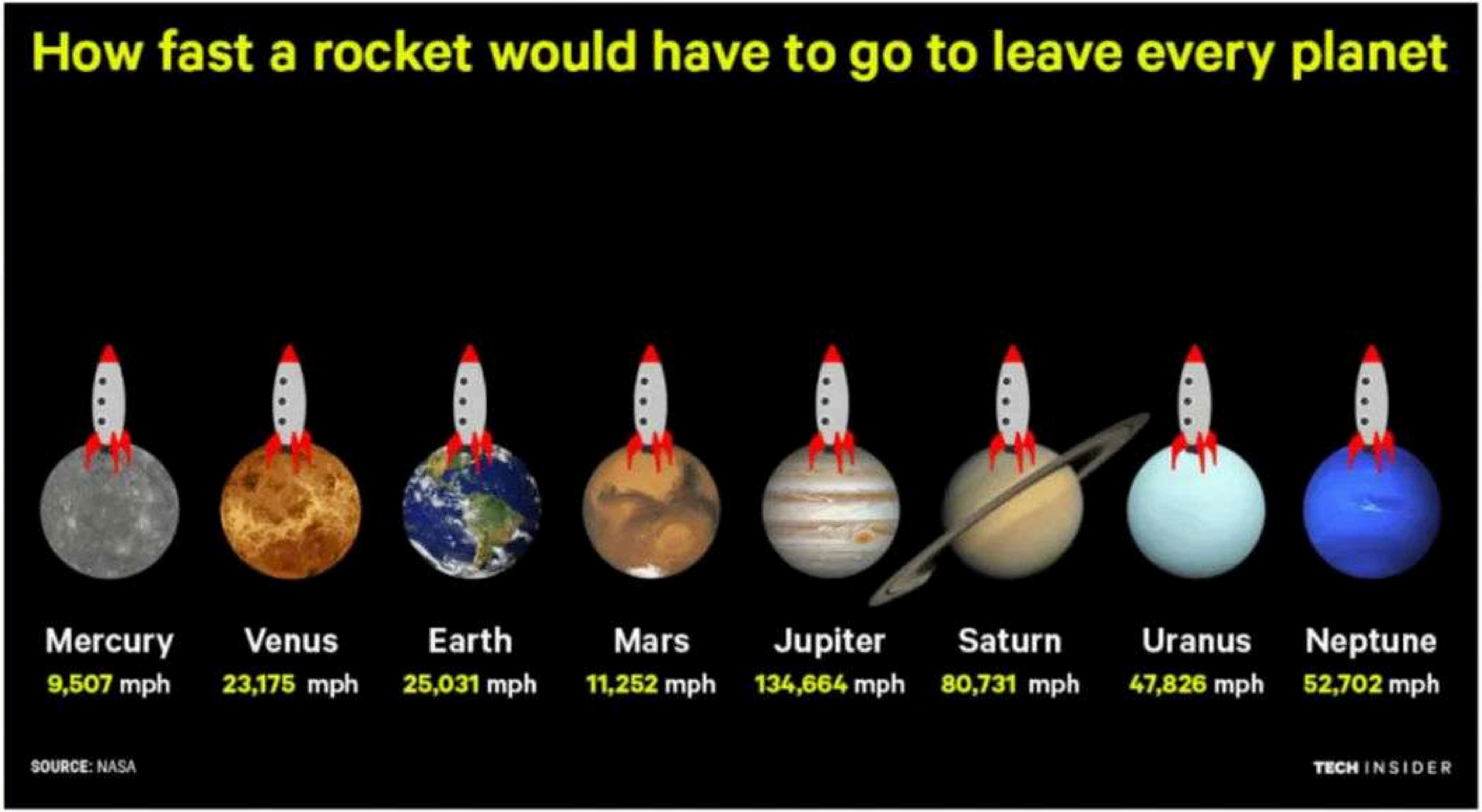


Escape velocity

Escape velocity its value for Earth's surface is 11.2 km/s.

The escape velocity at the Moon surface is 2.38 km/s, because, there is no atmosphere around the Moon.





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Q.40) Which of the following pair of physical quantity has same dimensions?

निम्नलिखित में से किस भौतिक राशि के युग्म के आयाम समान हैं?

(A) Work and Energy
(B) Force and Power
(C) Work and Power
(D) Power and Motion

(A) Work and Energy

Q.41) Energy stored in a spring in watch/घड़ी की स्प्रिंग में निहित ऊर्जा है-

(A) Kinetic Energy
(B) Potential Energy
(C) Heat Energy
(D) Chemical Energy

(B) Potential Energy

Q.42) Kinetic energy depends on
गतिज ऊर्जा निर्भर करती है

(A) The velocity or speed of the moving body
(B) The mass of the moving body
(C) The pressure of the moving body
(D) Both mass and velocity of the moving body

(D) Both mass and velocity of the moving body

Q.43) Which of the following is not a vector quantity ?

निम्नलिखित में से कौन एक सदिश राशि नहीं है?

(A) Work
(B) Force
(C) Displacement
(D) Velocity

(A) Work

Q.44) ______________is the mechanical transfer of energy to a system or from a system by an external force on it.

_________एक प्रणाली में या उस पर एक बाहरी बल द्वारा एक प्रणाली से ऊर्जा का यांत्रिक हस्तांतरण है।

(A) Work
(B) Power
(C) Intensity
(D) Force

(A) Work

Q.45) A bullet is fired from a rifle which recoils after firing. The ratio of kinetic energy of the rifle to that of the bullet is____

राइफल से गोली चलाई जाती है जो फायरिंग के बाद पीछे हट जाती है। राइफल की गतिज ऊर्जा और गोली की गतिज ऊर्जा का अनुपात ______ है

(A) Zero
(B) One
(C) Less than one
(D) More than one

(C) Less than one

Q.46) A stone is dropped from the roof of a house towards the ground. The Kinetic Energy of the stone will be maximum:

एक घर की छत से जमीन की ओर एक पत्थर गिराया जाता है। पत्थर की गतिज ऊर्जा अधिकतम होगी:

(A) Just after it is dropped
(B) When it is just on the half-way
(C) Just before it touches the ground
(D) When it touches the ground

(C) Just before it touches the ground

Q.47) When a ball is thrown vertically upwards, which of the following quantities remains constant during its motion?

जब एक गेंद को लंबवत ऊपर की ओर फेंका जाता है, तो उसकी गति के दौरान निम्नलिखित में से कौन सी मात्रा स्थिर रहती है?

(A) Energy
(B) Displacement
(C) Velocity
(D) Acceleration

(A) Energy

Q.48) Energy in the form of heat is wasted when a machine is operated. This heat is generated due to________

जब कोई मशीन चलती है तो ऊष्मा के रूप में ऊर्जा बर्बाद होती है। यह ऊष्मा ________ के कारण उत्पन्न होती है

(A) Burning
(B) Friction
(C) Combustion
(D) Lubrication

(B) Friction

Q.49) Mass of a body on measuring in lift at rest with a physical balance is found to be 'm'. If the Lift is accelerated upward with acceleration 'a'. Now what will be the mass of body?

एक भौतिक संतुलन के साथ आराम से लिफ्ट में मापने पर एक पिंड का द्रव्यमान 'm' पाया जाता है। यदि लिफ्ट को त्वरण 'a' के साथ ऊपर की ओर त्वरित किया जाता है। अब शरीर का द्रव्यमान क्या होगा?

(A) L
(B) m (g + a)
(C) M
(D) Zero

(B) $m(g + a)$

Q.50) The apparent weight of man in a lift is less than the real weight then
लिफ्ट में आदमी का स्पष्ट वजन वास्तविक वजन से कम होता है

(A) When the lift is going down with acceleration.
(B) The lift is going up with uniform speed.
(C) The lift is going down with uniform speed.
(D) The lift is going up with acceleration.

(A) When the lift is going down with acceleration.

Q.51) A man standing on a edge of a cliff throws a stone vertically upward with a certain speed. He then thrown another stone downward with a same speed. Find the ratio of speed of the two stones when they hit the ground?

एक चट्टान के किनारे पर खड़ा एक आदमी एक निश्चित गति के साथ एक पत्थर को लंबवत ऊपर की ओर फेंकता है। फिर उसने उसी गति से एक और पत्थर नीचे की ओर फेंका। जमीन से टकराने पर दो पत्थरों की गति का अनुपात ज्ञात कीजिए?

(A) 1:1
(B) 1:2
(C) 1:4
(D) Cannot be found from the given information

(A) 1:1

Q.52) Time period of Revolution for a Geostationary satellite is:

भूस्थिर उपग्रह के लिए परिक्रमा की समयावधि है:

(A) 365 days
(B) 30 days
(C) 24 hours
(D) Continuously changes

(C) 24 hours

Q.53) What is the minimum escape velocity of rocket to be launched into space?

अंतरिक्ष में प्रक्षेपित किए जाने वाले रॉकेट का न्यूनतम पलायन वेग कितना है?

(A) 5 km/sec.
(B) 6 km/sec.
(C) 11 km/sec.
(D) 15 km/sec.

(C) 11 km/sec.

Q.54) It is easier to carry two buckets of water in one hand each, than to carry only one in one hand because

एक हाथ में दो बाल्टी पानी ढोने की तुलना में एक हाथ में दो बाल्टी पानी ले जाना आसान है क्योंकि

(A) Weights of buckets are balanced
(B) Centre of gravity falls within the body
(C) Centre of gravity and centre of equilibrium fall within the feet
(D) Resultant weight of buckets is zero

(B) Centre of gravity falls within the body

Q.55) As we go from Equator to North pole the value of 'g', the acceleration due to gravity.

जब हम भूमध्य रेखा से उत्तरी ध्रुव की ओर जाते हैं तो गुरुत्वाकर्षण के कारण त्वरण 'g' का मान होता है।

(A) Remains the same
(B) Decreases
(C) Increases
(D) None of the above

(C) Increases

Q.56) The tides in the sea are primarily due to

समुद्र में ज्वार मुख्य रूप से किसके कारण होते हैं

(A) The atmospheric effect of the Earth
(B) The gravitational effect of Venus on the Earth
(C) The gravitational effect of the Sun on the Earth
(D) The gravitational effect of the Moon on the Earth.

(D) The gravitational effect of the Moon on the Earth.

Q.57) The apparent weight of a person in a lift which is moving down with uniform acceleration is

लिफ्ट में एक समान त्वरण के साथ नीचे जा रहे व्यक्ति का स्पष्ट भार है

(A) Greater than the weight when the person is stationary

(B) Twice the weight when the person is stationary

(C) Less than the weight when the person is stationary

(D) Same as the weight when the person is stationary

(C) Less than the weight when the person is stationary

Q.58) Acceleration due to gravity on a planet decreases with

किसी ग्रह पर गुरुत्वाकर्षण के कारण त्वरण कम हो जाता है

(A) Decrease in radius of the planet
(B) Increase in mass of the planet
(C) Decrease in mass of the body
(D) Increase in altitude from surface of the planet

(B) Increase in mass of the planet

Q.59) With reference to gravity, what is G called?

गुरुत्वाकर्षण के सन्दर्भ में G को क्या कहते हैं?

(A) Gravitational constant
(B) Gravitational attraction
(C) Gravitational force
(D) Acceleration due to gravity

(A) Gravitational constant

Q.60) What is the approximate height of any geostationary satellite from earth's surface (in km)?
पृथ्वी की सतह से किसी भूस्थिर उपग्रह की अनुमानित ऊँचाई (किमी में) क्या है?

(A) 36000
(B) 45000
(C) 48000
(D) 30000

(A) 36000

Q.61) At which of the following place, weight of an object is maximum?
निम्नलिखित में से किस स्थान पर किसी वस्तु का भार अधिकतम होता है?

(A) At poles
(B) At equator
(C) At tropic of Capricorn
(D) At tropic of Cancer

(A) At poles

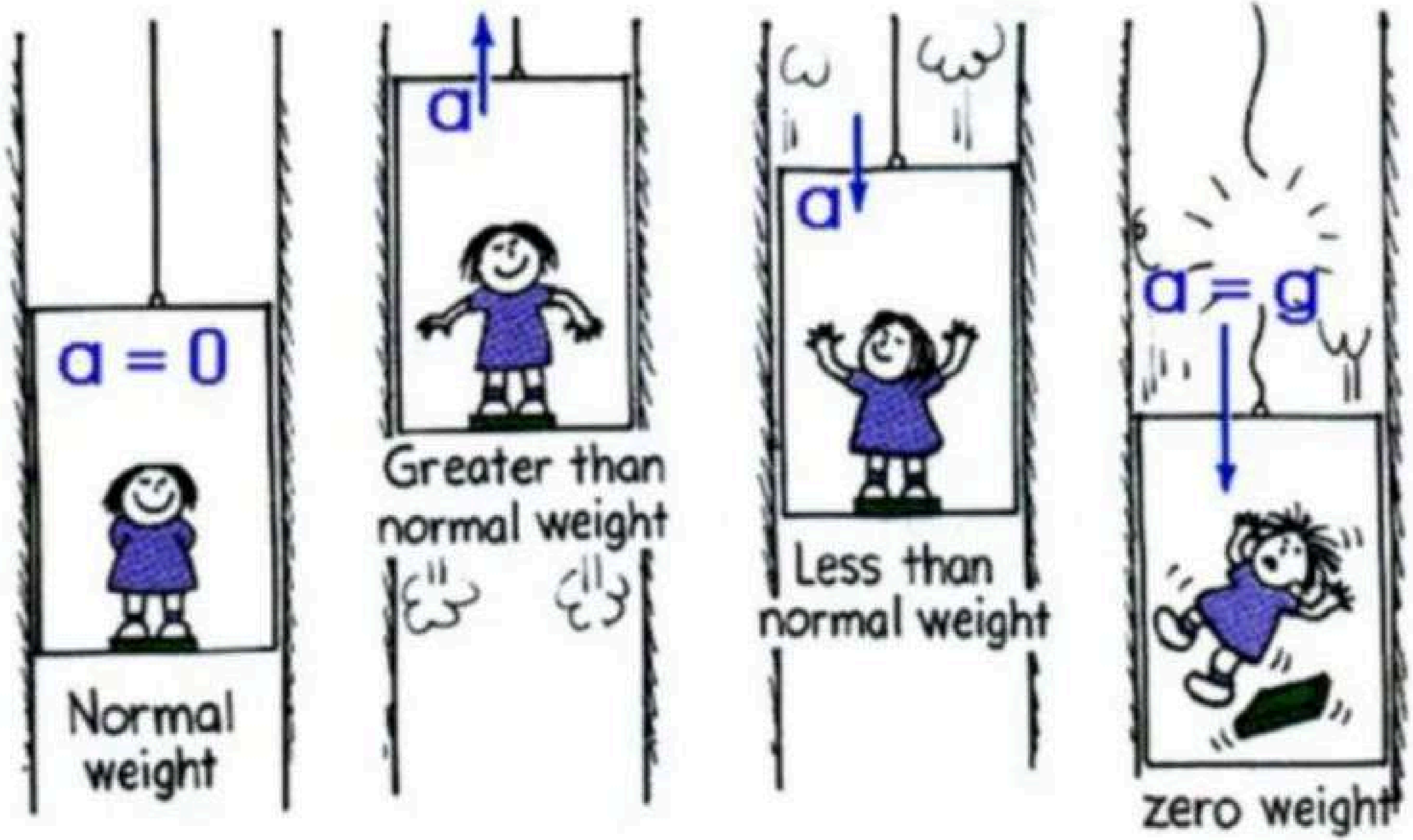
Derived Units:

The units which are obtained by the multiplication, division, etc. of two or more fundamental units .

Name	Symbol	Quantity	Base Units
hertz	Hz	*frequency*	second^{-1}
newton	N	*force, weight*	$\text{kg} \times \text{metre} \times \text{second}^{-2}$
pascal	Pa	*pressure, stress*	$\text{kg} \times \text{metre}^{-1} \times \text{second}^{-2}$
joule	J	*energy, work, heat*	$\text{kg} \times \text{metre}^{2} \times \text{second}^{-2}$
watt	W	*power, radiant flux*	$\text{kg} \times \text{metre}^{2} \times \text{second}^{-3}$
square metre	m^2	*area*	metre^{2}
cubic metre	m^3	*volume*	metre^{3}
metre per second	m/s	*speed, velocity*	$\text{metre} \times \text{second}^{-1}$
cubic metre per second	m^3/s	*volumetric flow*	$\text{metre}^{3} \times \text{second}^{-1}$

Weight of a Body in a Lift

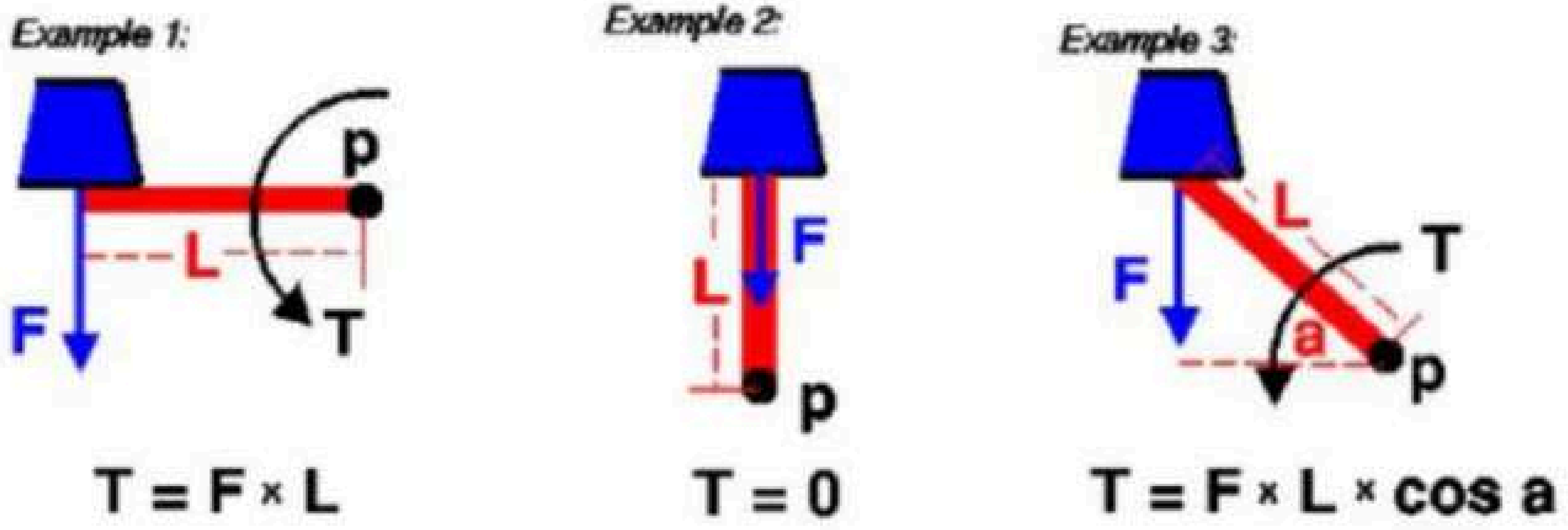
A pictorial summary of apparent weight:



Torque

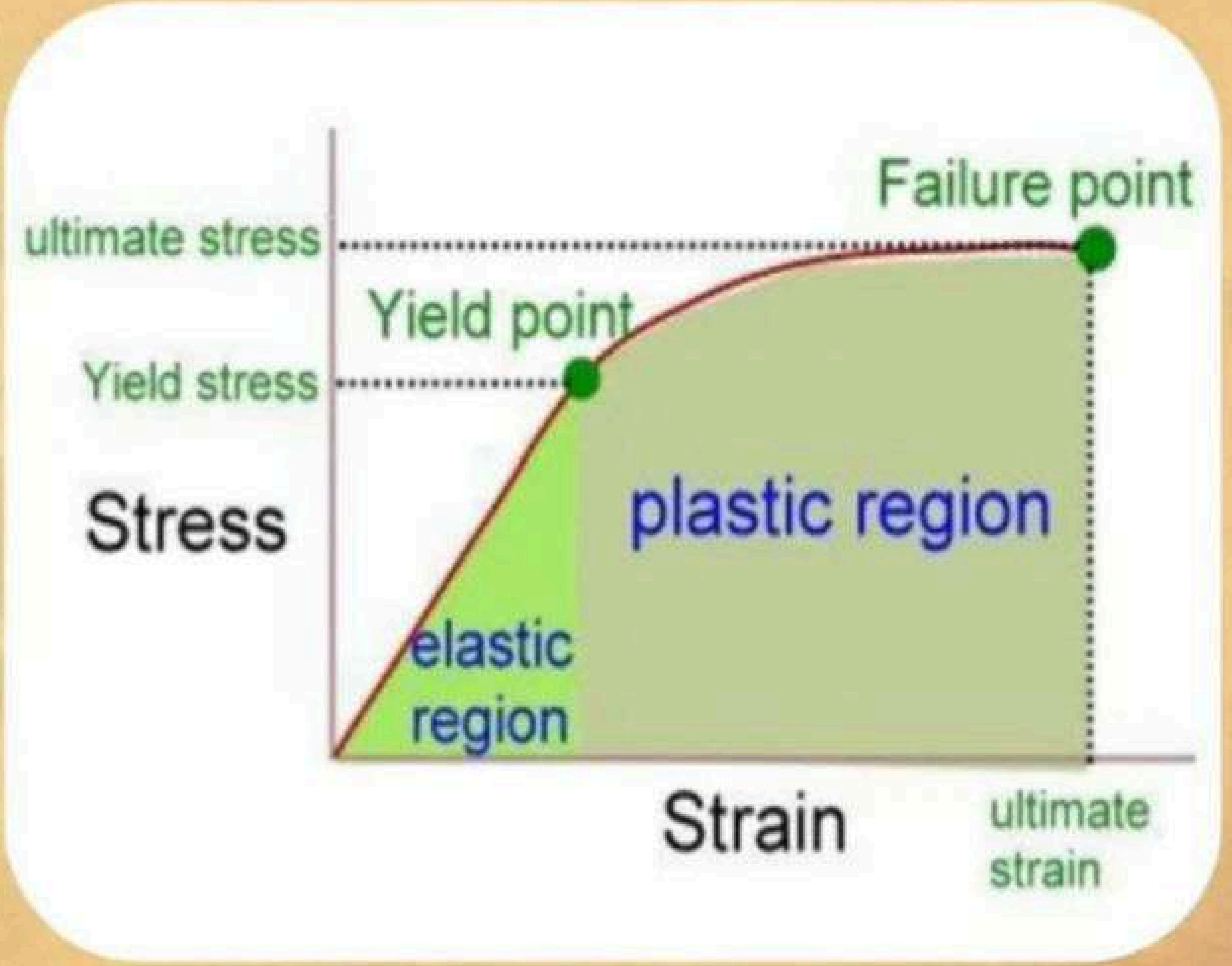
Torque (Moment)

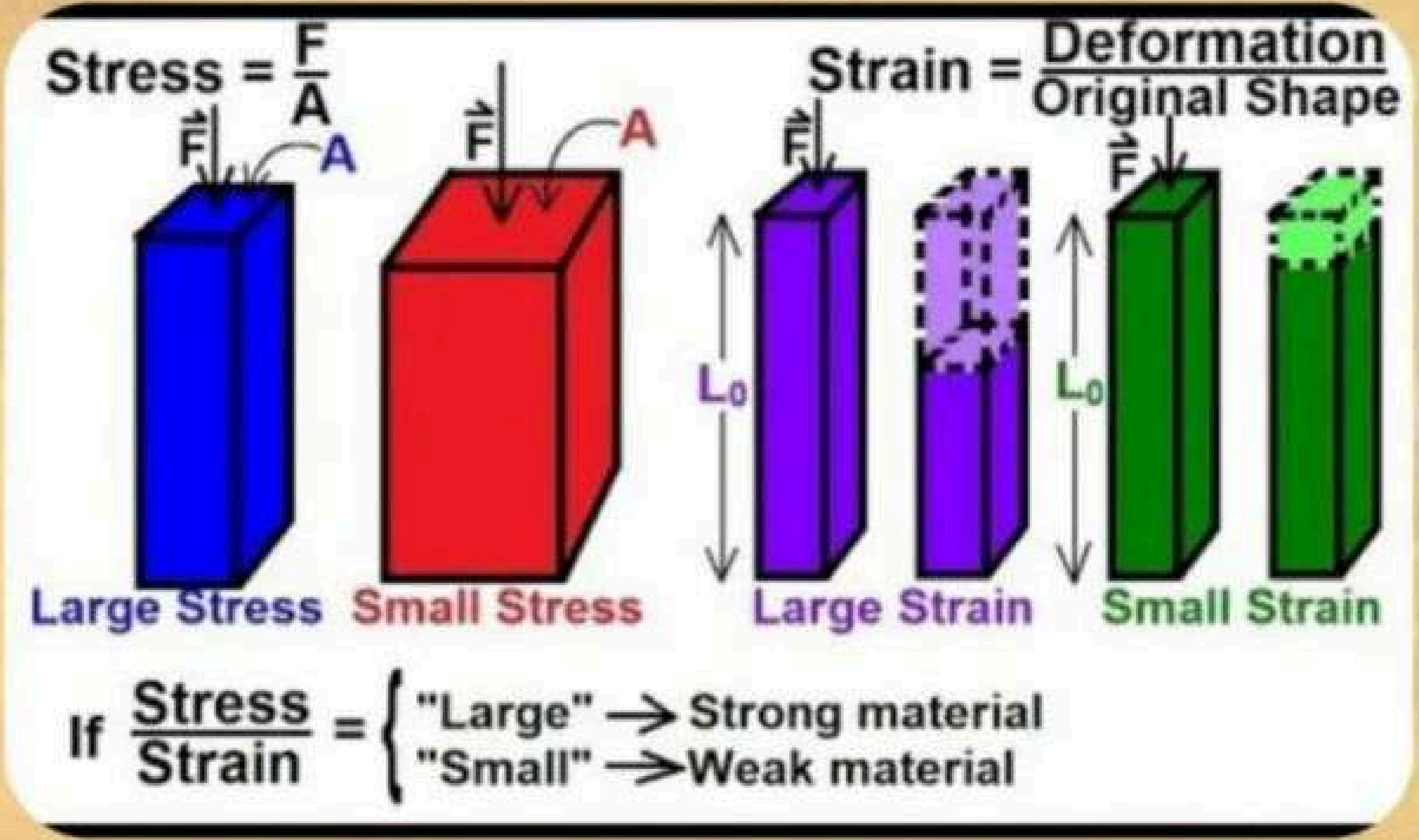
The Torque (T) about a point (p) is equal to the Force (F) times the distance (L) measured from the point perpendicular to the force. $T = F \times L_{\perp}$

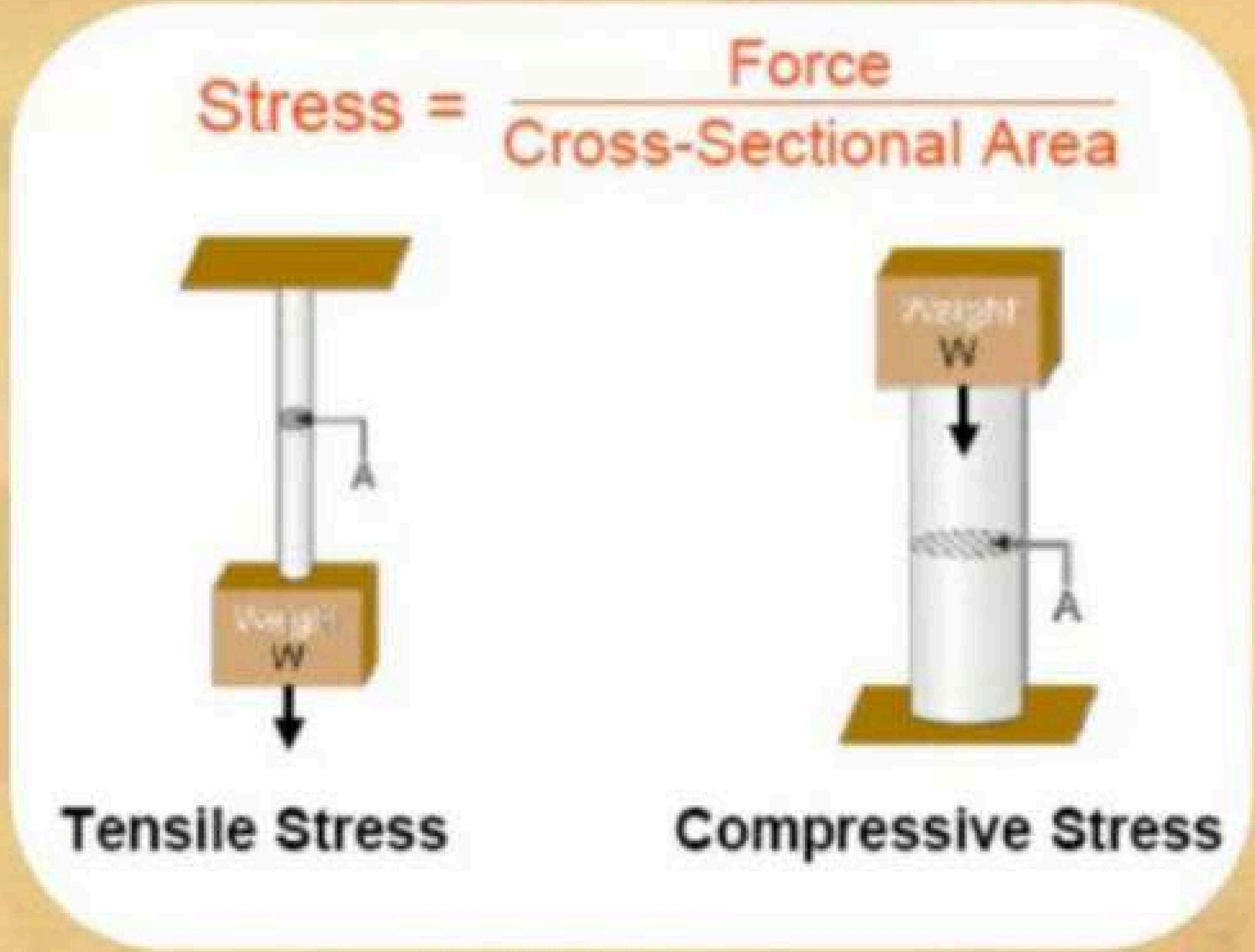


STRESS & STRAIN

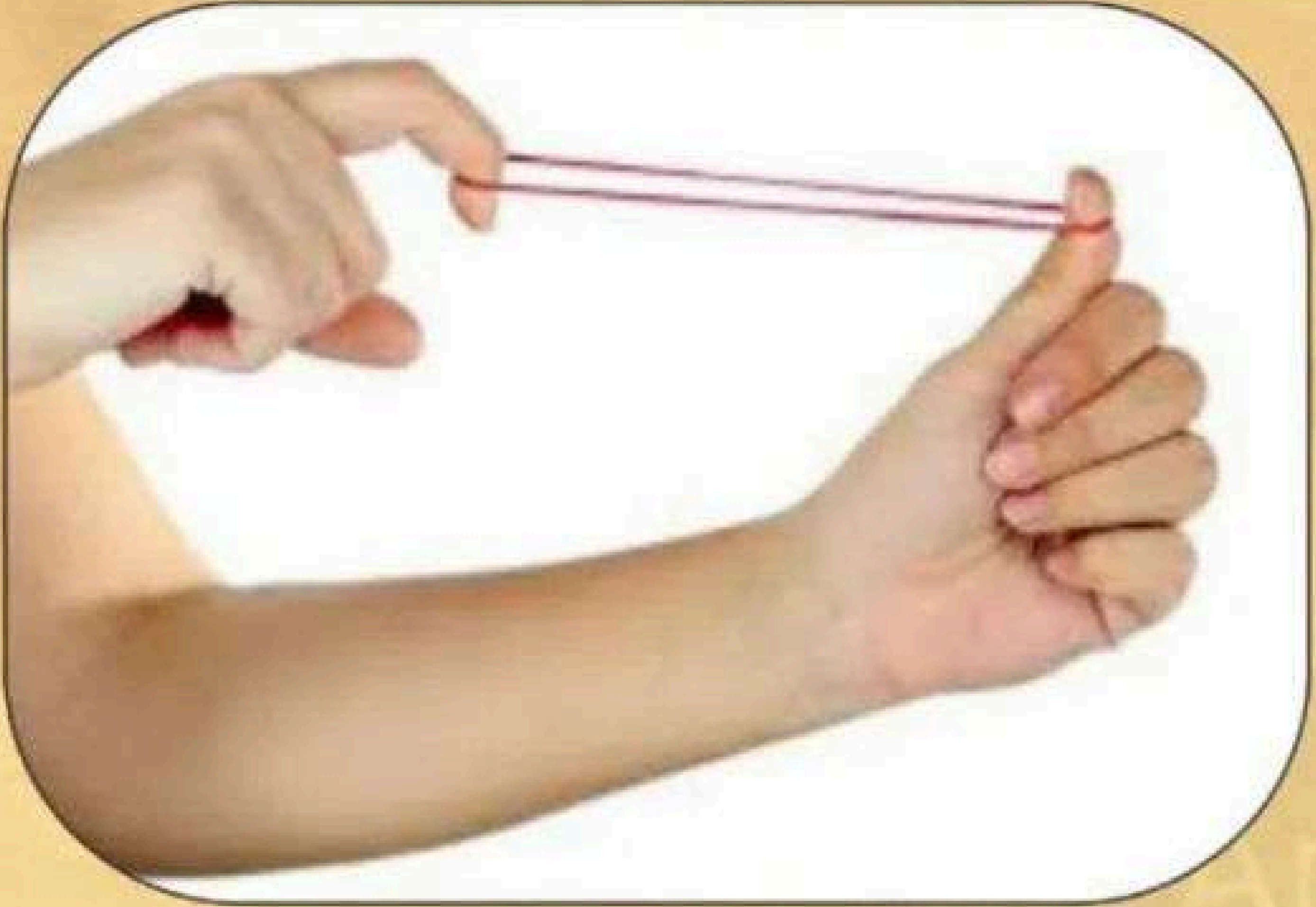
The internal restoring force acting per unit area of cross-section of the deformed body called **stress.** Its unit is N/m.
The change occurred in the unit size of the body is called **strain.** It is unit less.




Stress = $\frac{F}{A}$
Strain = $\frac{\text{Deformation}}{\text{Original Shape}}$
$\vec{F}$
A
L_0
Large Stress
Small Stress
Large Strain
Small Strain
If $\frac{\text{Stress}}{\text{Strain}}$ = { "Large" → Strong material
"Small" → Weak material


Stress = $\frac{\text{Force}}{\text{Cross-Sectional Area}}$
W
A
Tensile Stress
Compressive Stress

ELASTICITY



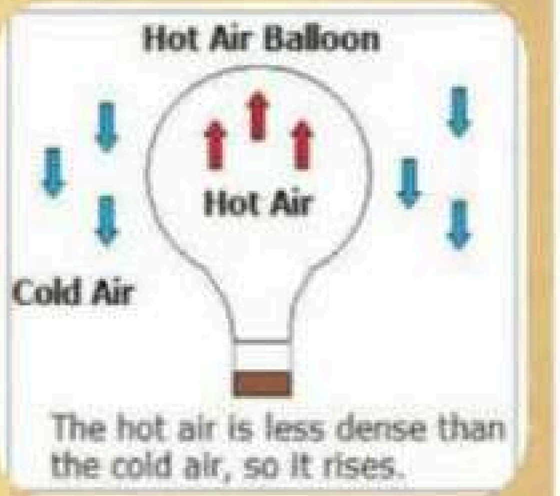
Steel is more elastic than rubber

DENSITY

- The density of a substance (d) is defined as the ratio of its mass (M) to its volume (V) i.e. d = M/V

Its unit is kg/m3.

- Density of water is maximum at 40C.



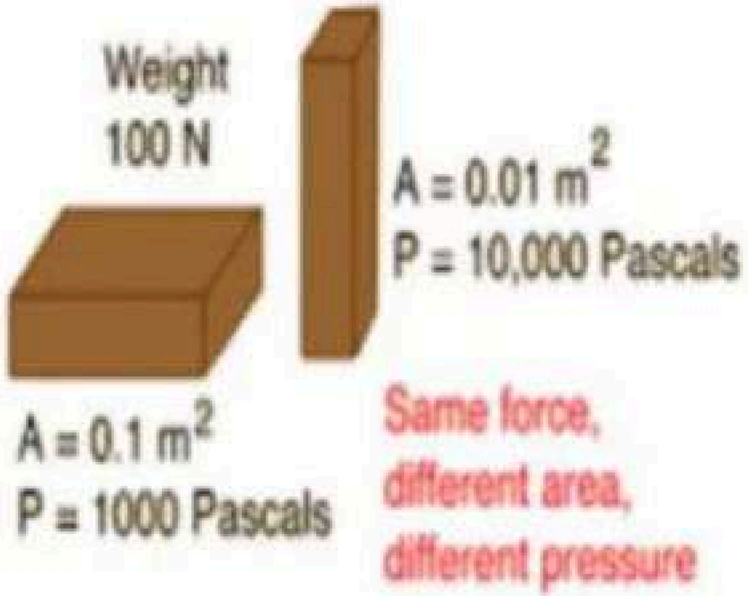
Pressure

Its unit is N/m^2 also called pascal. It is a scalar quantity.

- Pressure in liquid is given by p = hdg. Where h is the height, d is the density of liquid and g is the acceleration of gravity.

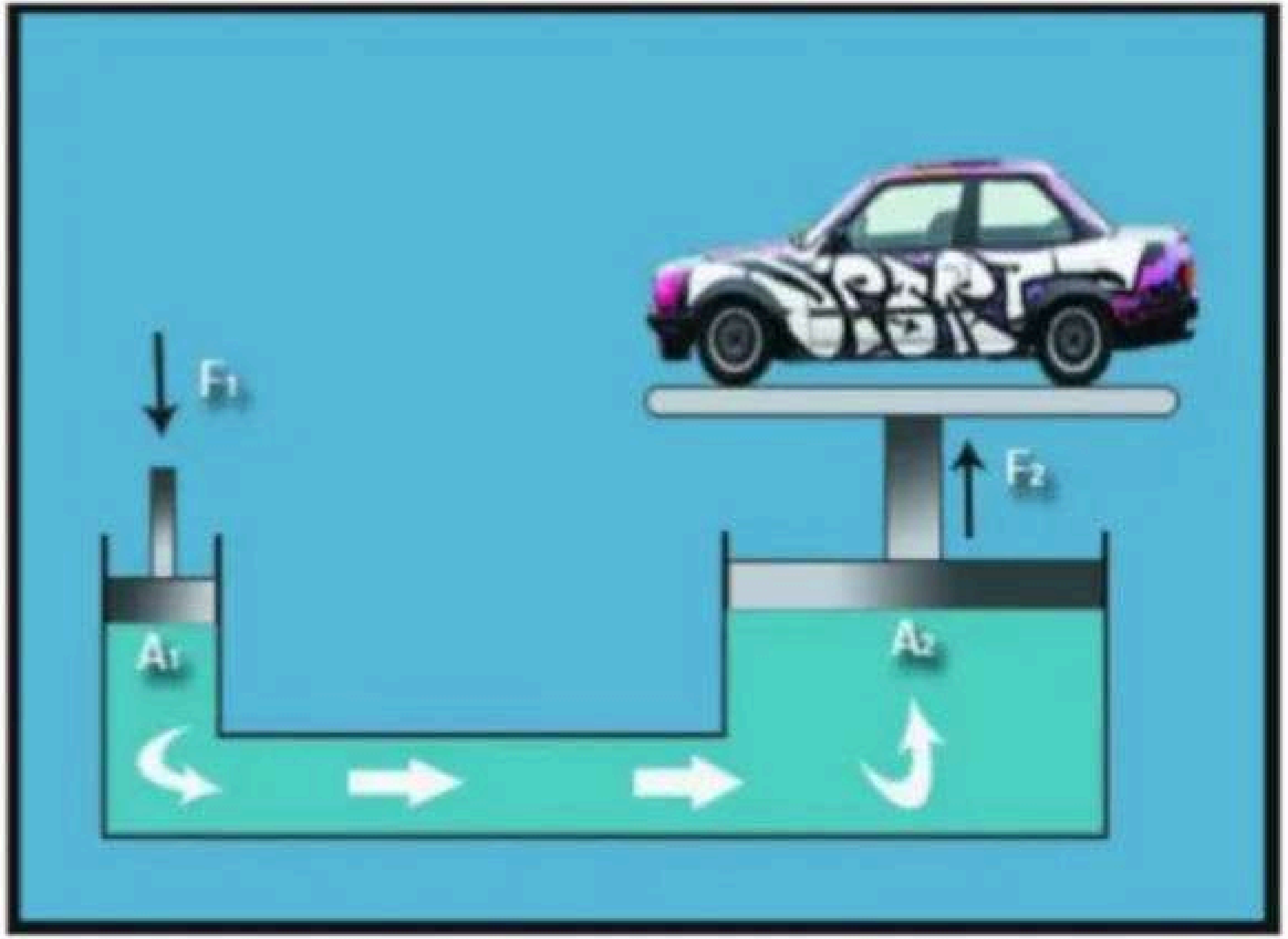
$$\text{PRESSURE} = \frac{\text{FORCE}}{\text{AREA}}$$

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} = \frac{F}{A}$$

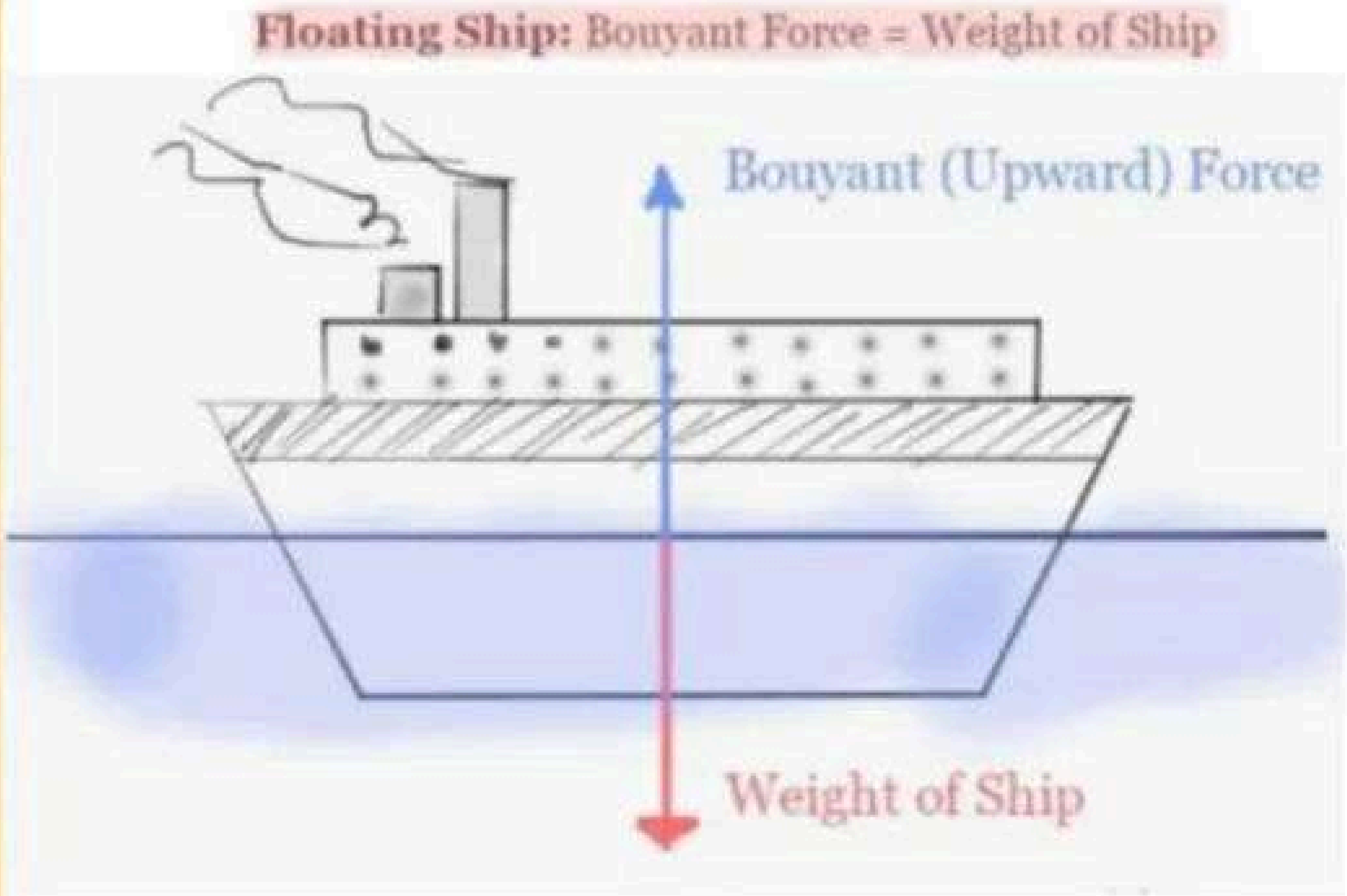


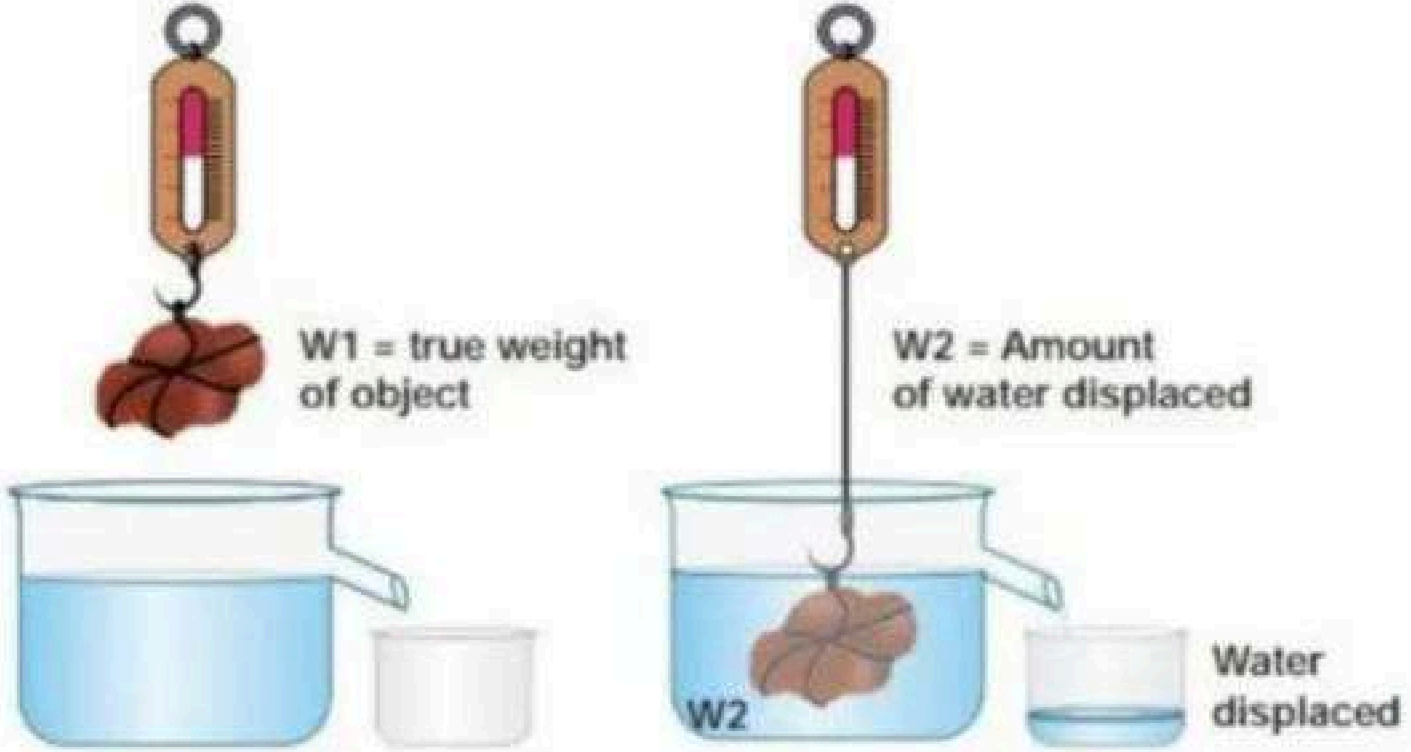
Pascal's Law

If an external pressure is applied to an enclosed fluid, it is transmitted undiminished to every direction



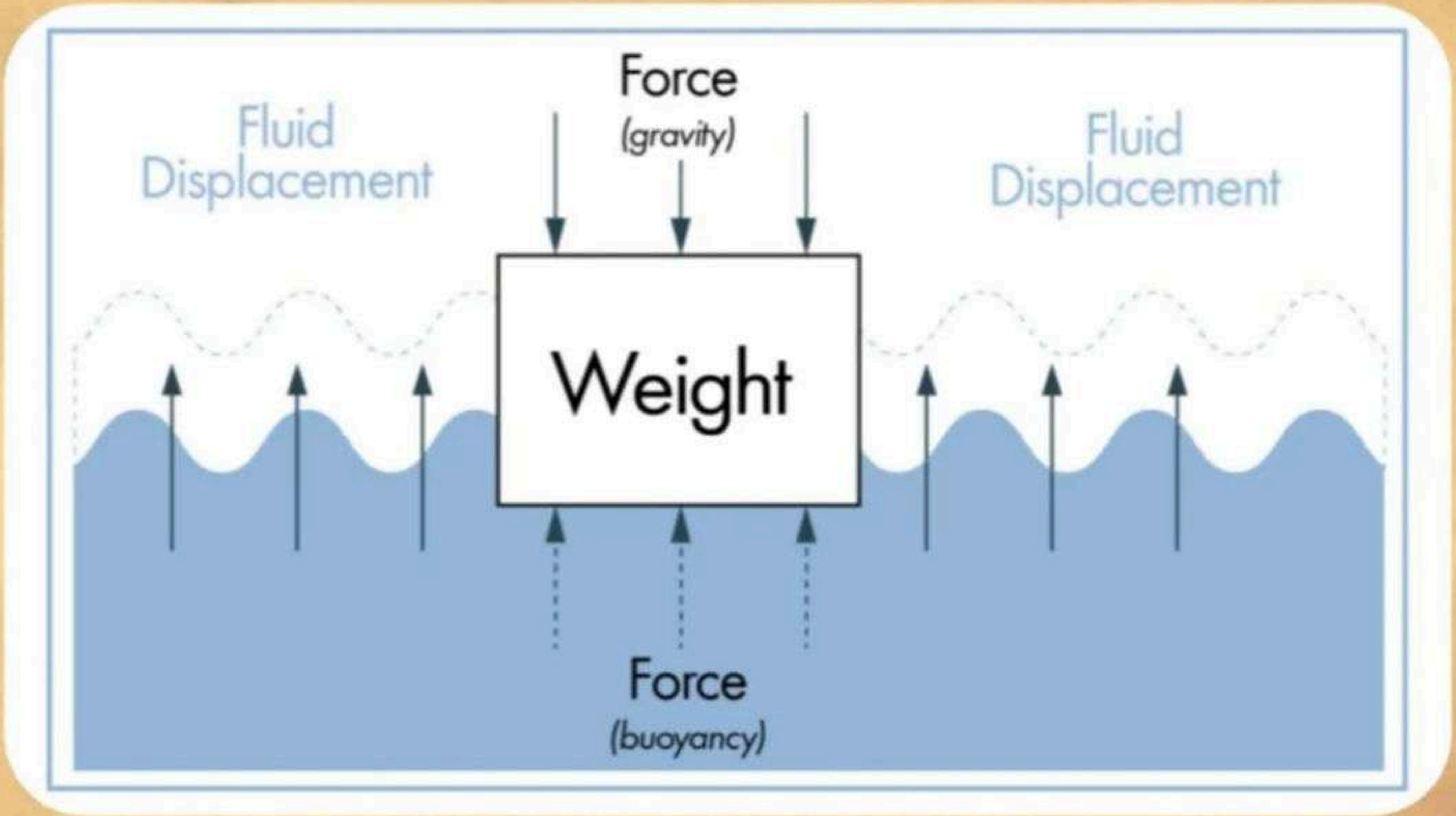
ARCHIMEDES PRINCIPLE





Upthrust is equal to the weight of the fluid displaced

BUOYANCY FORCE



#GRAPHICS BY - AMAN SRIVASTAVA

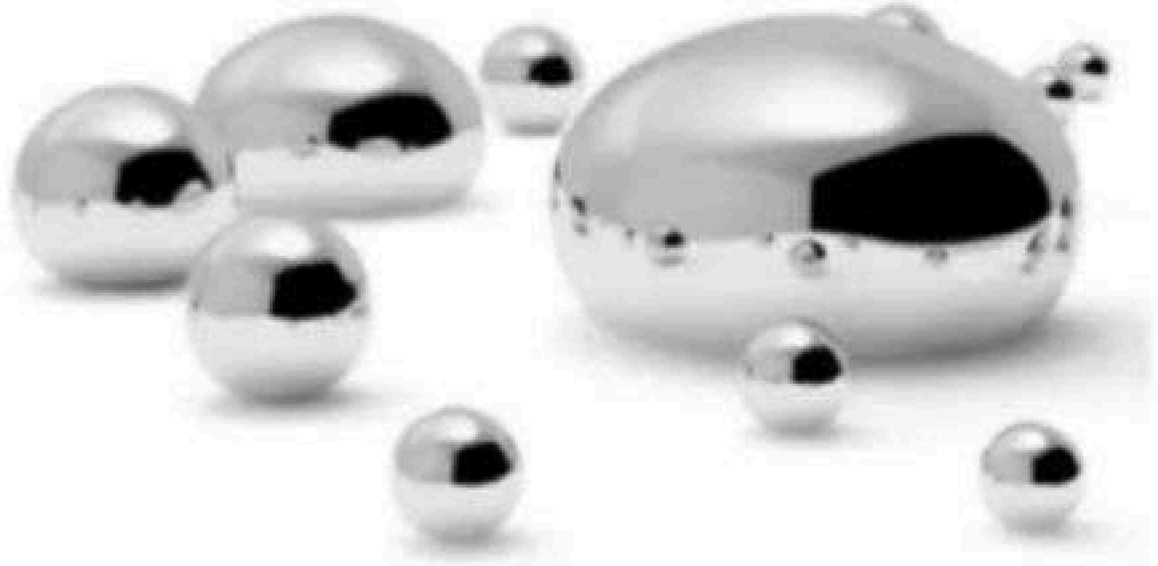
What is Surface Tension ?

- Surface Tension is defined as the tension of the surface film of a liquid caused by the attraction of the particles in the surface layer by the bulk of the liquid, which tends to minimize surface area.

- It is due to the phenomena of surface tension that the drops of water tend to assume a spherical shape to attain minimum surface area.

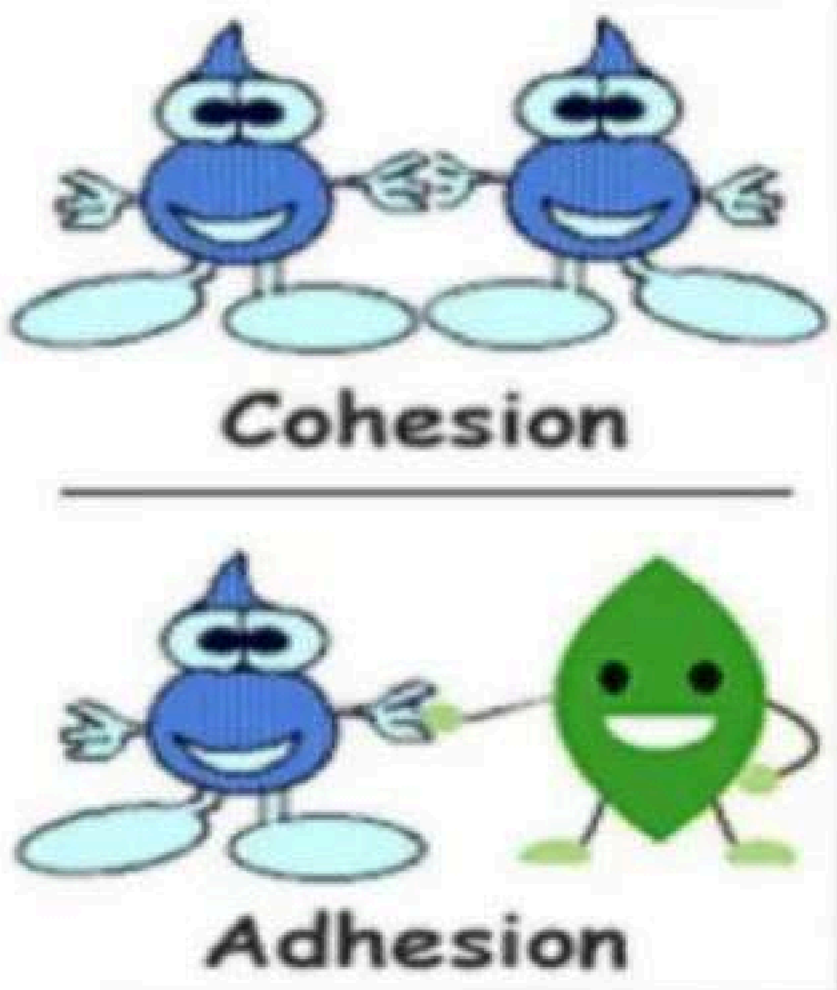
The surface tension decreases with rise in temperature and becomes zero at the critical temperature.

Ex. of surface tension :-
Small drops of mercury are spherical, while large ones are flat.



Adhesion and Cohesion

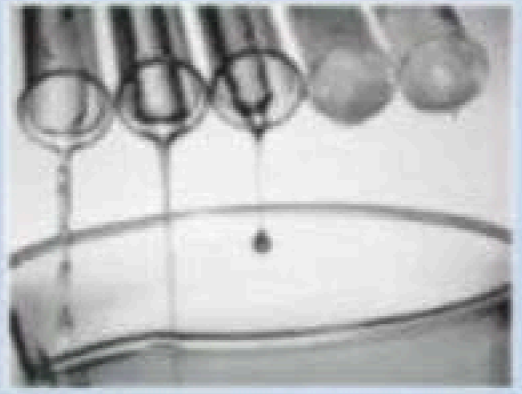
- The attraction between two like molecules is **cohesion.**
- The attraction between two unlike molecules is **adhesion**.
- Adhesion and cohesion are *inter*molecular forces between two molecules.



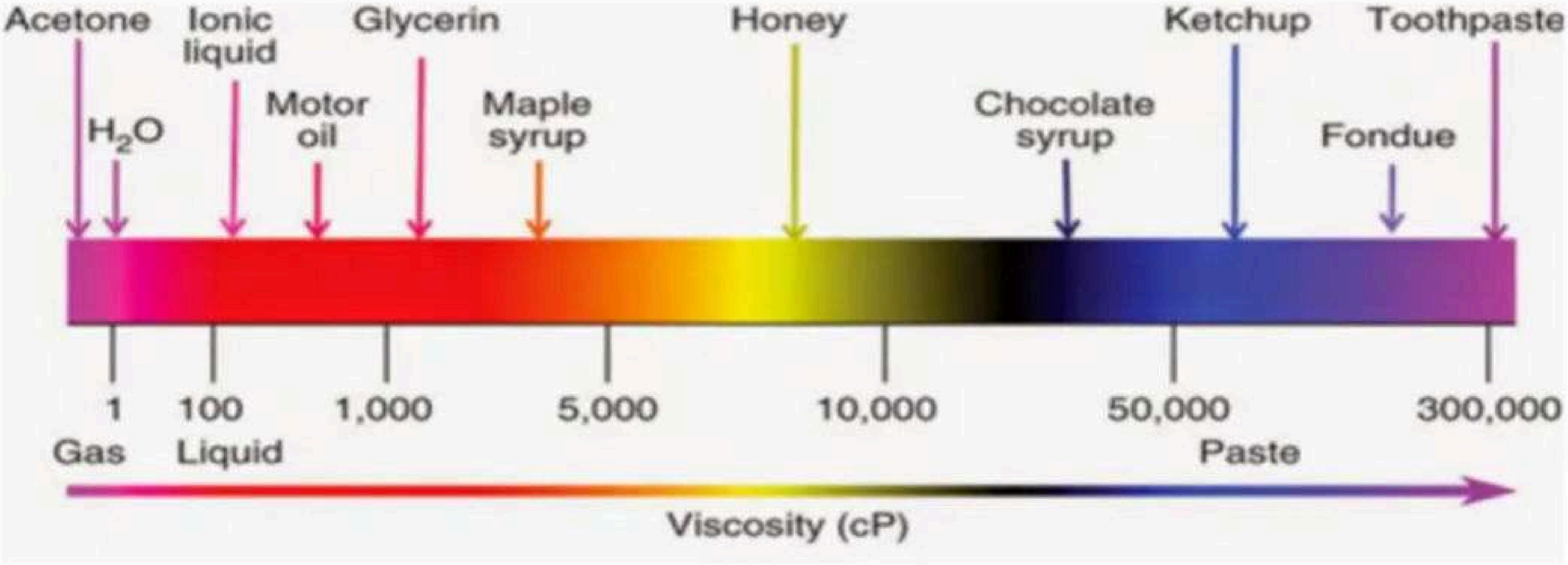
- Viscosity of gases is much less than that of liquids. Viscosity of a fluid is measured by its coefficient of viscosity. Its SI unit is decapoise (kg per meter per second) or pascal-second.

What is Viscosity?

- *Viscosity is the physical property of a fluid that limits its ability to flow*
- *Viscosity only applies to fluids (liquids and gases) because solids do not flow.*
- ***The higher a fluid's viscosity, the slower it flows.***
- ***The lower a fluid's viscosity, the easier/faster it flows.***



In this example, viscosity increases from left to right (left has lowest viscosity, right has highest viscosity)



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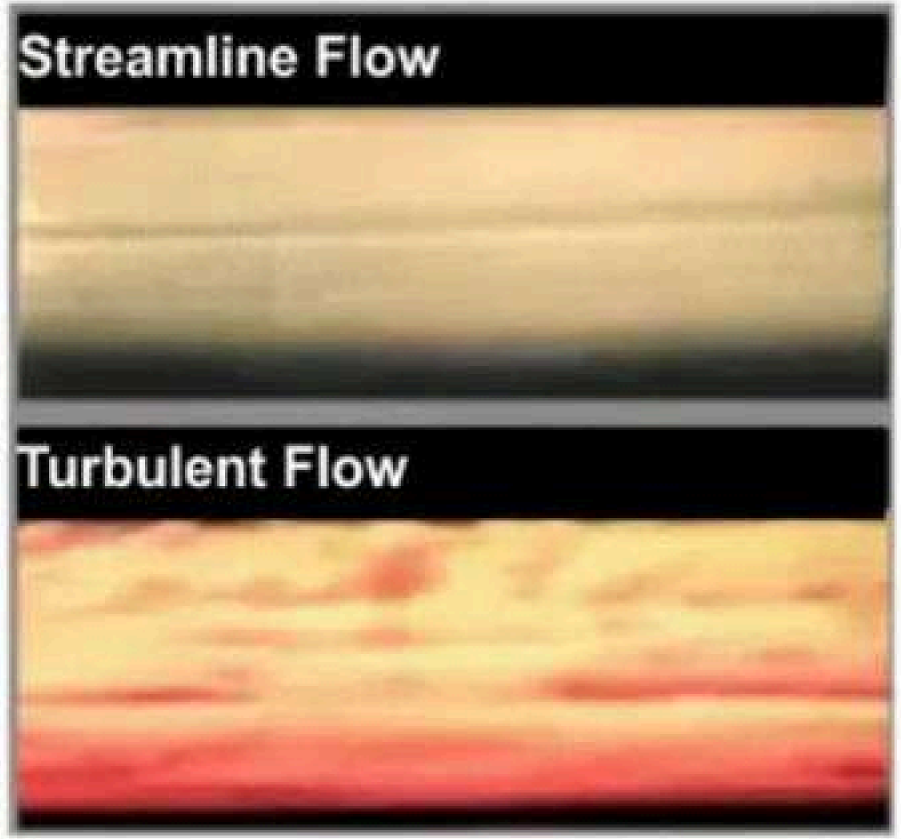
STREAMLINE FLOW & TURBULENT FLOW

Streamline Flow
In this type of flow, velocity at every point in the fluid remains same.

Turbulent Flow
The fluid does not maintain constancy of the velocity of its fluid particle.



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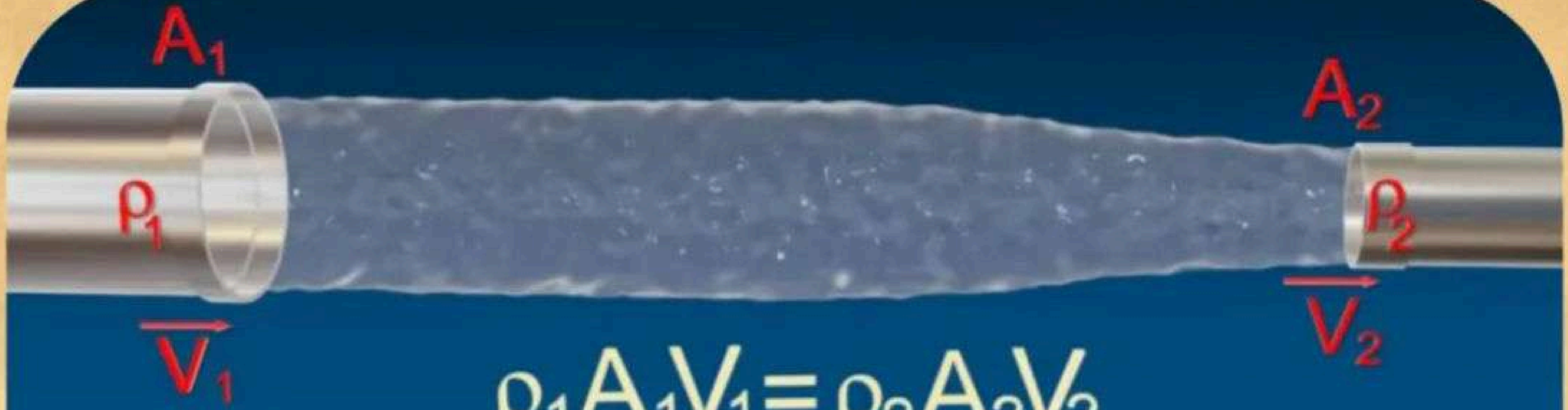


$$\rho_1 A_1 V_1 = \rho_2 A_2 V_2$$

$$\rho_1 = \rho_2$$

Bernoulli's Theorem

- **Total energy per unit volume (pressure energy + kinetic energy + potential energy) is constant.**

Q.62) Why the needle of iron swims on water surface when it is kept gently? लोहे के एक सुई को पानी के सतह पे आराम से रखने पर वो तैरने क्यों लगती है ?

(A) Surface tension / पृष्ठ तनाव
(B) Density / घनत्व
(C) Reaction / अभिक्रिया
(D) Momentum /संवेग

(A) Surface tension / पृष्ठ तनाव

Q.63) A boat will not submerge when it displaces water equal to its own- / एक नाव अपने .... के बराबर पानी विस्थापित करने पर जलमग्न रहेगी

(A) Volume / आयतन
(B) Weight / भार
(C) Surface area / पृष्ठीय क्षेत्रफल
(D) Density / घनत्व

(A) Volume / आयतन

Q.64) An ice block with a piece of lead embedded in it floats in water. If ice melts the water level- / बर्फ का एक ब्लॉक जिसमे की लेड अन्तर्निहित है, पानी पे तैरता है। बर्फ के पिघलने पर पानी का स्तर --

(A) Rises/उठता है
(B) Falls/गिरता है
(C) Remains same/वही रहता है
(D) Falls first and then rises/पहले गिरता है और फिर उठता है

(B) Falls

Q.65) What principle/law explains the working of the hydraulic brakes in automobiles?

ऑटोमोबाइल के हाइड्रोलिक ब्रेक के कार्य करने का सिद्धांत है-

(A) Bernoulli's law/बर्नोली का सिद्धांत

(B) Poiseuille's principle/पॉइज़ुइल का सिद्धांत

(C) Pascal's law/पास्कल का सिद्धांत

(D) Archimedes' principle/आर्किमिडीज का सिद्धांत

(C) Pascal's law

Q.66) An oil drop spreads over water because-
तेल की बूँद पानी पर फैल जाती है
(A) Oil is lighter than water/तेल पोंनी से हल्का होता है
(B) Oil is more viscous/तेल अधिक श्यान होता है
(C) Oil does not mix with water/तेल पानी में नहीं घुलता है
(D) Surface tension of oil is much smaller than that of water/तेल का पृष्ठ तनाव पानी से बहुत कम होता है

(D) Surface tension of oil is much smaller than that of water

Q.67) A fountain pen works on the principle of-
एक फाउण्टेन पेन किस सिद्धांत पर कार्य करता है
(A) Flow of liquids from higher to lower potential/द्रवों का उच्च से निम्न विभव की ओर प्रवाह
(B) Capillary action/केशिका क्रिया
(C) Bernoulli's principle/बर्नोली का सिद्धान्त
(D) Viscosity of liquids/द्रवों की श्यानता

(B) Capillary action

Q.68) The hair of shaving brush clings together when removed from water due to-

पानी से निकलने पर सेविंग ब्रश के बाल आपस में चिपक जाते हैं । इसका कारण है ?

(A) Surface tension/पृष्ठ तनाव

(B) Viscosity/श्यानता

(C) Elasticity/प्रत्यास्थता

(D) Friction/घर्षण

(A) Surface tension

Q.69) A falling drop of rain water acquires the spherical shape due to-

वर्षा की बूंद गोलाकार क्यों होती है?

(A) Viscosity/श्यानता के कारण

(B) Surface Tension/पृष्ठ तनाव के कारण

(C) Atmospheric pressure/वातावरण घर्षण के कारण

(D) Gravitational force/गुरुत्वाकर्षण के कारण

(B) Surface Tension

Q.70) The modulus of rigidity is the ratio of- / कठोरता का मापांक अनुपात है -

(A) longitudinal stress to longitudinal strain
(B) Volume stress to volume strain
(C) Shearing stress to shearing strain
(D) Tensile stress to tensile strain

(C) Shearing stress to shearing strain

Q.71) A spherical ball made of steel when dropped in mercury container will-

लोहे से बनी एक गोलागार गेंद को जब पारे के बर्तन में गिराया जायेगा तो-

(A) Sink in mercury/पारे में डूब जायेगी

(B) Will be on the surface of mercury/पारे की सतह पर रहेगी

(C) Will be partly immersed/आंशिक रूप से डूबेगी

(D) Will dissolve in mercury/पारे में घुल जायेगी

(B) Will be on the surface of mercury

Q.72) Which of the following is a result of surface tension?
निम्न में से कौन सतह पर तनाव का एक परिणाम है?
(A) Gravitational pull
(B) Viscosity
(C) Capillary action
(D) Radiation

(C) Capillary action

Q.73) Which of the following liquid is most viscous?

निम्नलिखित में से कौन सा तरल सबसे चिपचिपा है?

(A) Oil

(B) Milk

(C) Water

(D) Petrol

(A) Oil

Q.74) The surface tension of water on adding detergent to it-

पानी के साथ डिटर्जेंट मिलाने पर उसका पृष्ठ तनाव घटता है या बढ़ता?

(A) Increases

(B) Decreases

(C) No change

(D) Becomes zero

(B) Decreases

Q.75) Rise of oil in a wick is due to-

एक बाती में तेल का उठाव किसके कारण होता है-

(A) Density of the oil/तेल के घनत्व के कारण

(B) Viscosity of the oil/तेल की श्यानता के कारण

(C) Surface tension of the oil/तेल की पृष्ठ तनाव के कारण

(D) Pressure of the oil/तेल के दबाव के कारण

(C) Surface tension of the oil

Q.76) Ball pen functions on the principle of-
बॉल पेन किसके सिद्धांत पर कार्य करता है?
(A) Viscosity/श्यानता
(B) Boyle's law/बॉयल का नियम
(C) Gravitational force/गुरुत्वीय बल
(D) Surface tension/पृष्ठीय तनाव

(D) Surface tension

Q.77) Water drops cannot stick to the oily surface due to-
जल की बूंदें, तैलीय सतह से चिपक नहीं सकती हैं
(A) Lack of adhesive force/आसंजक बल की कमी
(B) Surface tension /पृष्ठ तनाव
(C) Cannot mix each other/आपस में मिल नही सकते
(D) Water is lighter than oil/तेल की अपेक्षा जल हल्का होता है

(B) Surface tension

Q.78) Materials for rain proof coats and tents owe their water proof properties to- / रैन प्रूफ कोट और टेंट के लिए इस्तेमाल होने वाला पदार्थ की जल रोधक गुण इनमे से किसके कारण है -

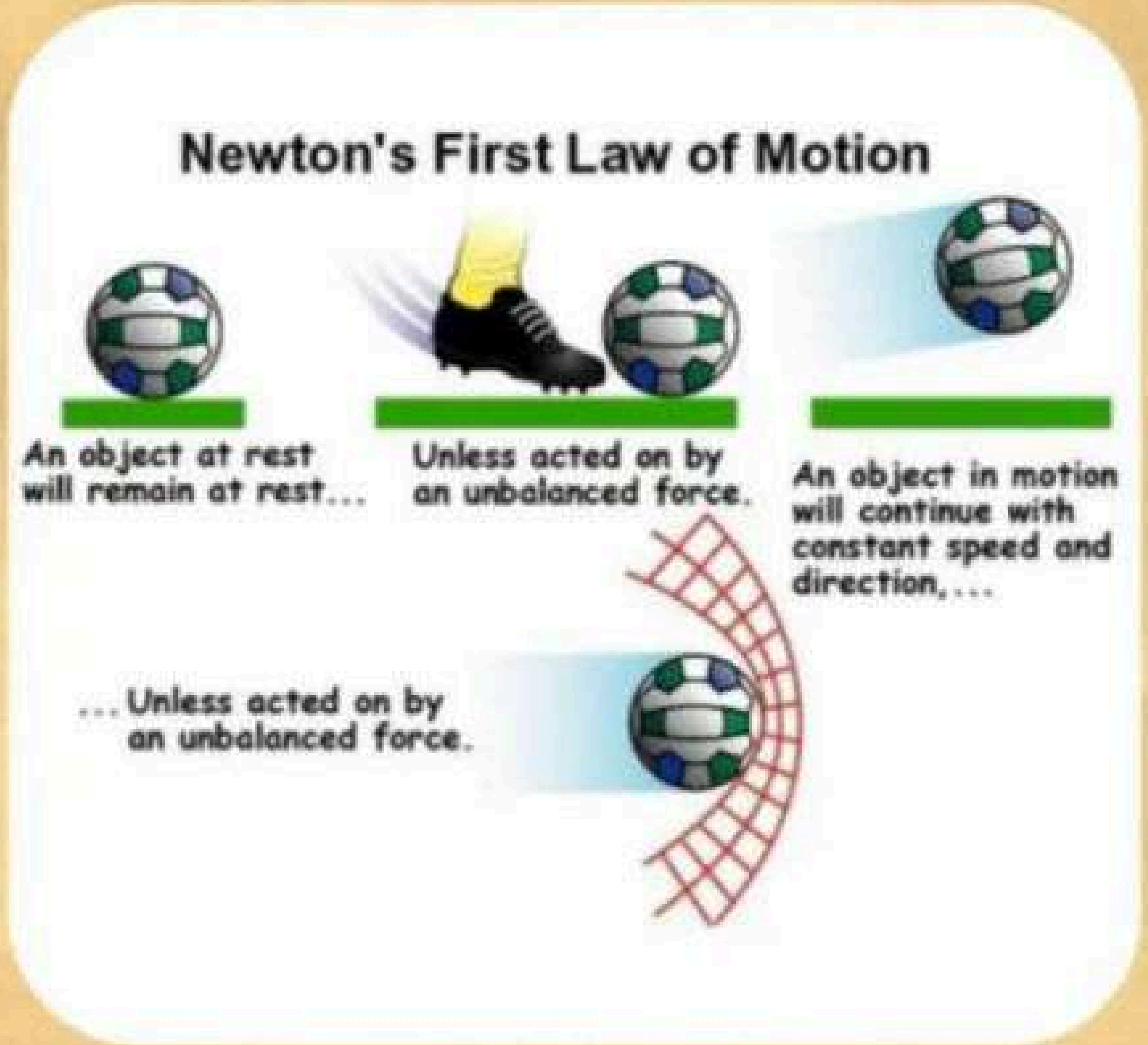
(A) Surface tension/ पृष्ठ तनाव
(B) Viscosity /श्यानता
(C) Specific gravity /विशिष्ट गुरुत्व
(D) Elasticity /लचीलता

(A) Surface tension

Q.79) Purity of a metal can be determined with the help of
धातु की शुद्धता का निर्धारण किस की सहायता से किया जा सकता है?
(A) Pascal's law
(B) Boyle's law
(C) Archimedes principle
(D) Conservation of mass principle

(C) Archimedes principle

Newton's First Law of Motion



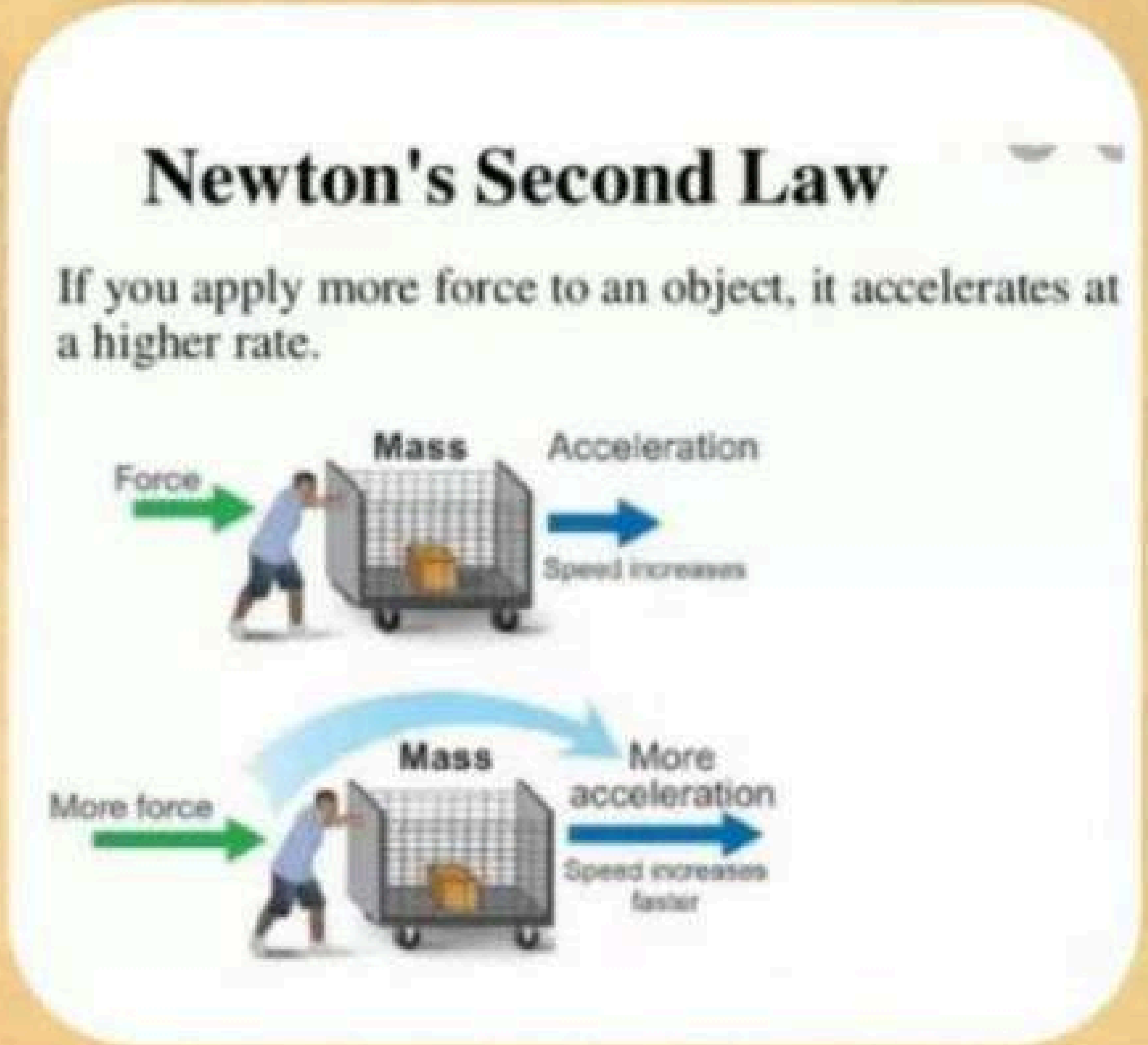
It states that every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force.

This is normally taken as the definition of inertia.

The First law can be stated mathematically as

$$\sum F = 0 \Rightarrow \frac{dv}{dt} = 0$$

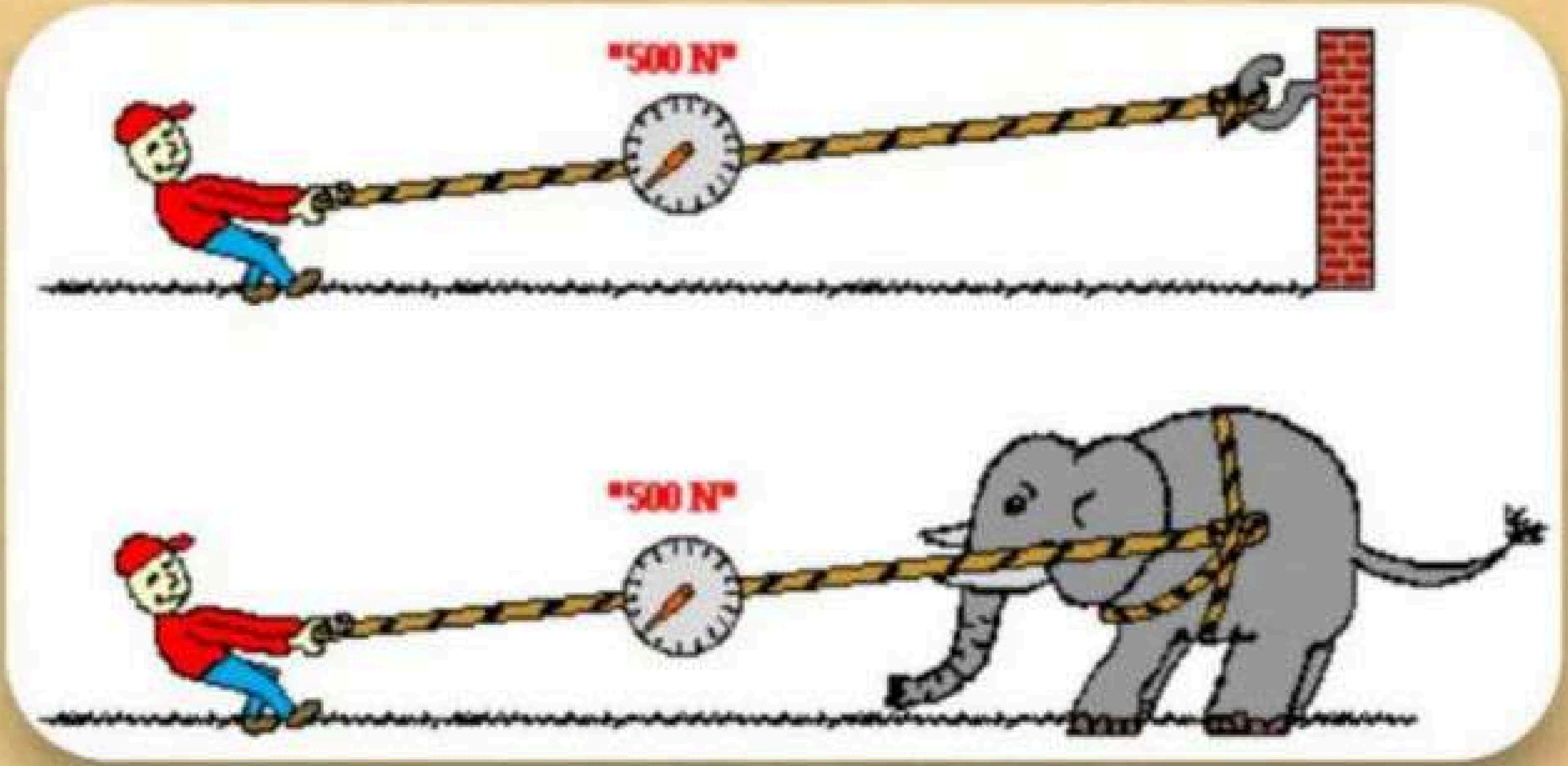
Newton's Second Law of Motion



It explains how the velocity of an object changes when it is subjected to an external force.
It defines a force to be equal to change in momentum (mass times velocity) per unit change in time.
For an object with a constant mass m, the second law states that the force (F) is the product of an object's mass (m) and its acceleration (a):

$$F = m\frac{dv}{dt} = ma$$

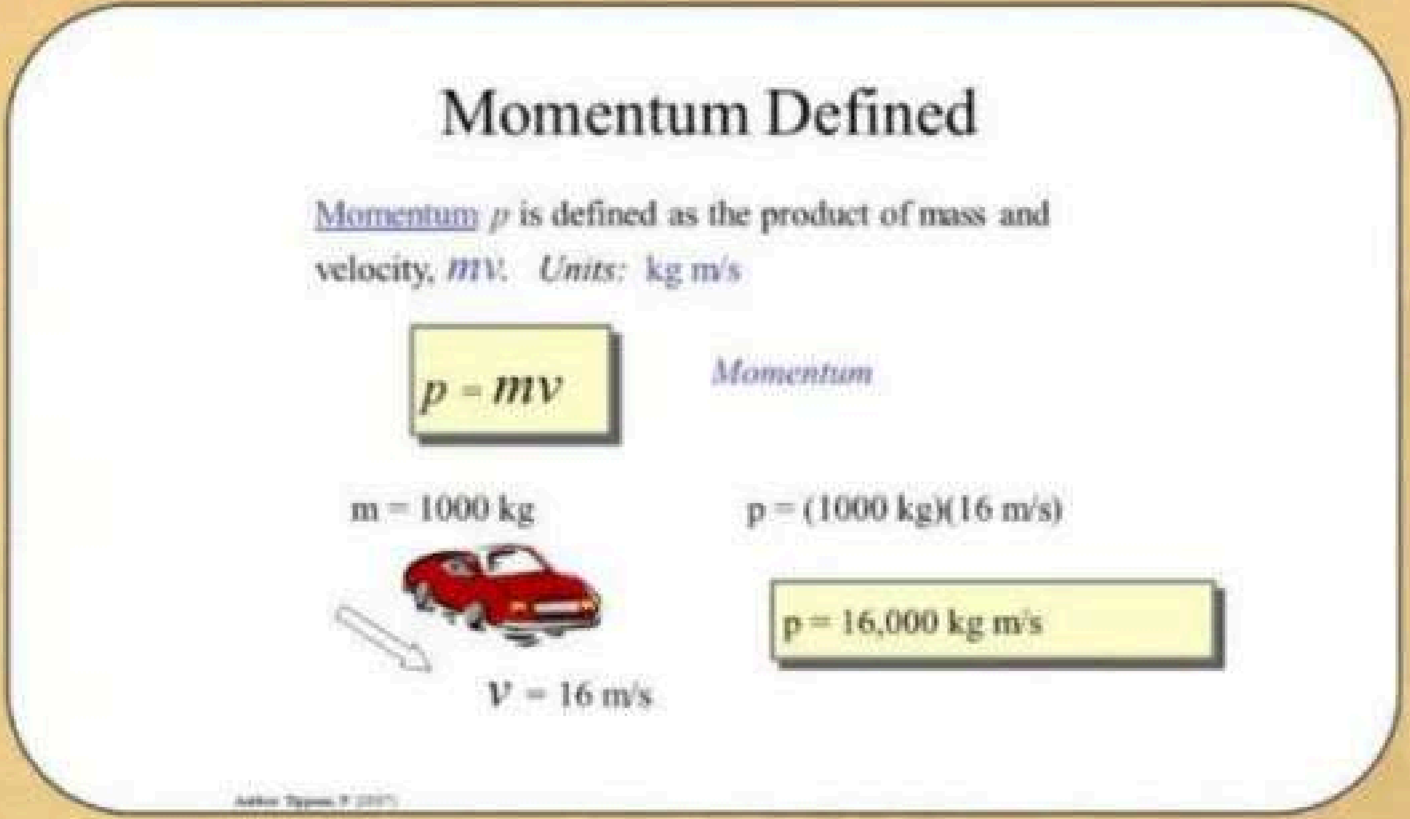
Newton's Third Law of Motion



Every action has an equal and opposite reaction.

The third law states that all forces exist in pairs: If one object A exerts a force FA on a second object B, then B simultaneously exerts a force FB on A, and the two forces are equal and opposite ⇨ $F_A = -F_B$

Momentum (p)



It can be also defined as "mass in motion."

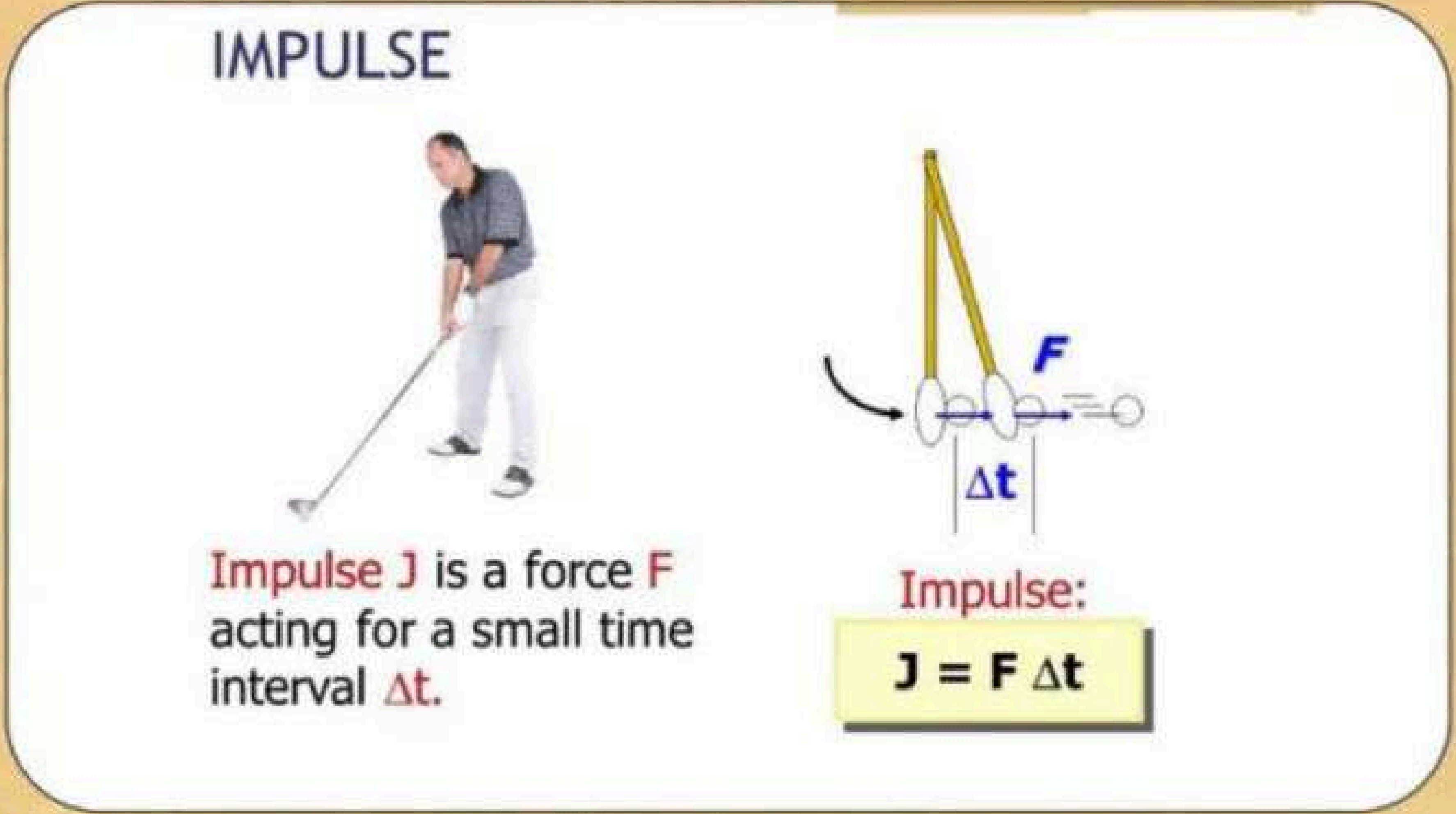
Linear momentum or translational momentum is the product of the mass and velocity of an object.

It is a vector quantity.

$$p = mv$$

Where p = linear momentum, m = mass, v = velocity

Impulse (I) or (J)

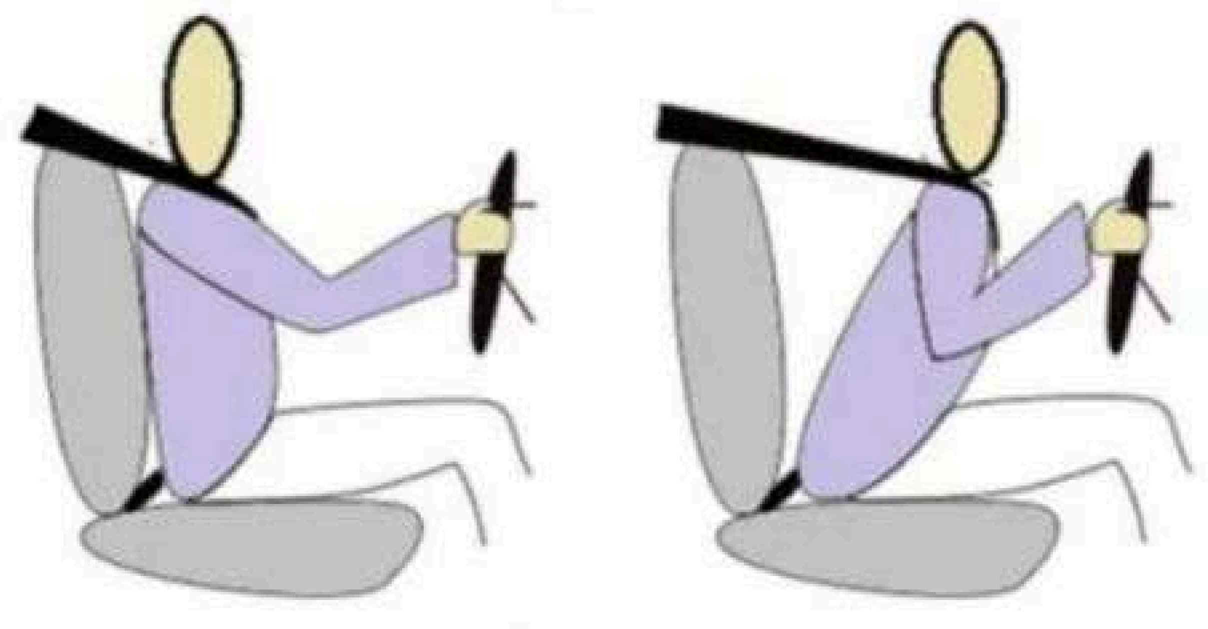


It is defined as the integral of a force with respect to time.

Its unit is newton second (Ns)

The quantity of impulse is force × time interval.

Inertia


Because of inertia you feel jerk when brakes are applied

It is the tendency of objects to keep moving in a straight line at constant velocity.

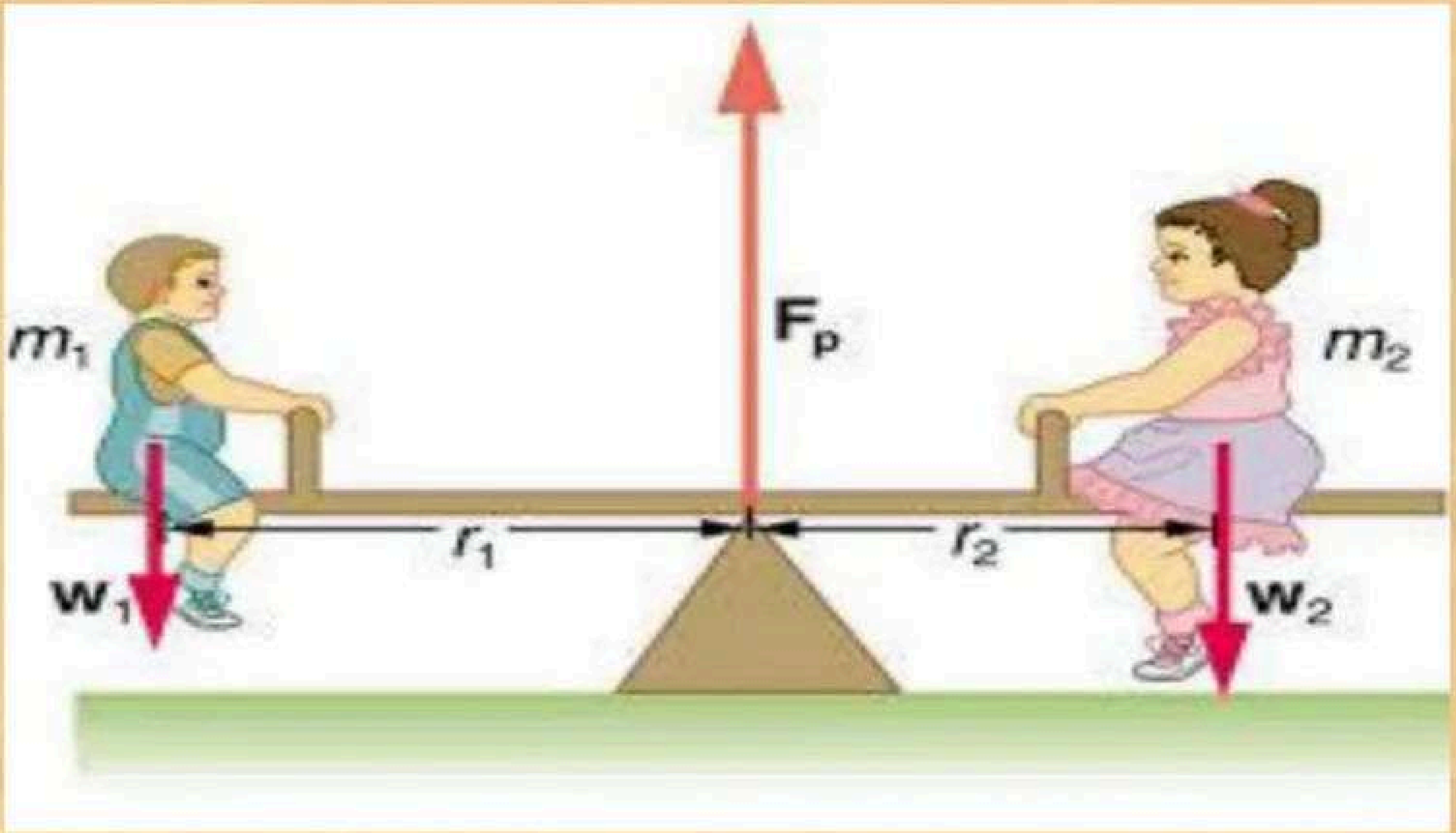
Types of Inertia:

Inertia of Rest

Inertia of Motion

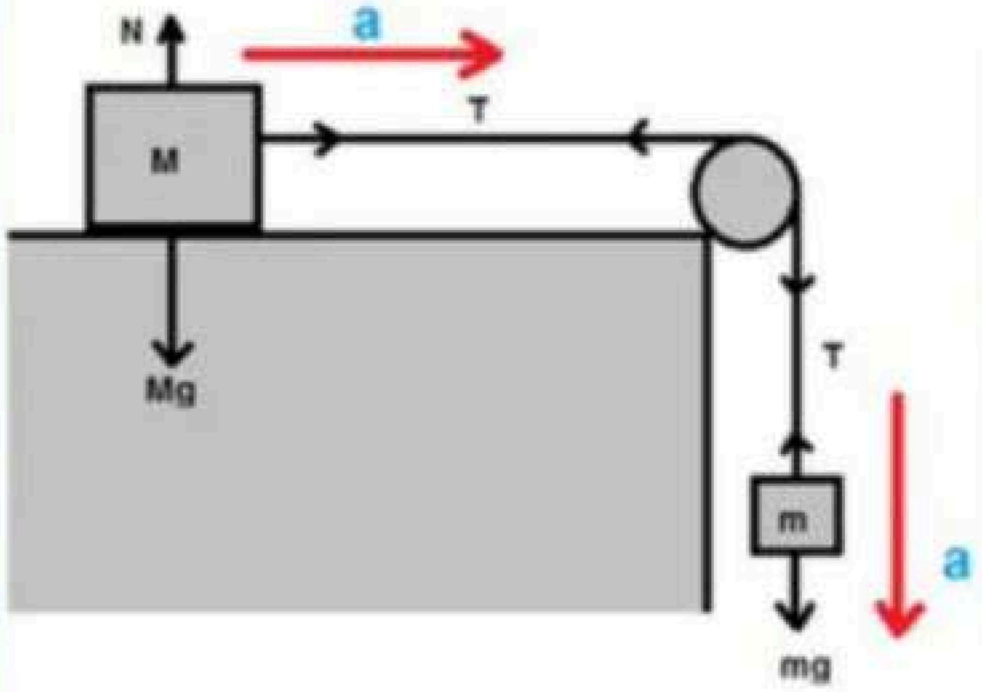
#Graphic By Aman Srivastava

Equilibrium



It is the condition of a system when neither its state of motion nor its internal energy state tends to change with time.

Friction (μ)



It is the force between surfaces in contact that resists their relative tangential motion (slipping).

The force of friction is a force that resists motion when two objects are in contact.

Rolling Friction occurs when an object rolls over another (something with wheels or that is circular like a ball). e.g. riding a motorcycle

Fluid Friction occurs when an object moves through a fluid, meaning either a liquid or gas. e.g. skydiving, swimming

Sliding Friction occurs when solid surfaces slide over each other. e.g. falling on the pavement

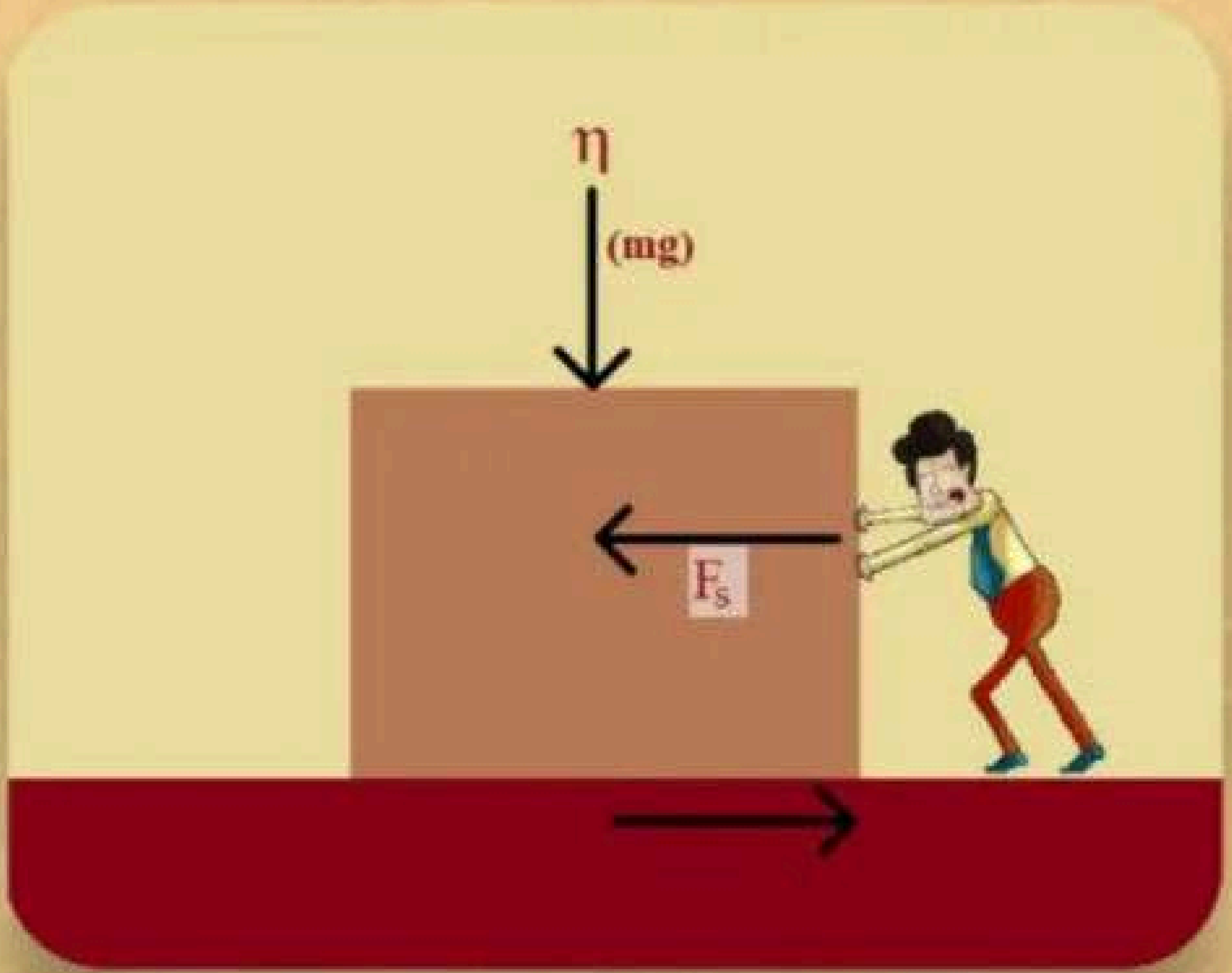
Lubricated friction is a case of fluid friction where a fluid separates two solid surfaces.

Skin friction is a component of drag, the force resisting the motion of a solid body through a fluid.

Internal friction is the force resisting motion between the elements making up a solid material while it undergoes deformation.

#Graphic By Aman Srivastava

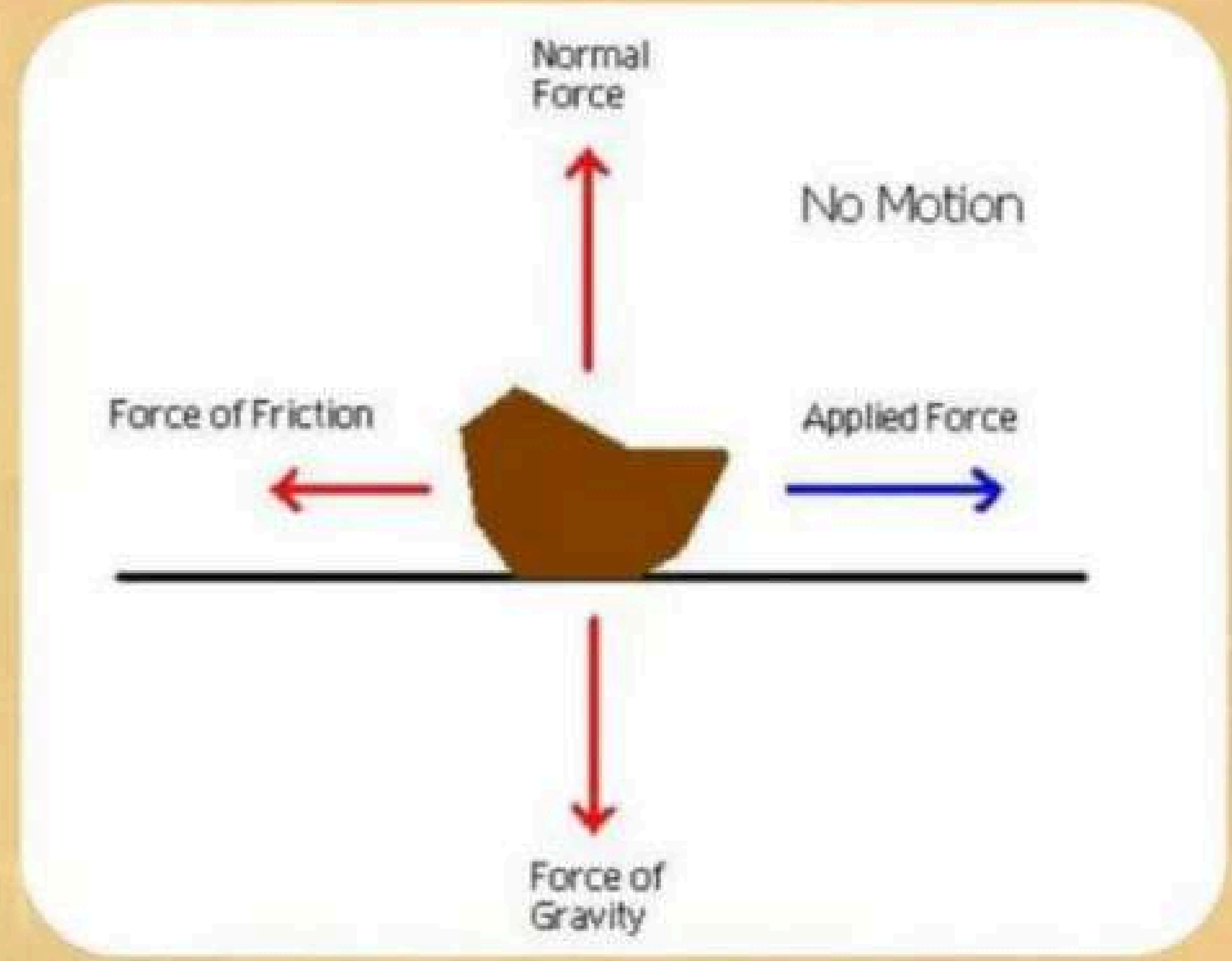
Static friction



The Force of Static Friction keeps a stationary object at rest!

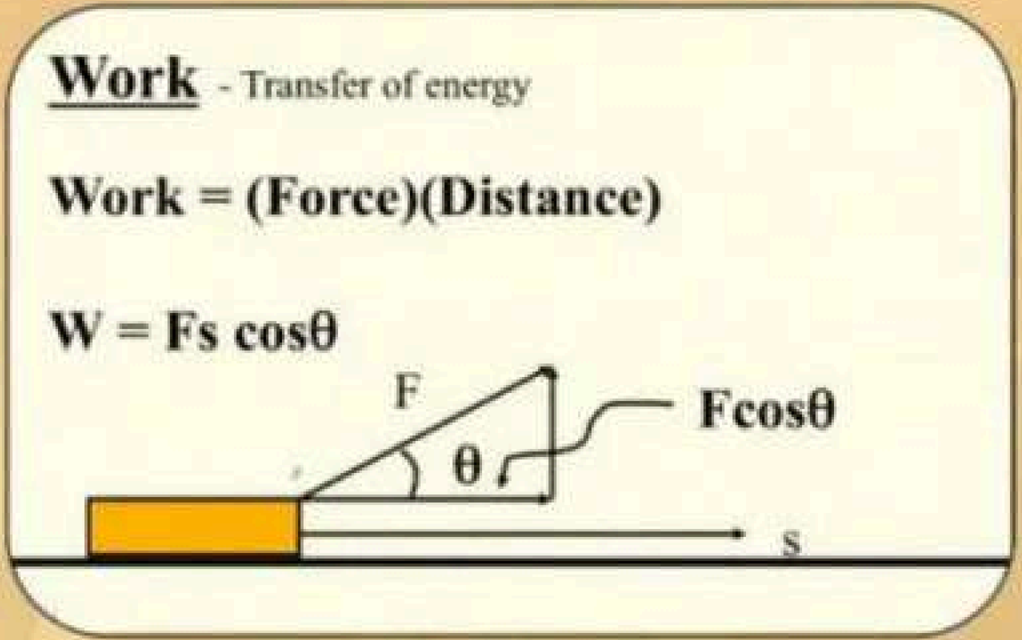
#Graphic By Aman Srivastava

Kinetic friction

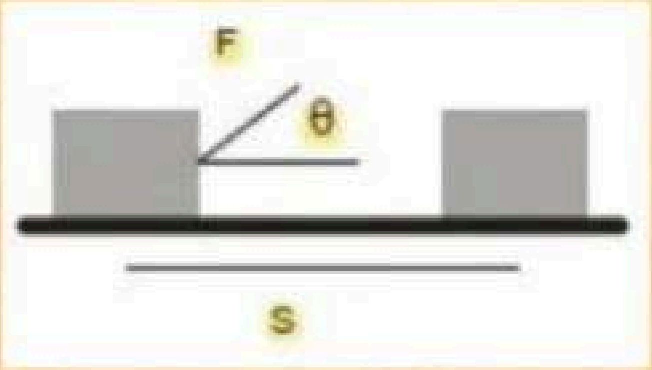


Once the Force of Static Friction is overcome, the Force of Kinetic Friction is what slows down a moving object!

Work (W)



Work done by the force is equal to the product of the force and the displacement of the object in the direction of force.
The SI unit of work is the newton-metre (N m) or joule (J) and CGS unit is erg.
Its dimensional formula is [ML2T-2].



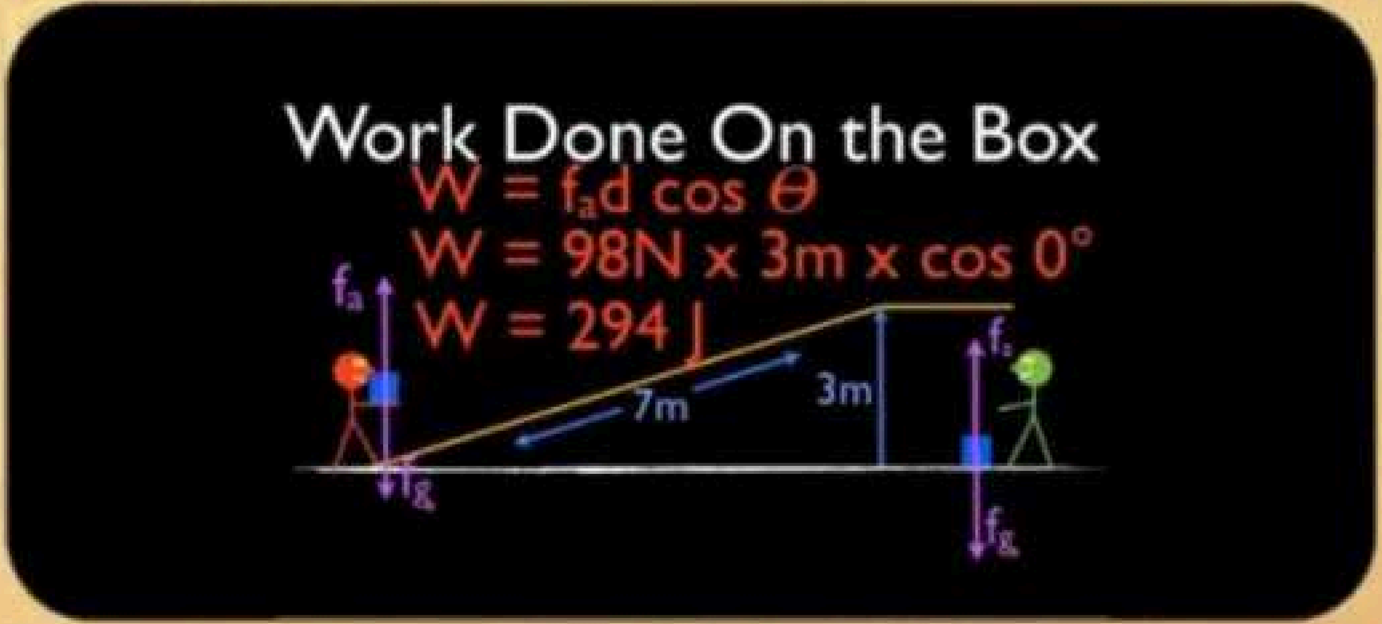
Where W = Work, F = Force, S = Displacement, θ = angle between force and displacement.

Work Maybe (+)ve, zero or (-)ve

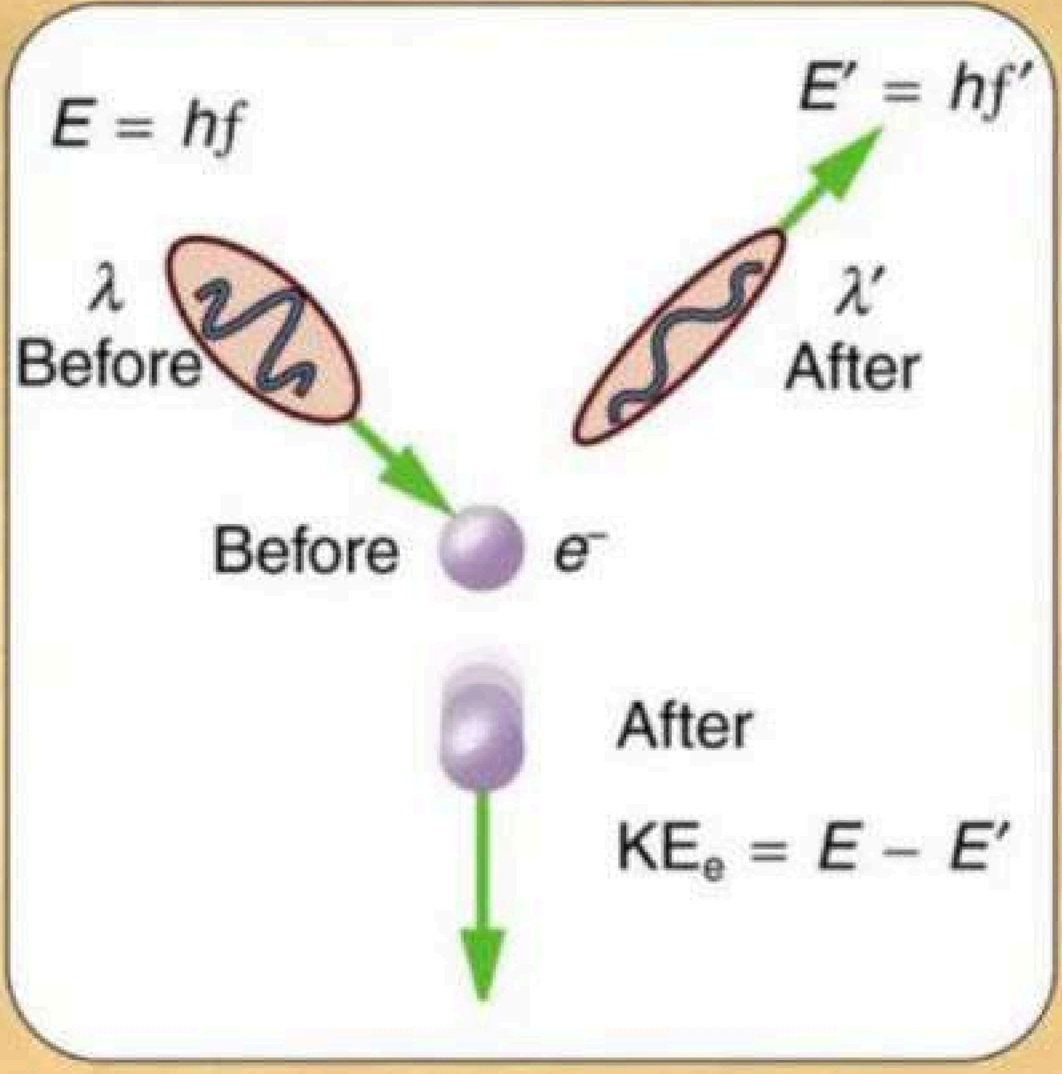
Work done by a force is zero, if
(a) body is not displaced actually, i.e., S = 0
(b) body is displaced perpendicular to the direction of force, i.e., $\theta = 90°$

Work done by a force is positive if the angle between F and S is an acute angle.

Work done by a force is negative if the angle between F and S is an obtuse angle.



Energy (E)

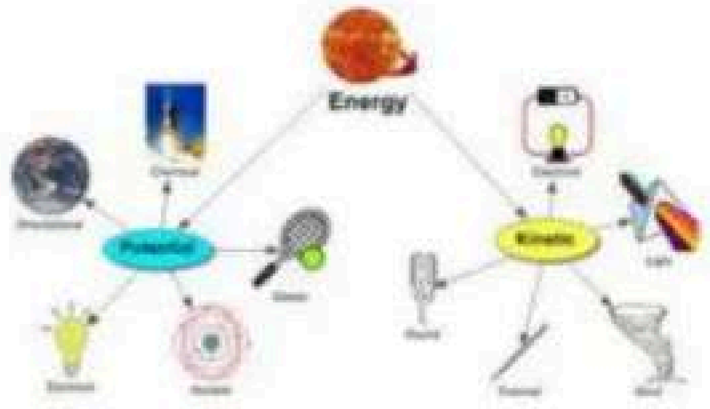


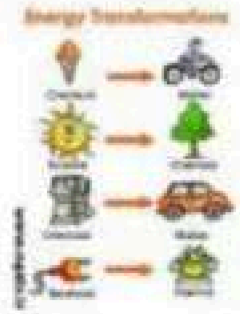
Energy of a body is its capacity for doing work.
It is a scalar quantity.
Its SI unit is newton-metre (N m) or joule and CGS unit is erg.
Its dimensional formula is $[ML^2T^{-2}]$

Law of Conservation of Energy

The Law of Conservation of Energy

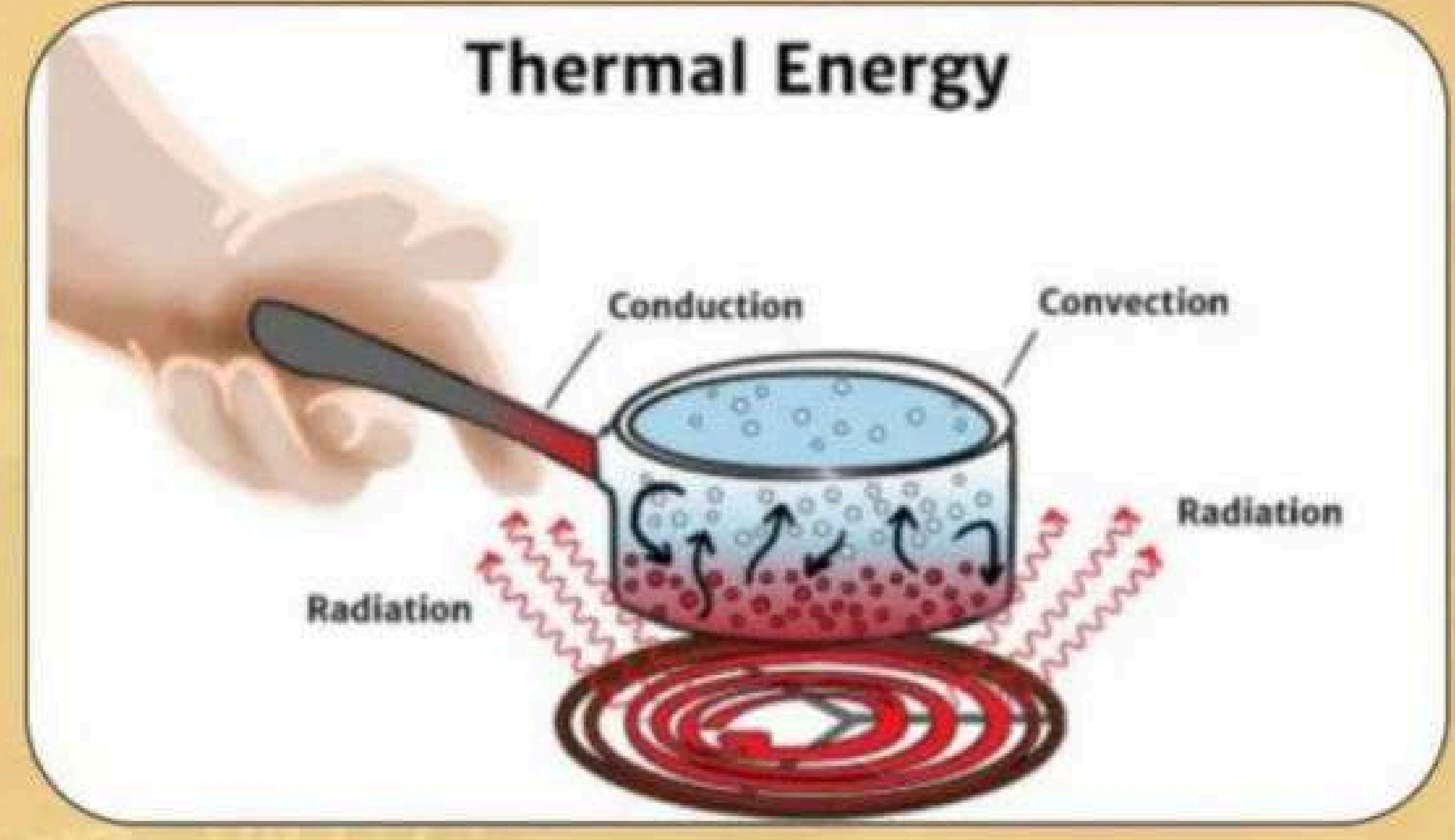
- **Energy is neither created or destroyed, however energy can change form**
- Energy can be transferred.





"Energy cannot be created or destroyed; it can only be changed from one form to another." - Albert Einstein

Thermal energy



It is the total kinetic energy of a substance's atoms and molecules. Atoms and molecules are constantly in motion. When thermal energy causes particles to move faster and farther apart, the result is a phase change (or change of state).

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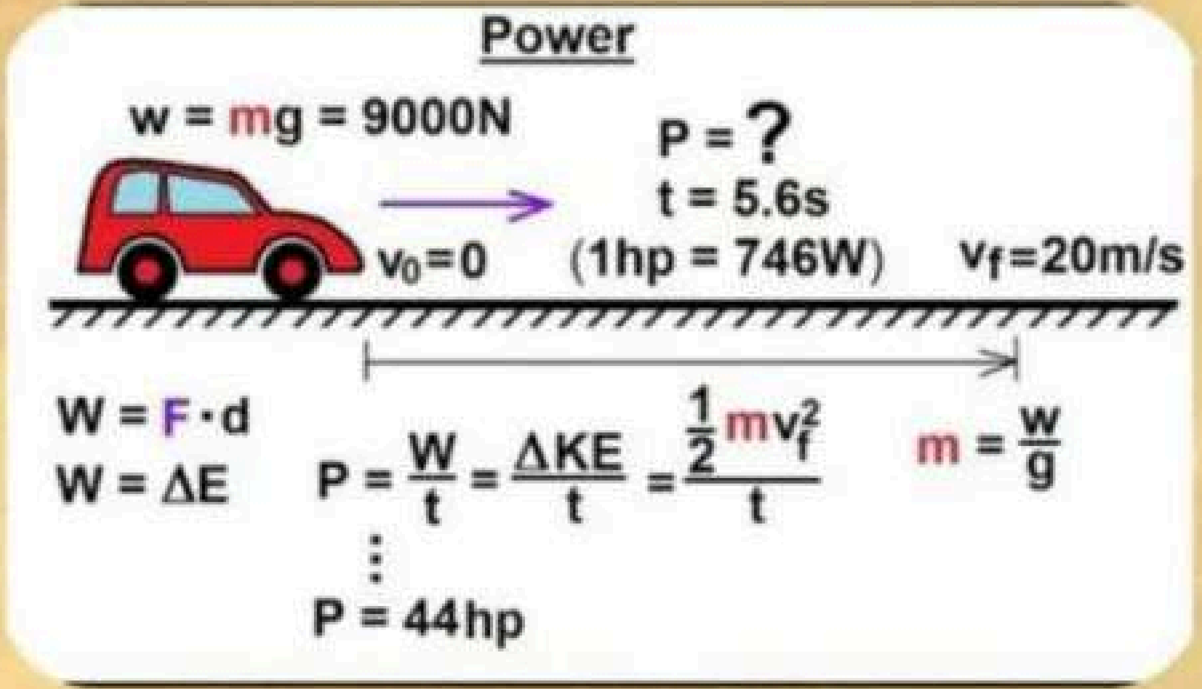
Power (P)



Rate of doing work by a body is called power (P).

$$\text{Power (P)} = \frac{\text{Work Done(W)}}{\text{Time Taken(t)}}$$

The unit of power is the joule per second (J/s), known as the watt (in honor of James Watt, the eighteenth-century developer of the Steam Engine).

1 W = 1 J/s

1 kW = 103 W

1 MW = 106 W

1 Horse-Power = 746 W

1 watt second (W-s) = 1 J

1 watt hour (W-h) = 3600 J

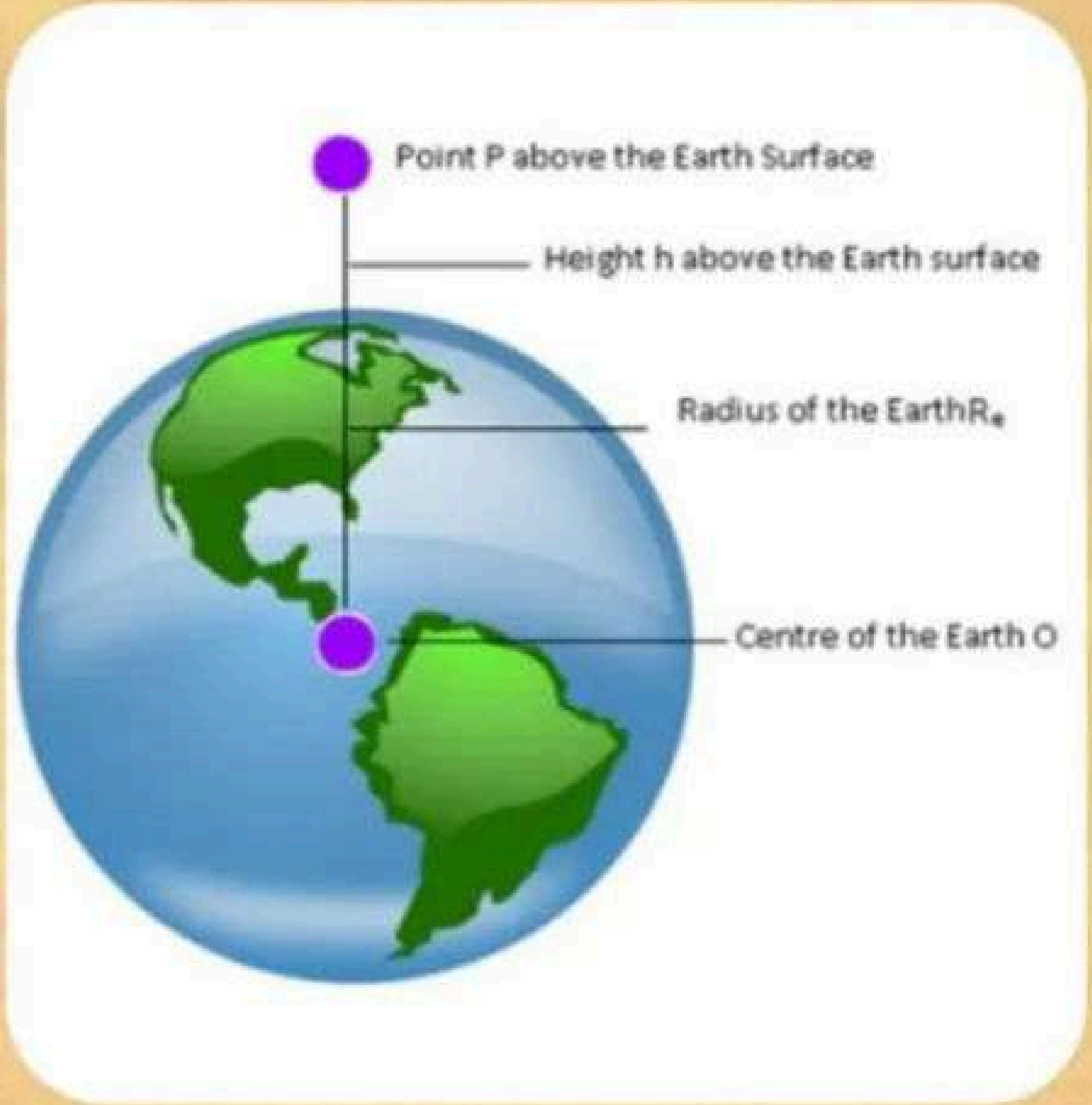
1 kilowatt hour (kW-h) = 3.6 x 106 J

GRAVITATION

"Every particle of matter in the universe attracts every other particle with a force that is directly proportional to the product of the masses of the particles and inversely proportional to the square of the distance between them."

#Graphic By Aman Srivastava

Gravity & Acceleration Due to gravity (g)



It is the force that attracts a body toward the center of the earth, or toward any other physical body having mass.

The gravity of Earth, denoted g, refers to the acceleration that the Earth imparts to objects on or near its surface.

Its unit is meters per second squared (in symbols, m/s2 or m·s−2) or equivalently in newtons per kilogram (N/kg or N·kg−1).

It has an approximate value of 9.8 m/s2.

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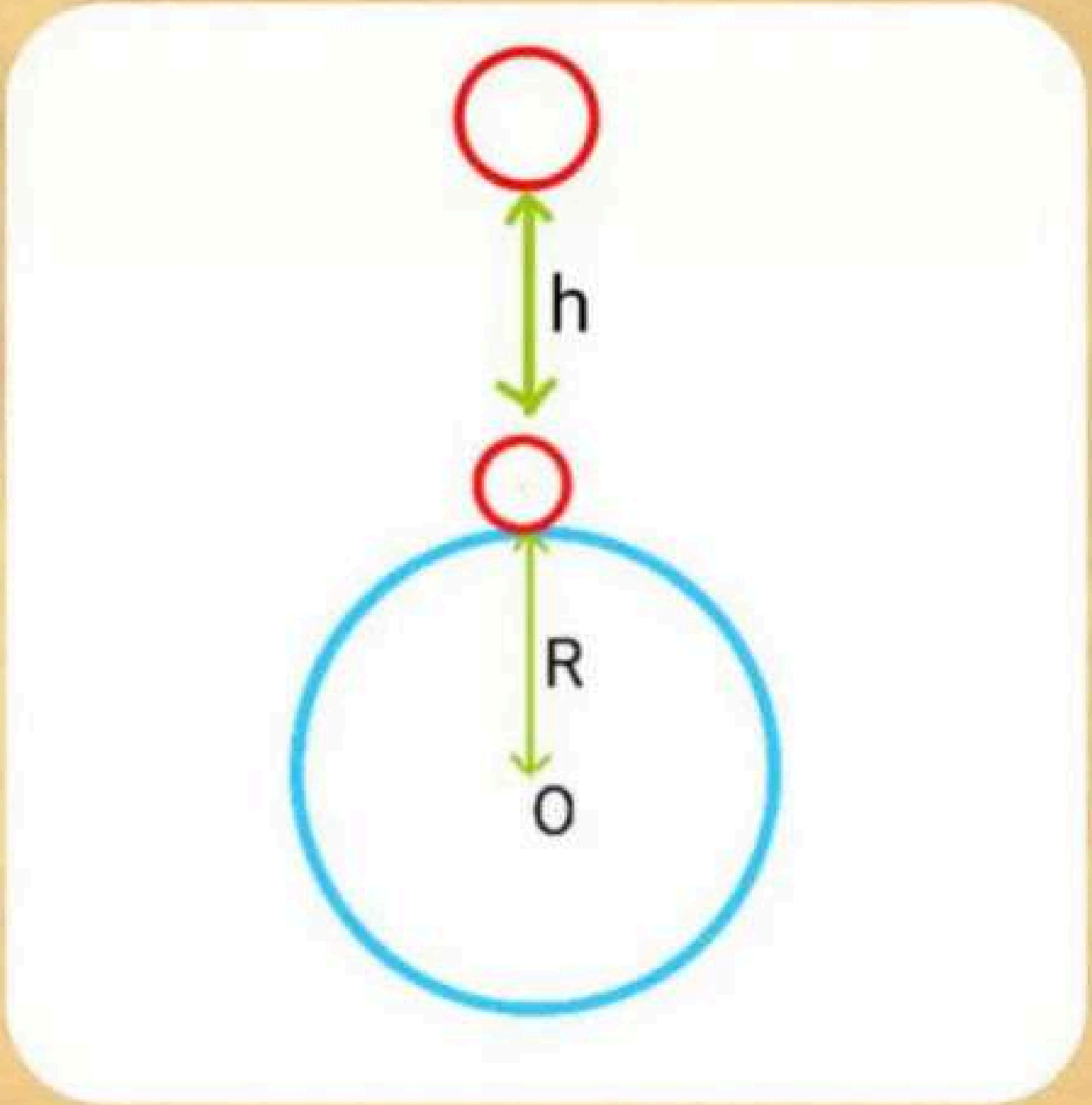
Variation in gravity (g)



Acceleration due to gravity decreases with increase in height/altitude.

g is maximum at poles.

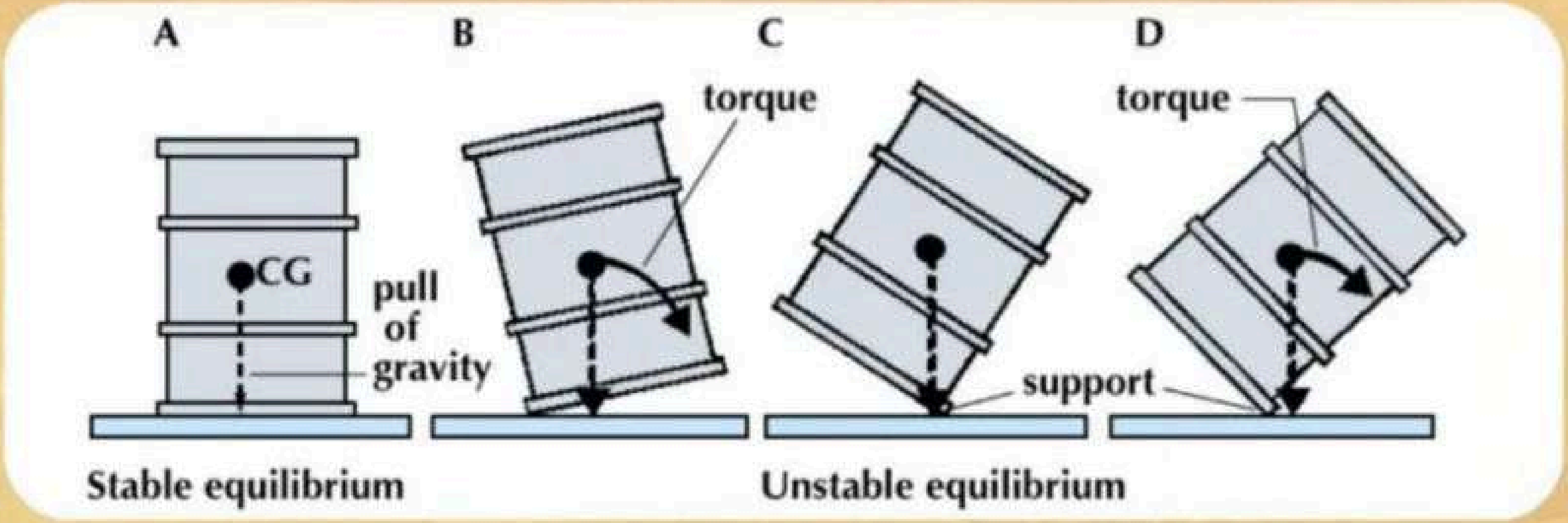
g is minimum at the equator.

g decreases due to rotation of earth.

g decreases if angular speed of earth increases and increases in angular speed of earth decreases.

#Graphic By Aman Srivastava

Centre of Gravity

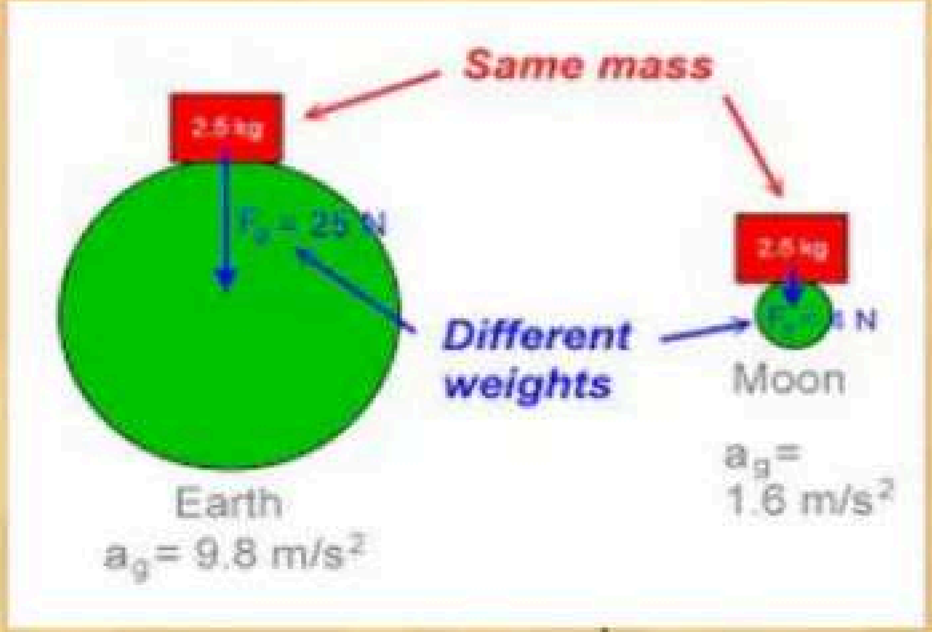


It is the point in a body around which the resultant torque due to gravity forces vanish. Near the surface of the earth, the center of gravity and the center of mass are the same.

Mass (m)

It is the quantity of matter in a body regardless of its volume or of any forces acting on it.
Its unit is the kilogram (kg).
mass = Force / acceleration [m = F/a]
mass = momentum / velocity [m = p/v]
mass = weight / acceleration of gravity [m = W/g]

Weight (W)



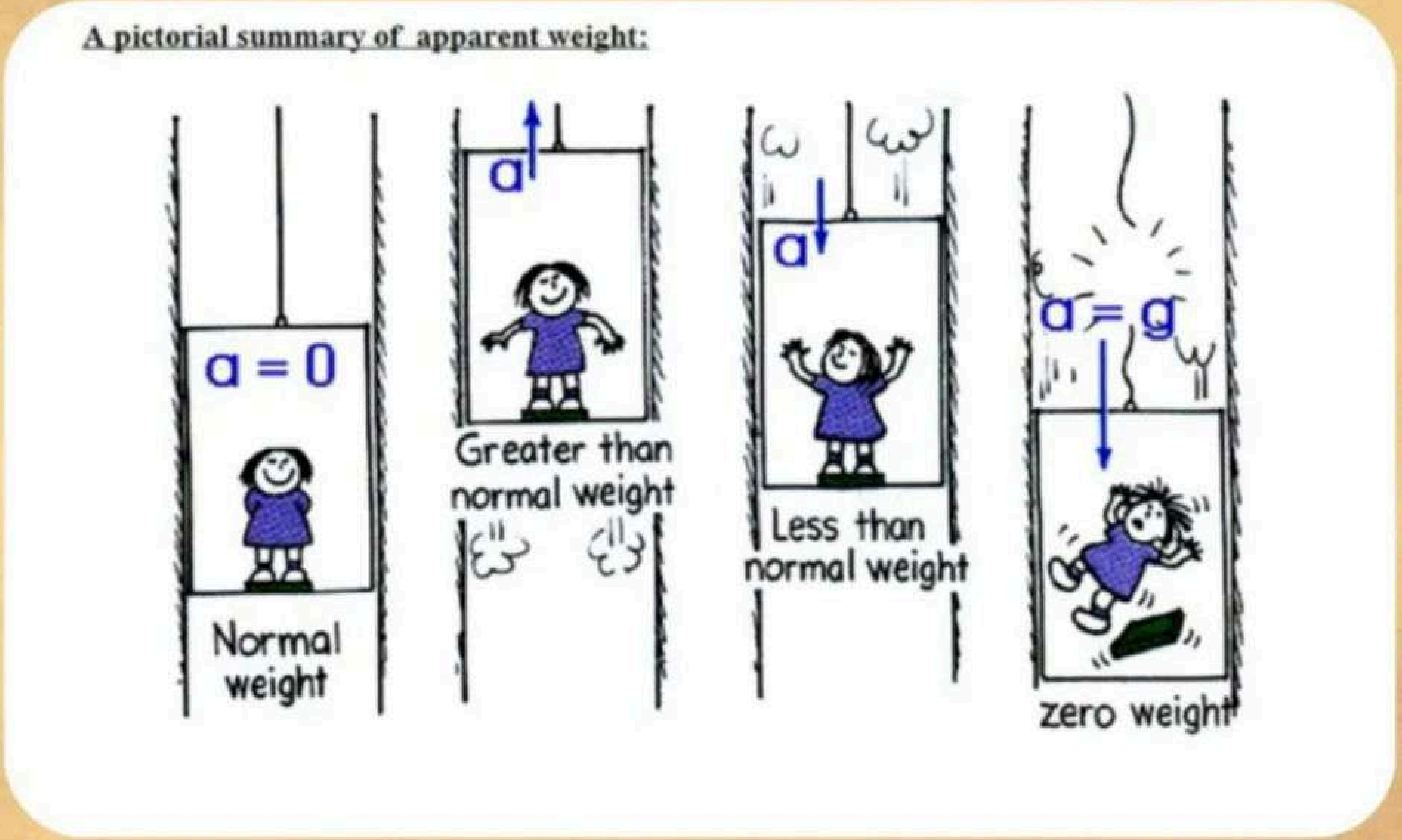
It is the force exerted on a body by gravity and calculated as the mass times the acceleration of gravity, w = mg.

Its unit is the newton (N).

W = mg

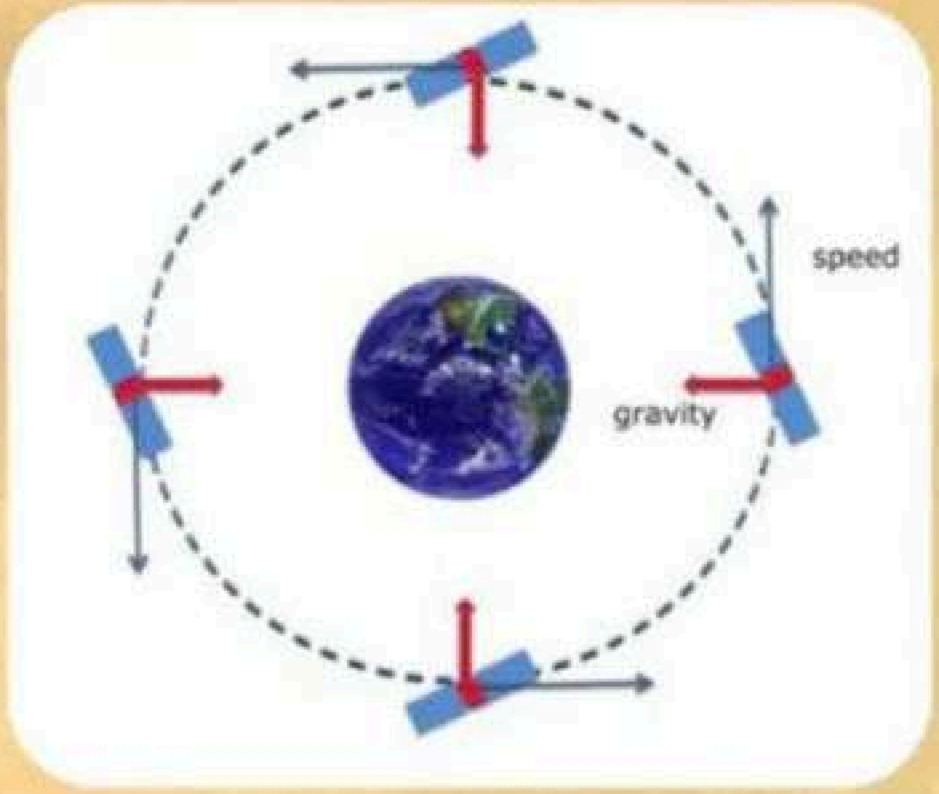
Weight of object = mass of object x acceleration of gravity

Weight of a Body in a Lift



#GRAPHICS BY - AMAN SRIVASTAVA

Satellite



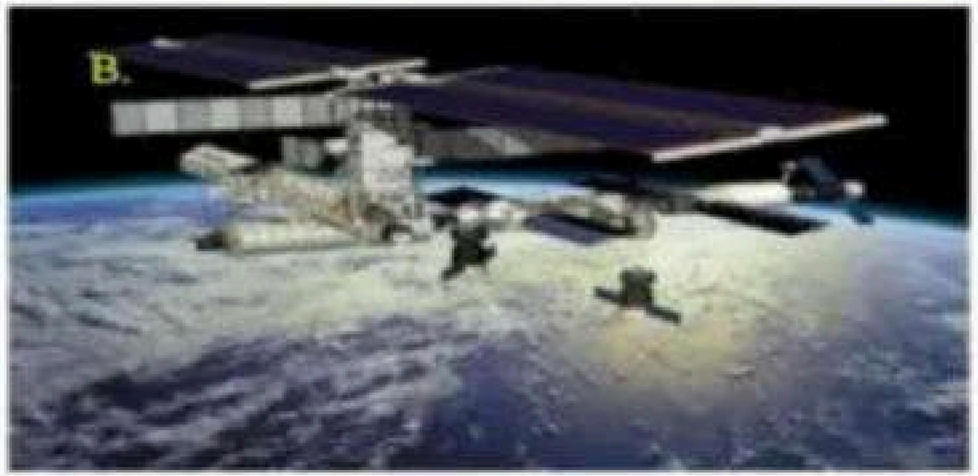
A satellite is a moon, planet or machine that orbits a planet or star. For example, Earth is a satellite because it orbits the sun. Likewise, the moon is a satellite because it orbits Earth.

The world's first artificial satellite, the Sputnik 1, was launched by the Soviet Union on Oct. 4, 1957.

Types of Satellite

Natural: Such as the moon orbiting around the earth

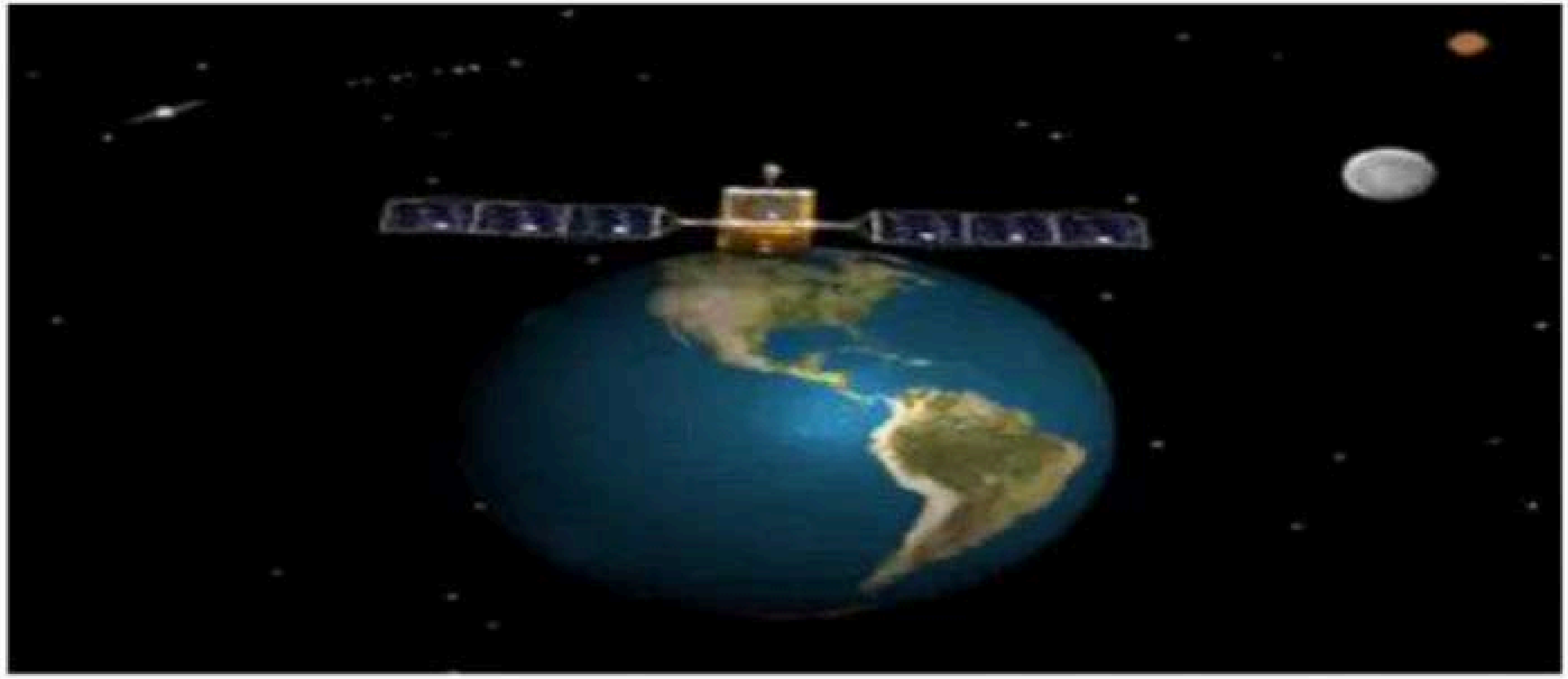
Artificial: The international space station orbiting the earth



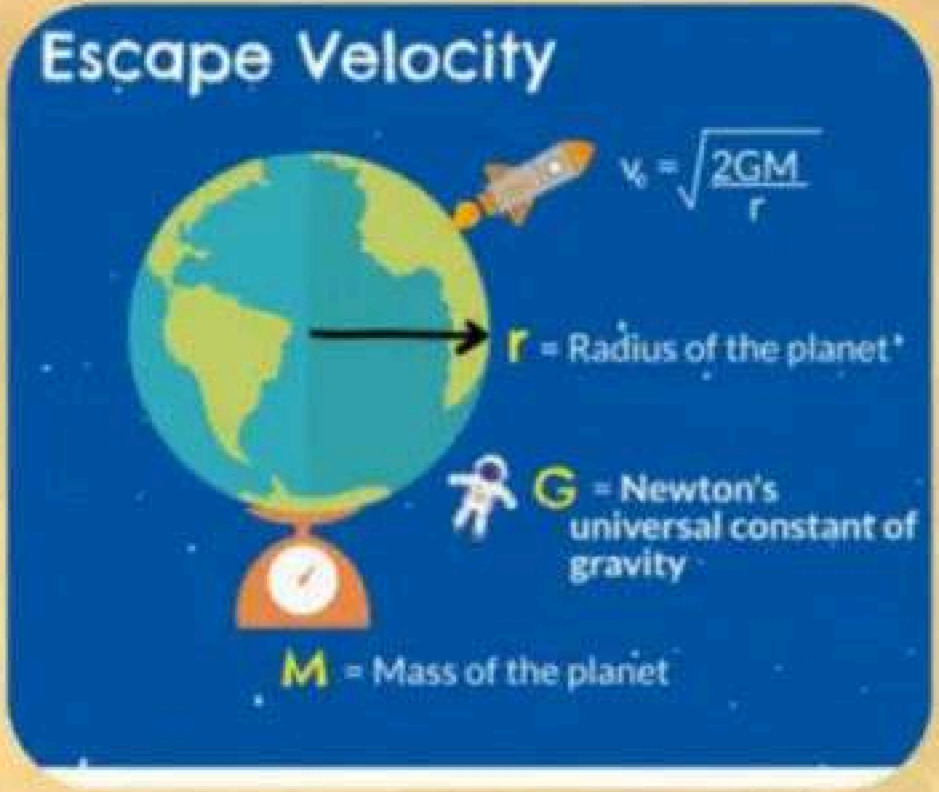
Satellite revolving around earth

A satellite revolving very close to Earth's surface has a period of revolution about 84 min and its speed is nearly 8 km/s.

The satellite, whose time period is 24h, is called Geostationary Satellite

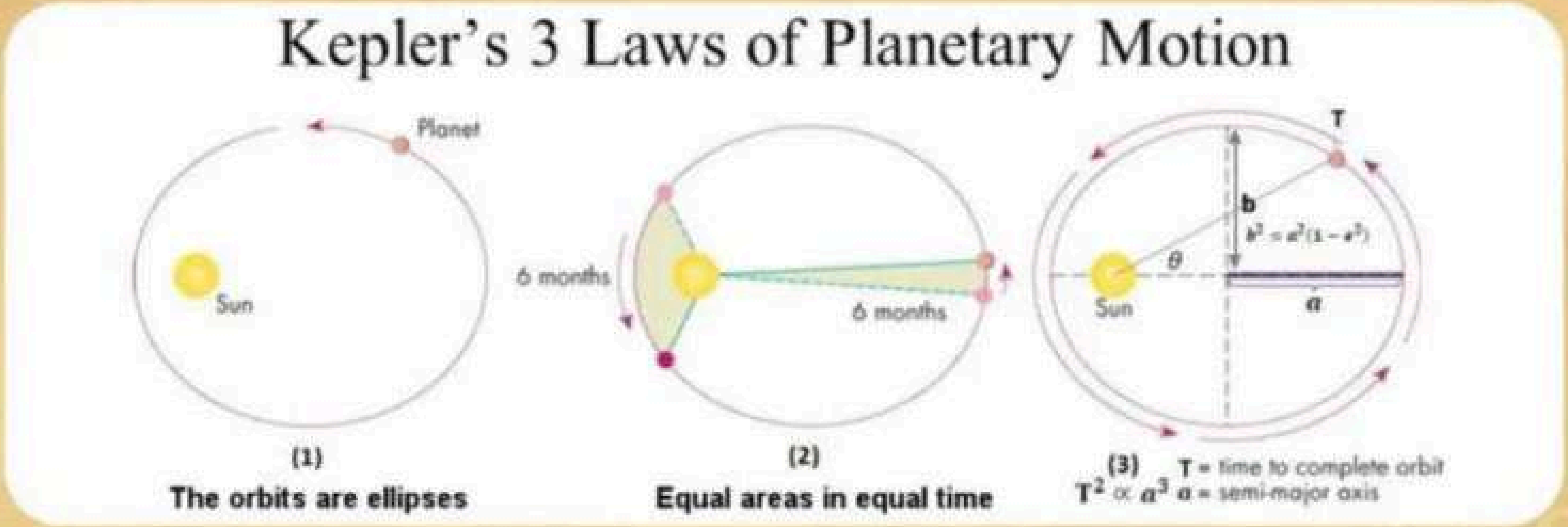


Escape Velocity



It is the speed at which the kinetic energy plus the gravitational potential energy of an object is zero.

Kepler's Laws



Johannes Kepler developed three laws which described the motion of the planets across the sky.

1. Law of Orbits: It states that all planets move in elliptical orbits, with the sun at one focus.
2. Law of Areas: It states that a line that connects a planet to the sun sweeps out equal areas in equal times.
3. Law of Periods: It states that the square of the period of any planet is proportional to the cube of the semi major axis of its orbit.

Q.80) Which of the following force is dissipative?
निम्नलिखित में से कौन सा बल क्षयकारी है?

[a] Gravitation
[b] Frictional
[c] Electrostatic
[d] Magnetic

[b] Frictional

Q.81) Newton's 1st law of motion gives the concept of :
न्यूटन का गति का पहला नियम ----- की अवधारणा देता है

[a] Energy
[b] Work
[c] Momentum
[d] Inertia

[d] Inertia

Q.82) The weight of a body at the centre of earth is :

पृथ्वी के केंद्र में किसी पिंड का भार है:

[a] Half the weight at the surface
[b] Zero
[c] Twice the weight at the surface
[d] Infinite

[b] Zero

Q.83) An object is in static equilibrium when it is ________ .

एक वस्तु स्थिर संतुलन में होती है जब वह ________ होती है।

[a] At rest

[b] Moving in a circular path

[c] Moving with uniform velocity

[d] Accelerating at high speed

[a] At rest

Q.84) The mass of an object ______

किसी वस्तु का द्रव्यमान ______

[a] Changes from place to place
[b] Remains same everywhere
[c] Is equal to its weight
[d] Is greater at mountains

[b] Remains same everywhere

Q.85) When a bus starts suddenly, then passengers in the bus tend to fall backwards. This event is an example of _______ .

जब कोई बस अचानक चलती है तो बस में सवार यात्री पीछे की ओर गिर जाते हैं। यह घटना ___________ का उदाहरण है।

[a] Inertia of rest
[b] Inertia of motion
[c] Inertia of direction
[d] None of these

[a] Inertia of rest

Q.86) Friction can be reduced by which of the following?
निम्नलिखित में से किसके द्वारा घर्षण को कम किया जा सकता है?

I. Polishing surfaces/चमकाने वाली सतह
II. Use of lubricants/स्नेहक का उपयोग
III. Decreasing area of contact/संपर्क का बढ़ता क्षेत्र

[a] Only I
[b] Only II
[c] Only I and II
[d] All options are correct

[d] All options are correct

Q.87) Action and reaction ______ .
क्रिया और प्रतिक्रिया ______।

[a] Always act on same body
[b] Are equal in magnitude
[c] Are in same direction
[d] Always act independently

[b] Are equal in magnitude

Q.88) What is the other name of Galileo's law of falling bodies?
गैलीलियो के गिरते पिंडों के नियम का दूसरा नाम क्या है?

[a] Law of motion
[b] Newton's first law
[c] Newton's second law
[d] Newton's third law

[a] Law of motion

Q.89) If the mass of an object is 60 kgs, what will be its weight on the moon? [N = Newton]

यदि किसी वस्तु का द्रव्यमान 60 किग्रा है, तो चंद्रमा पर उसका भार कितना होगा? [एन = न्यूटन]

[a] 60 N
[b] 600 N
[c] 100 N
[d] 10 N

[c] 100 N

Q.90) Contact force is another name for ________ .

संपर्क बल ________ का दूसरा नाम है।

[a] Friction

[b] Magnetic force

[c] Electrostatic force

[d] Muscular force

[a] Friction

Q.91) According to the Second Law of Motion, for a given force, acceleration is inversely proportional to the ______ of an object.

गति के दूसरे नियम के अनुसार, किसी दिए गए बल के लिए, त्वरण किसी वस्तु के ______ के व्युत्क्रमानुपाती होता है।

[a] Density
[b] Volume
[c] Force
[d] Mass

[d] Mass

Q.92) Mass of a body on measuring in lift at rest with a physical balance is found to be 'm'. If the Lift is accelerated upward with acceleration 'a'. Now what will be the mass of body?

एक भौतिक संतुलन के साथ आराम से लिफ्ट में मापने पर एक पिंड का द्रव्यमान 'm' पाया जाता है। यदि लिफ्ट को त्वरण 'a' के साथ ऊपर की ओर त्वरित किया जाता है। अब शरीर का द्रव्यमान क्या होगा?

[a] L

[b] m (g+a)

[c] M

[d] Zero

[b] $m(g+a)$

Q.93) Intensity of gravitational field of earth is maximum is:

पृथ्वी के गुरुत्वाकर्षण क्षेत्र की तीव्रता अधिकतम है:

[a] Poles
[b] Equator
[c] Centre of earth
[d] Surface

[a] Poles

Q.94) As we go from Equator to North pole the value of ‘g’, the acceleration due to gravity.

जैसे ही हम भूमध्य रेखा से उत्तरी ध्रुव की ओर जाते हैं, गुरुत्वाकर्षण के कारण त्वरण 'g' का मान होता है।

[a] Remains the same
[b] Decreases
[c] Increases
[d] None of the above

[c] Increases

Q.95) Two bodies kept at a certains distance feel a gravitational force F to each other. If the distance between them is made double the former distance, the force will be :

एक निश्चित दूरी पर रखे गए दो पिंड एक दूसरे को गुरुत्वाकर्षण बल F महसूस करते हैं। यदि उनके बीच की दूरी को पिछली दूरी से दोगुना कर दिया जाए, तो बल होगा:

[a] 2 F

[b] ½ F

[c] 4 F

[d] ¼ F

[d] ¼ F

Q.96) The point where total mass of a body is supposed to be concentrated is known as :
जिस बिंदु पर किसी पिंड का कुल द्रव्यमान केंद्रित होना चाहिए, उसे कहा जाता है:

[a] Dead centre
[b] Centre of mass
[c] Centre of gravity
[d] Centre of motion

[b] Centre of mass

Q.18) The value of acceleration due to gravity (g) at a distance of 2R from the surface of earth, where R is the radius of earth is _______ .

[a] g/3
[b] g/4
[c] g/9
[d] g/2

[b] g/4

Q.19) Who first determined the value of G (gravitational constant) ?

[a] Lord Cavendish
[b] R.R. Heyl
[c] Boyle
[d] Poynting

[a] Lord Cavendish

Q.20) A flying jet possesses ________ .

[a] Potential energy
[b] Kinetic energy
[c] Wind energy
[d] Both kinetic and potential energy

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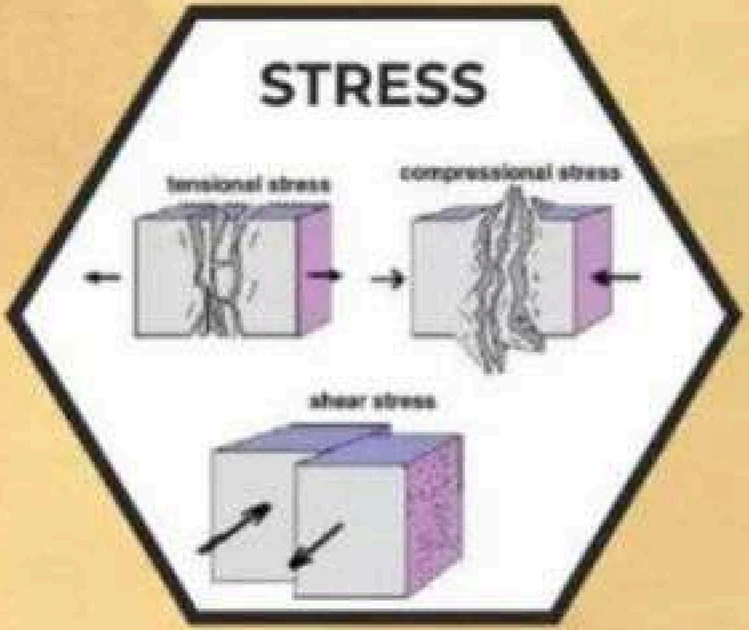
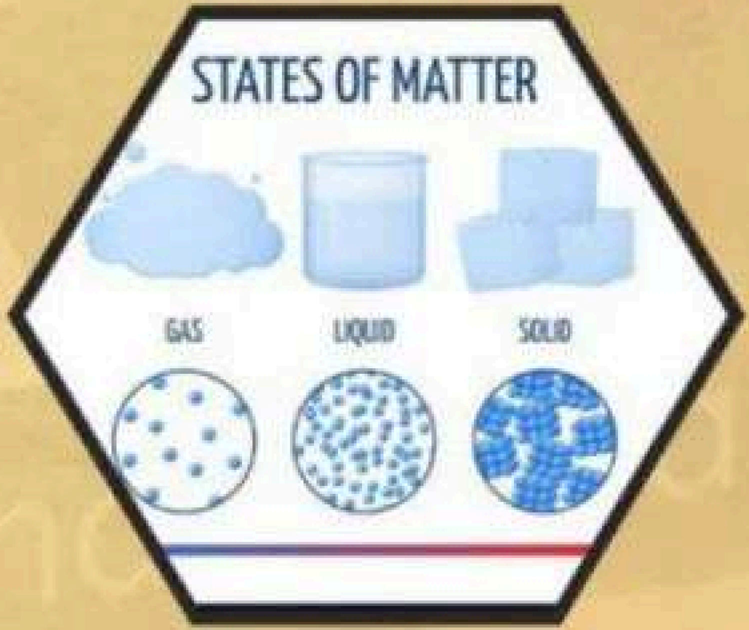
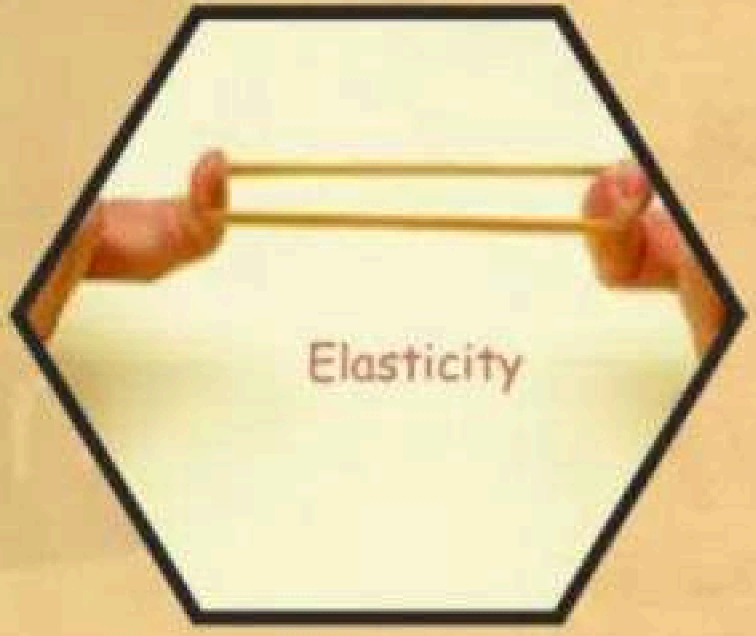
GENERAL PROPERTIES OF MATTER







#GRAPHICS BY - AMAN SRIVASTAVA

GENERAL PROPERTIES OF MATTER

Matter

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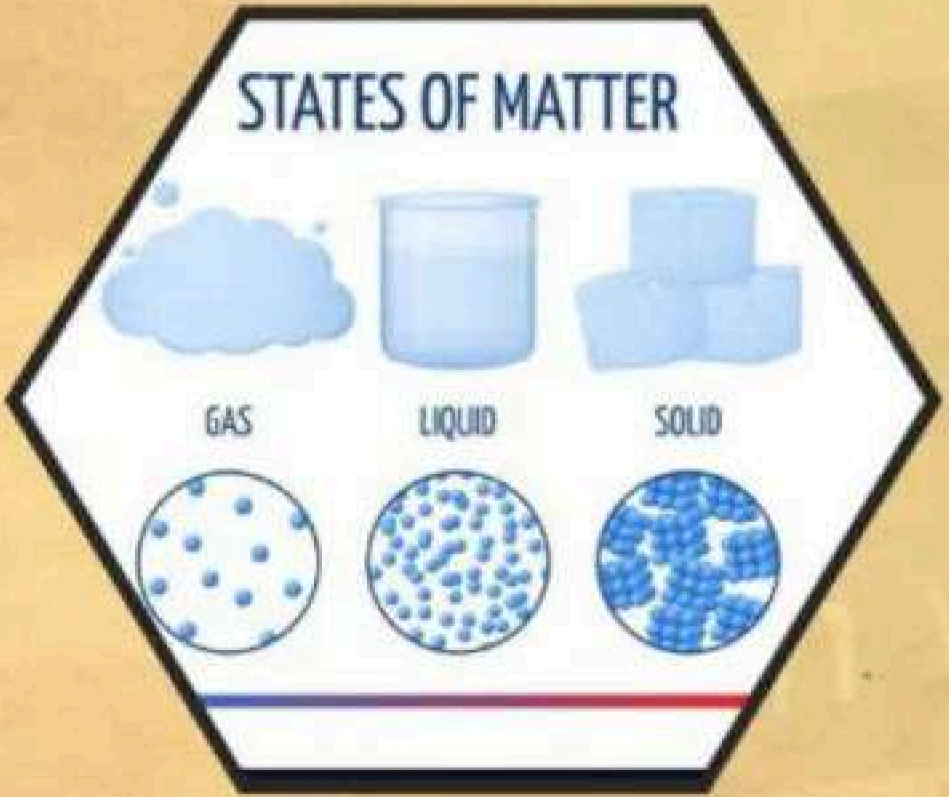
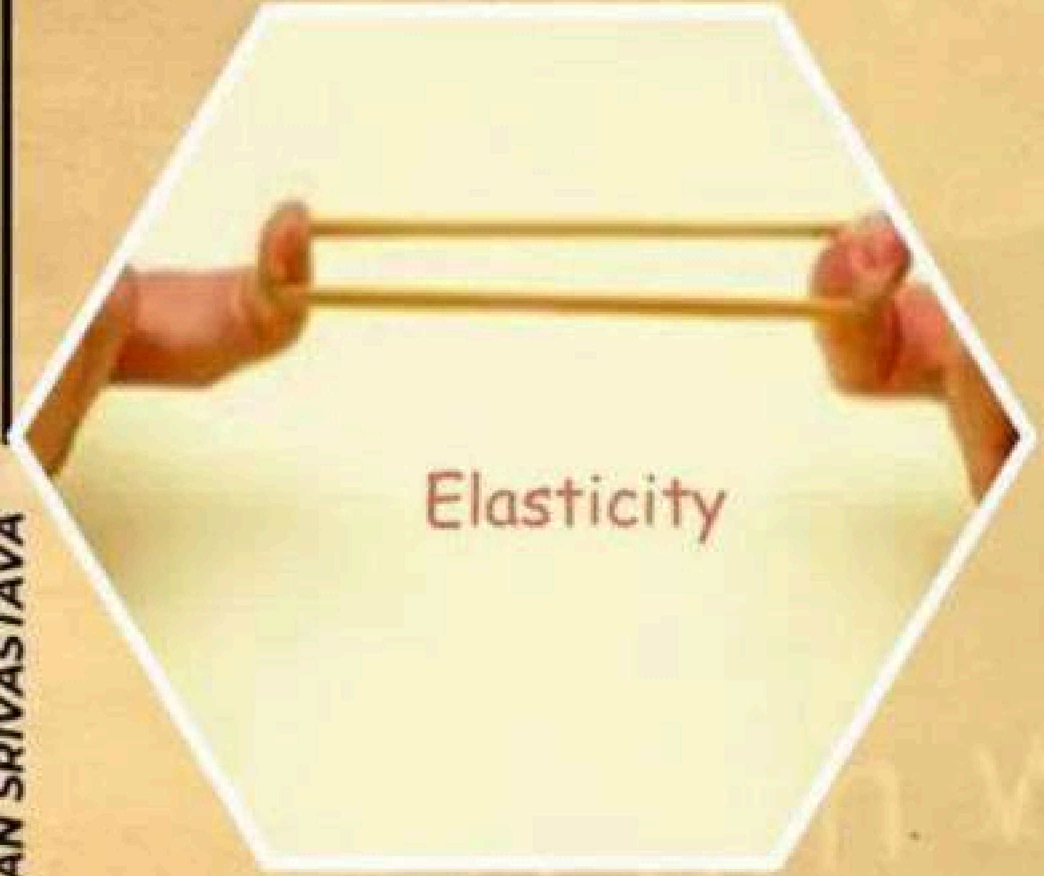


GENERAL PROPERTIES OF MATTER

Elasticity



It is the property of a material whose dimensions can be changed by applying a force to it (for example, pushing, pulling, twisting, or compressing), but subsequently returns to its original shape.

The deforming force is called a stress, and the deformation is called the strain.

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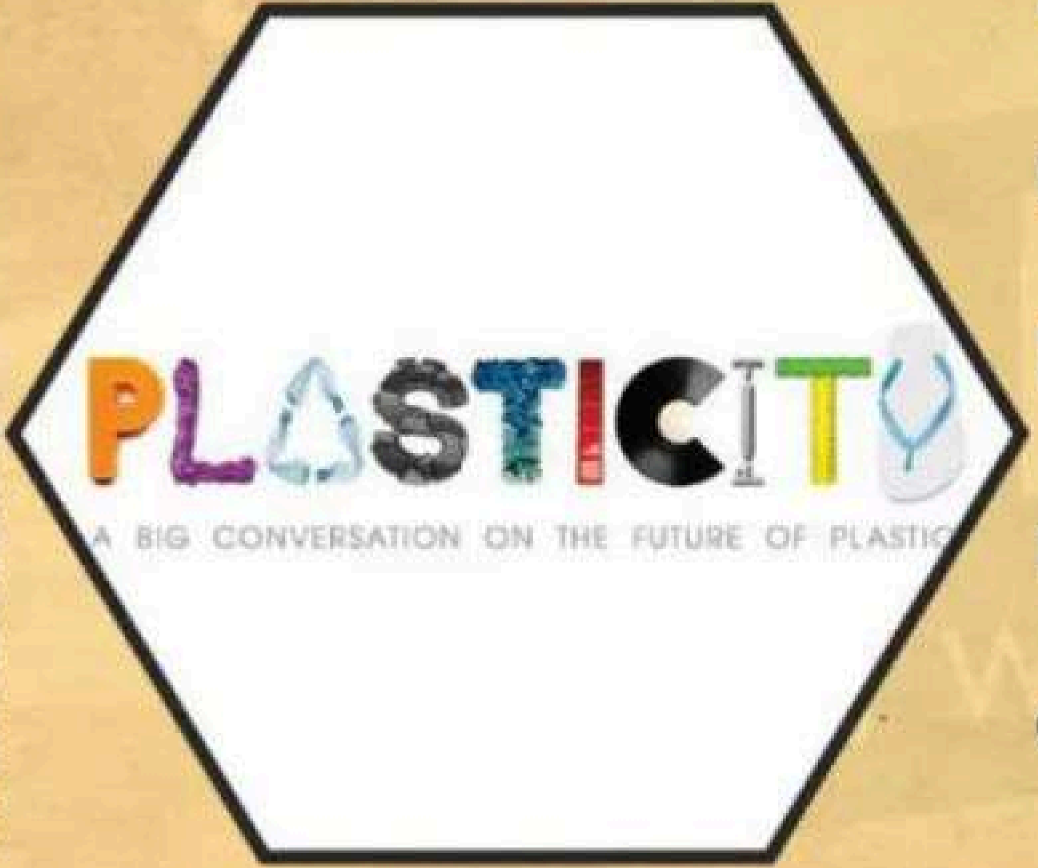

It is the deformation of a (solid) material undergoing non-reversible changes of shape in response to applied forces.

Plastic deformation is observed in most materials including metals, soils, rocks, concrete, foams, bone and skin.

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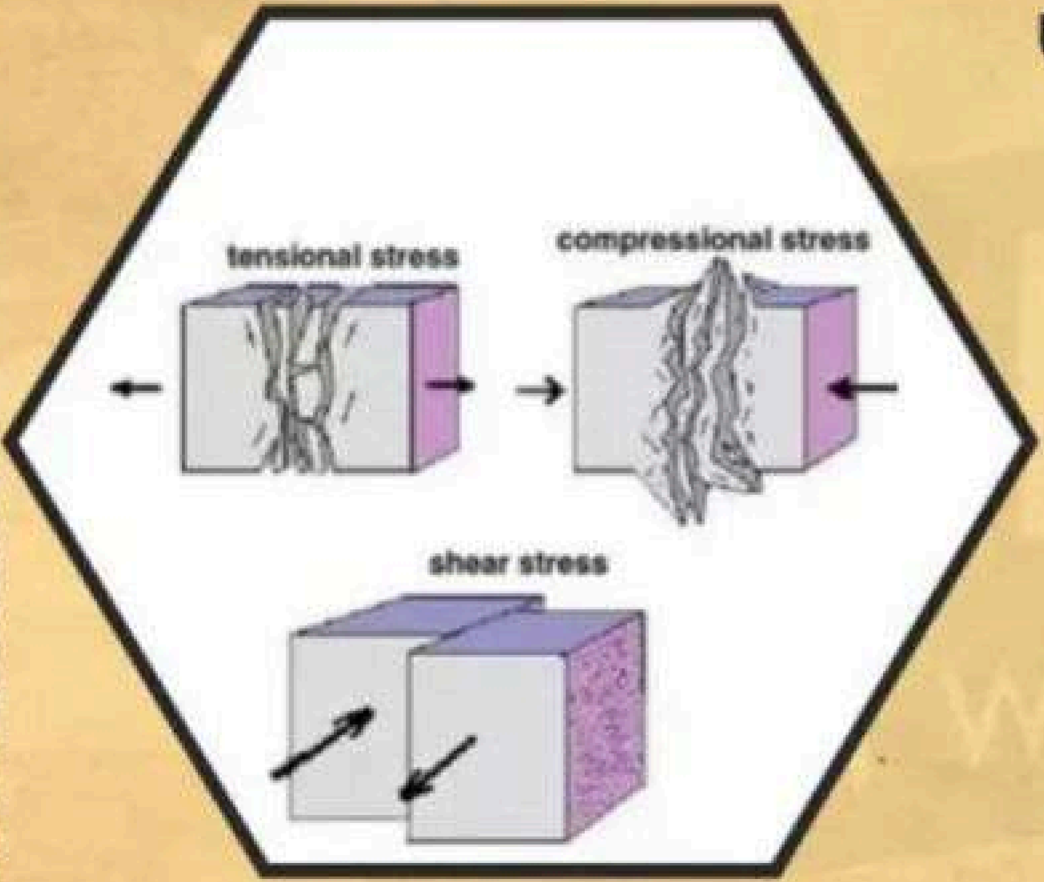

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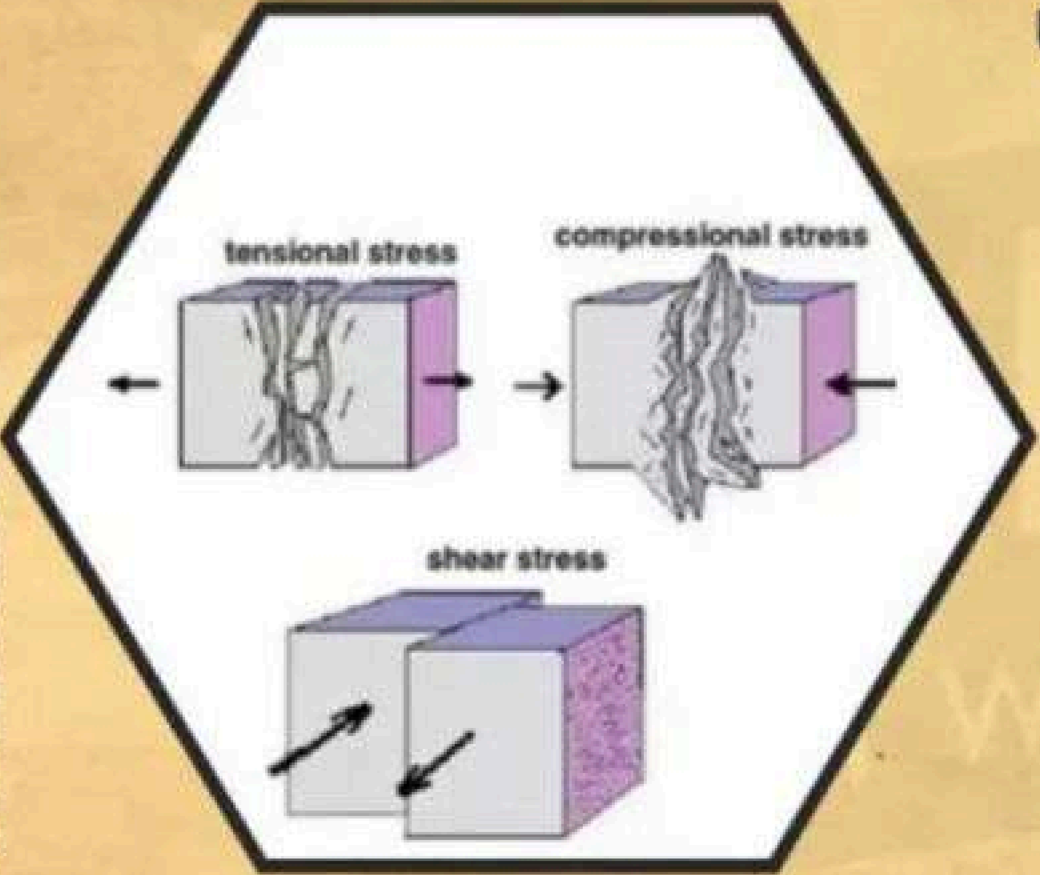

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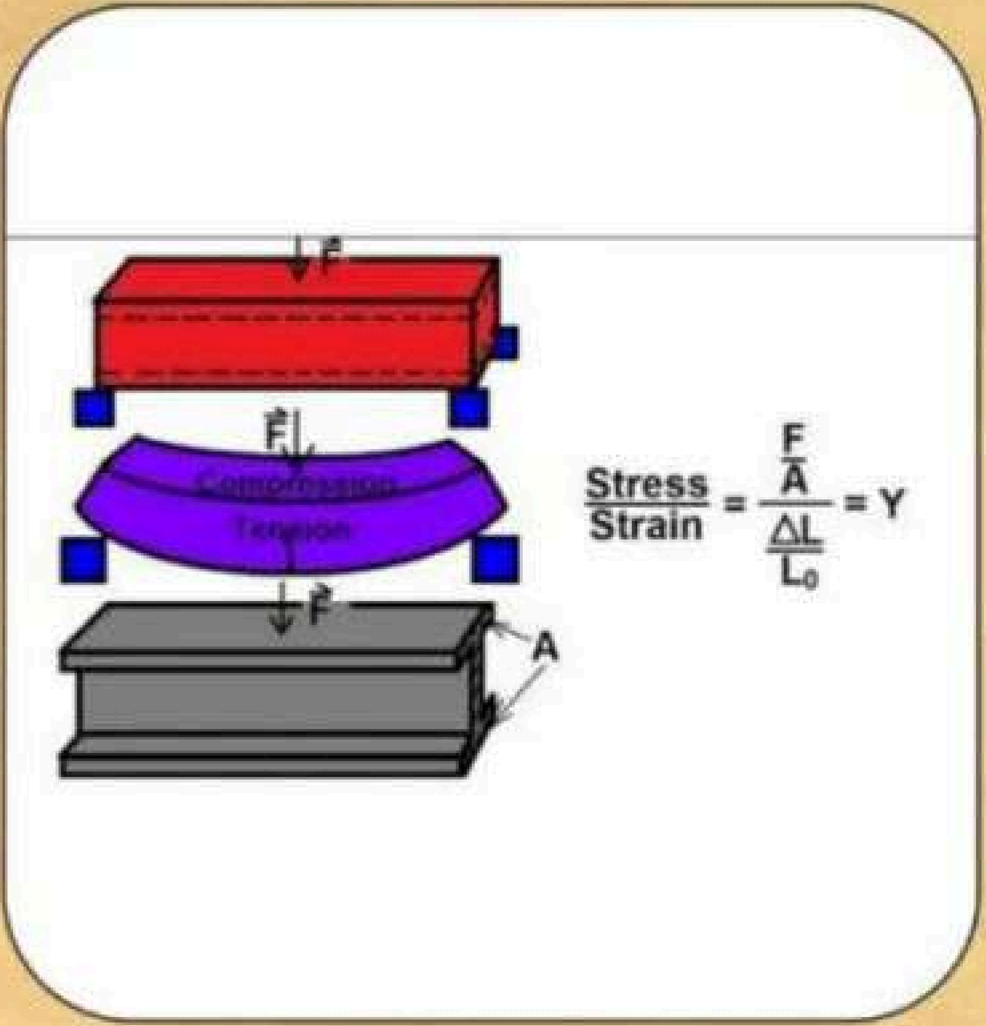

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Hooke's law states that the force needed to extend or compress a spring by some distance is proportional to that distance.

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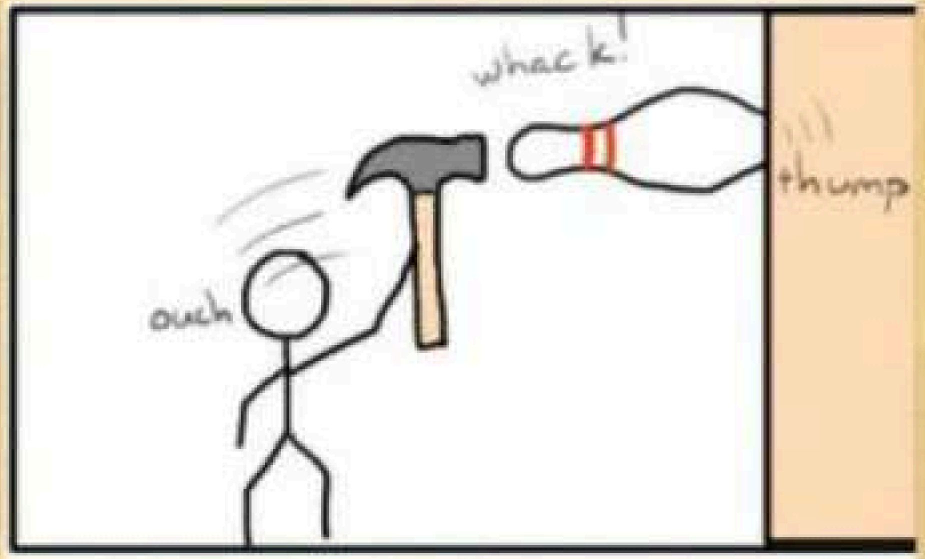

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In an ideal gas, molecules have no volume and do not interact. Pressure varies linearly with temperature, volume, and quantity according to the ideal gas law.

$$P = \frac{nRT}{V}$$

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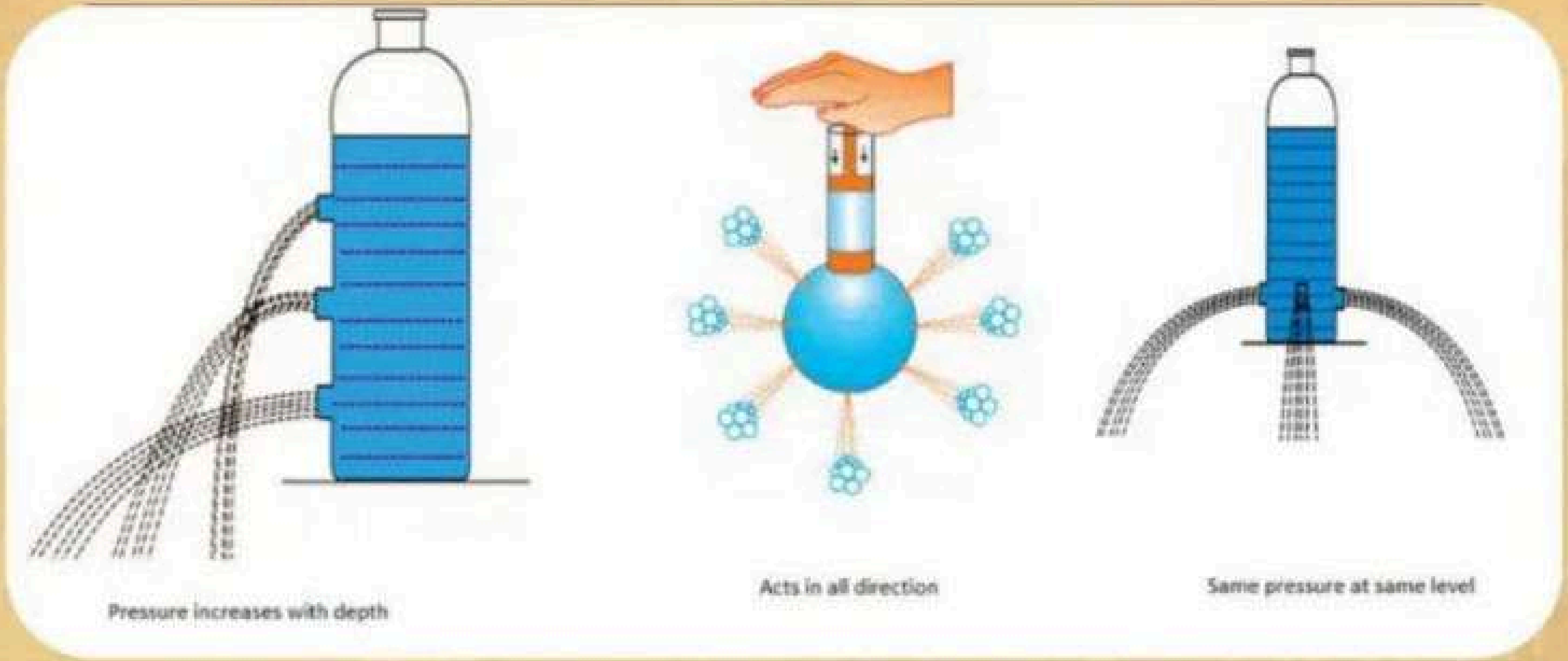

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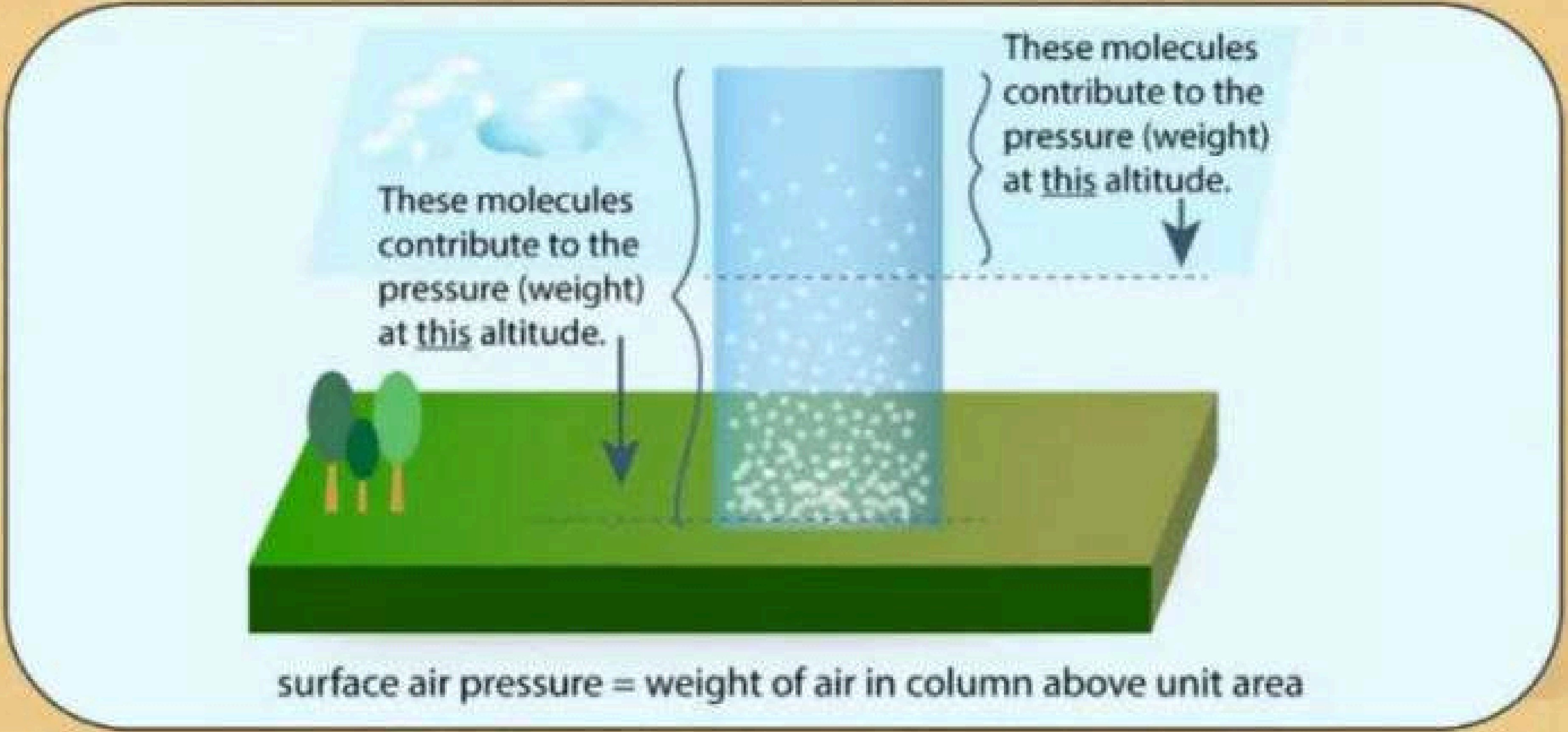

It is the force per unit area exerted on a surface by the weight of air above that surface in the atmosphere of Earth (or that of another planet).

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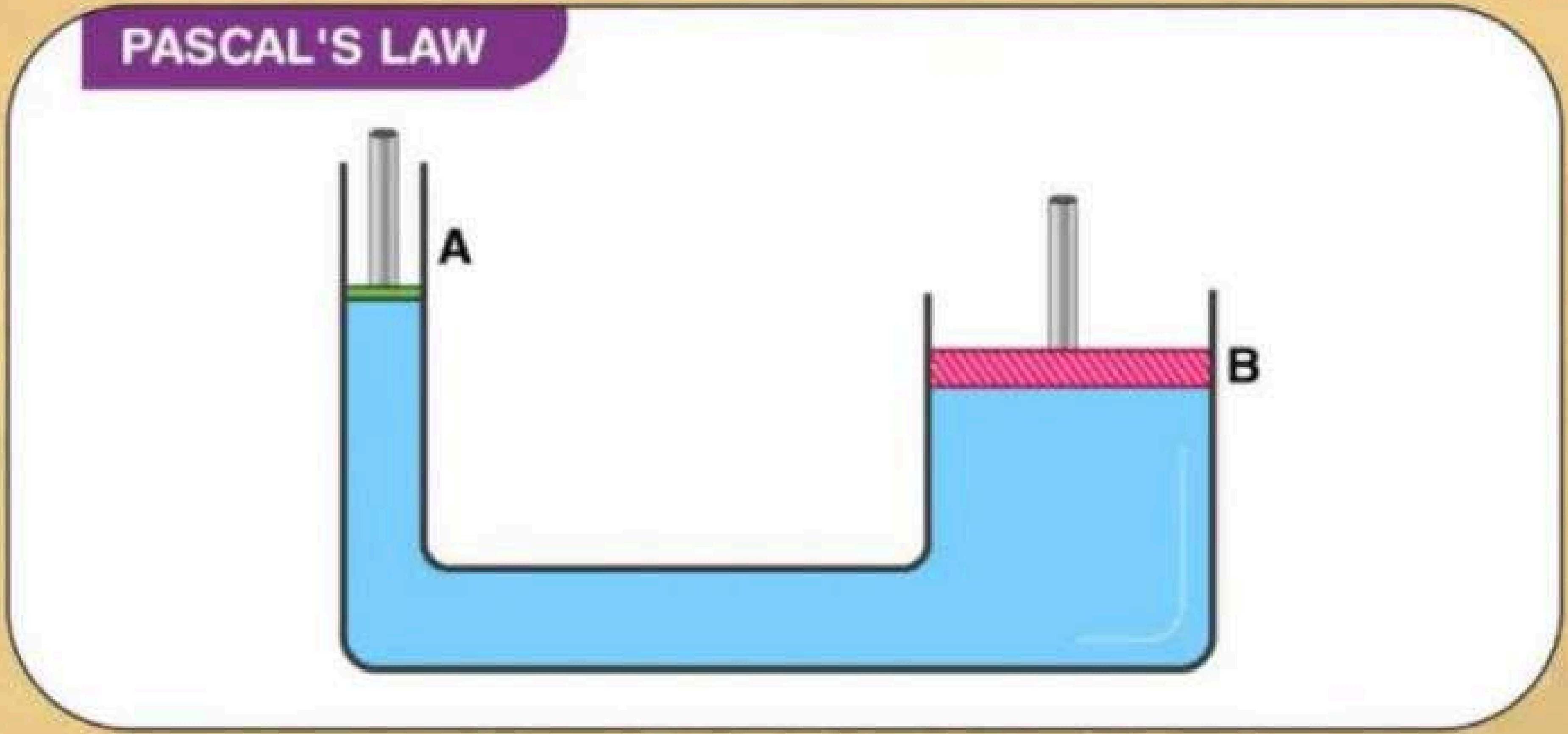

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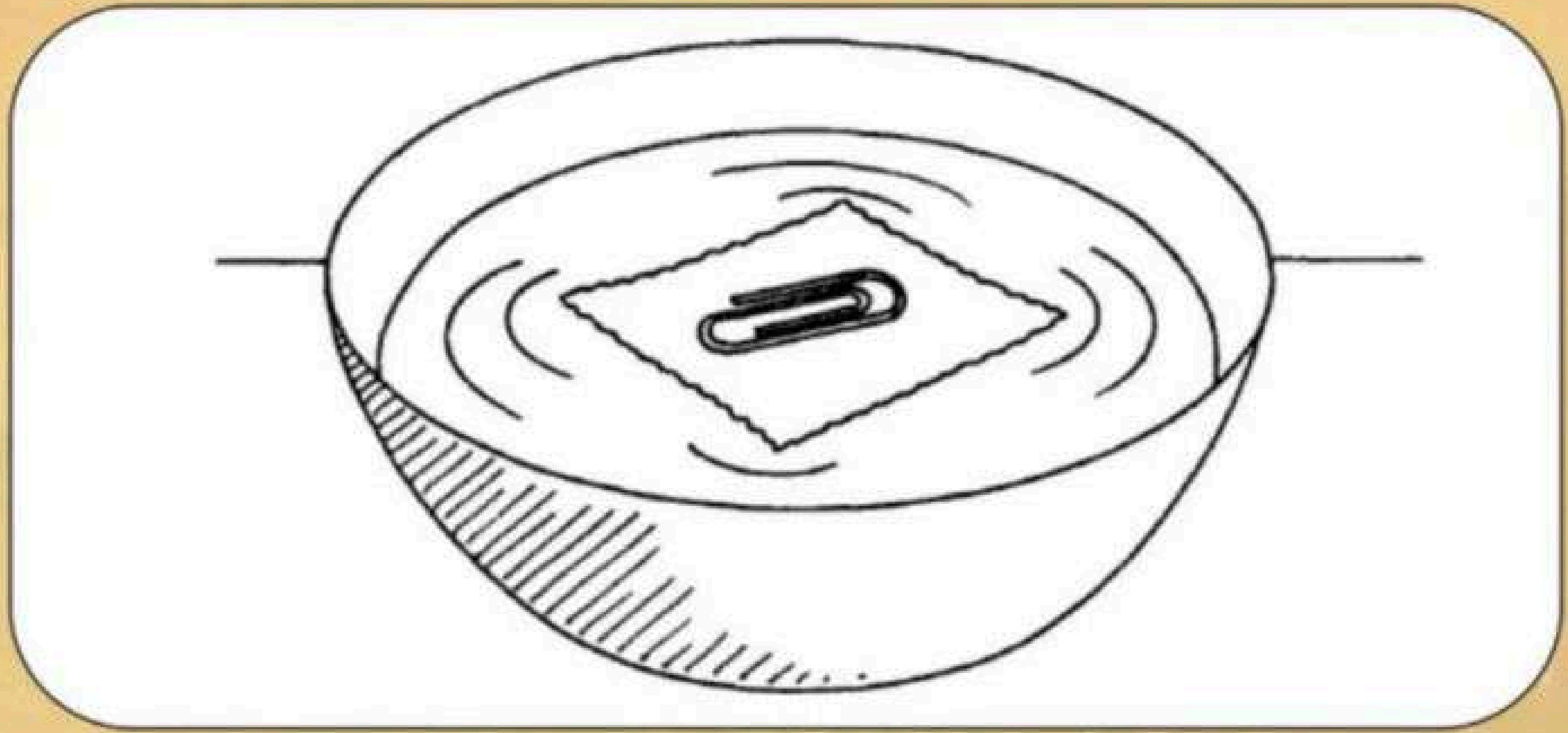

It is the elastic tendency of a fluid surface which makes it acquire the least surface area possible. Its unit is Nm-1 .

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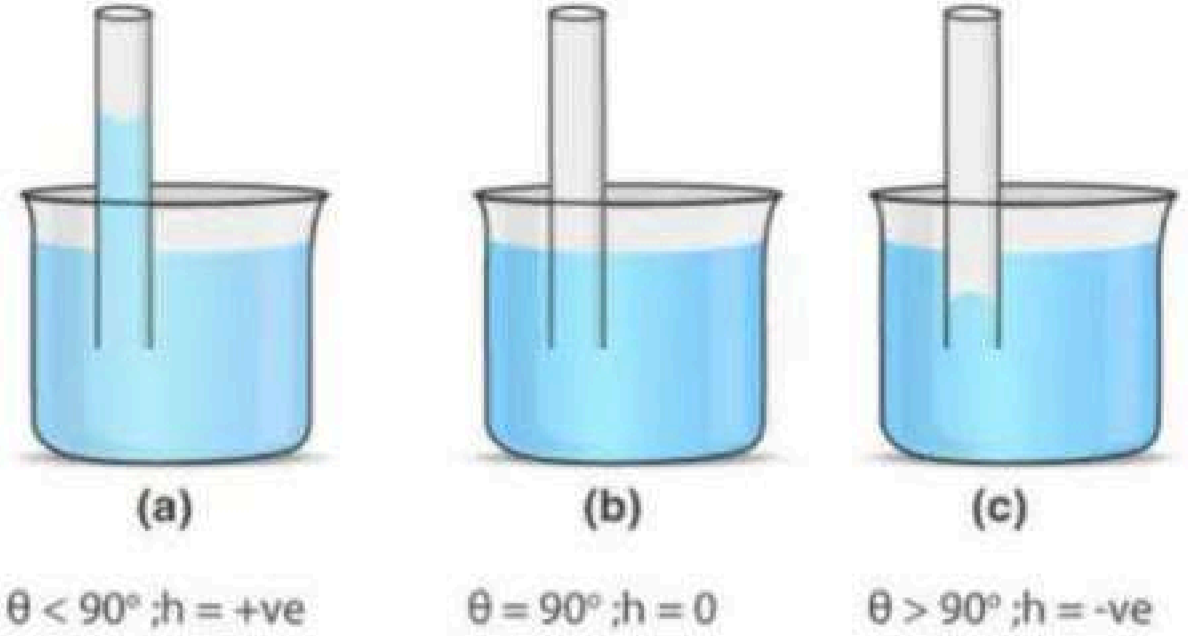

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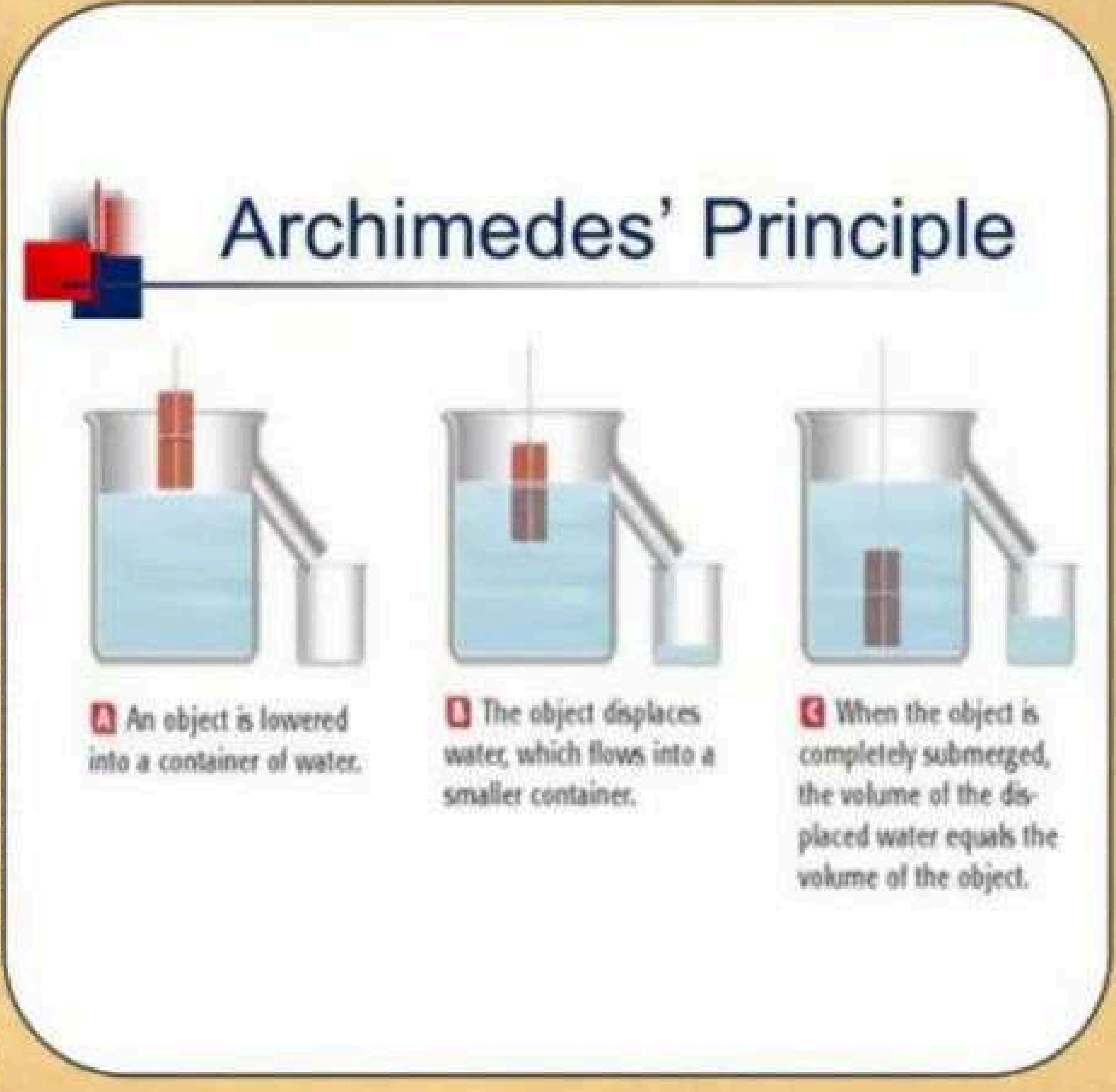

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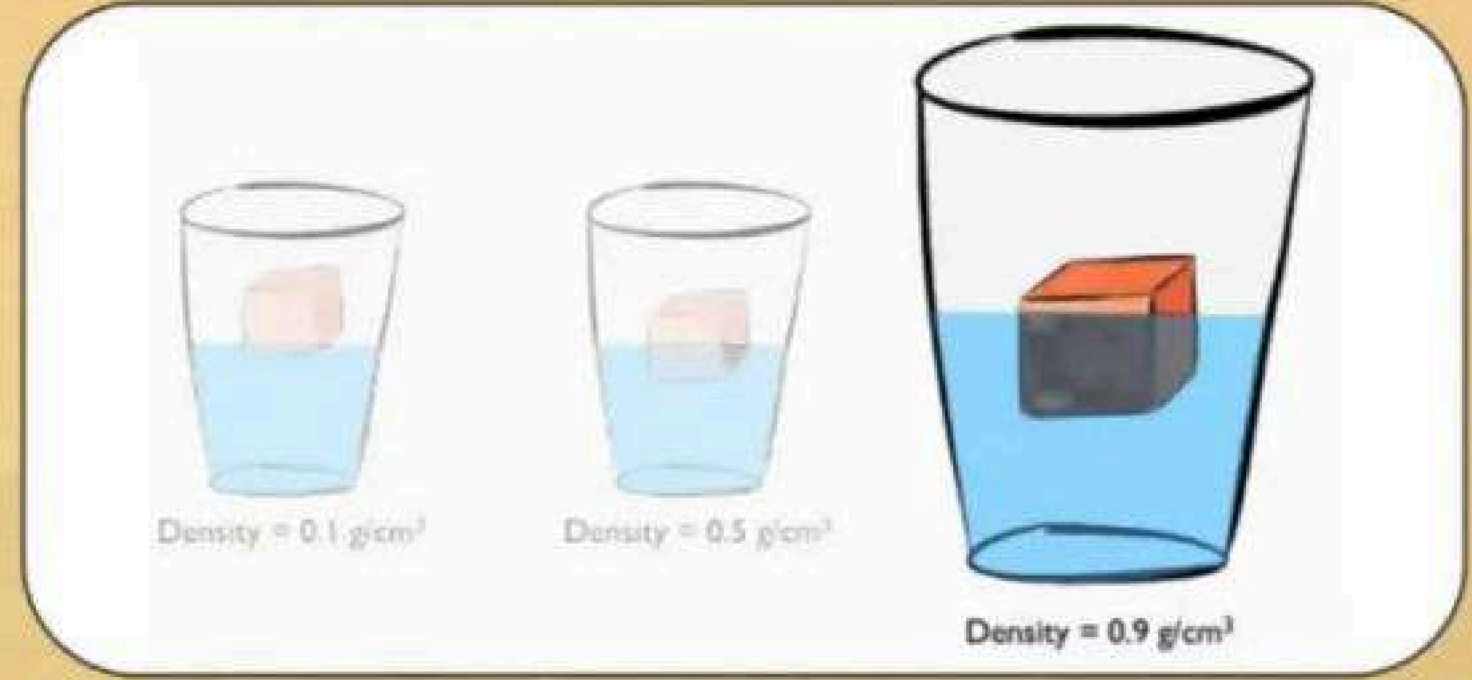
Density



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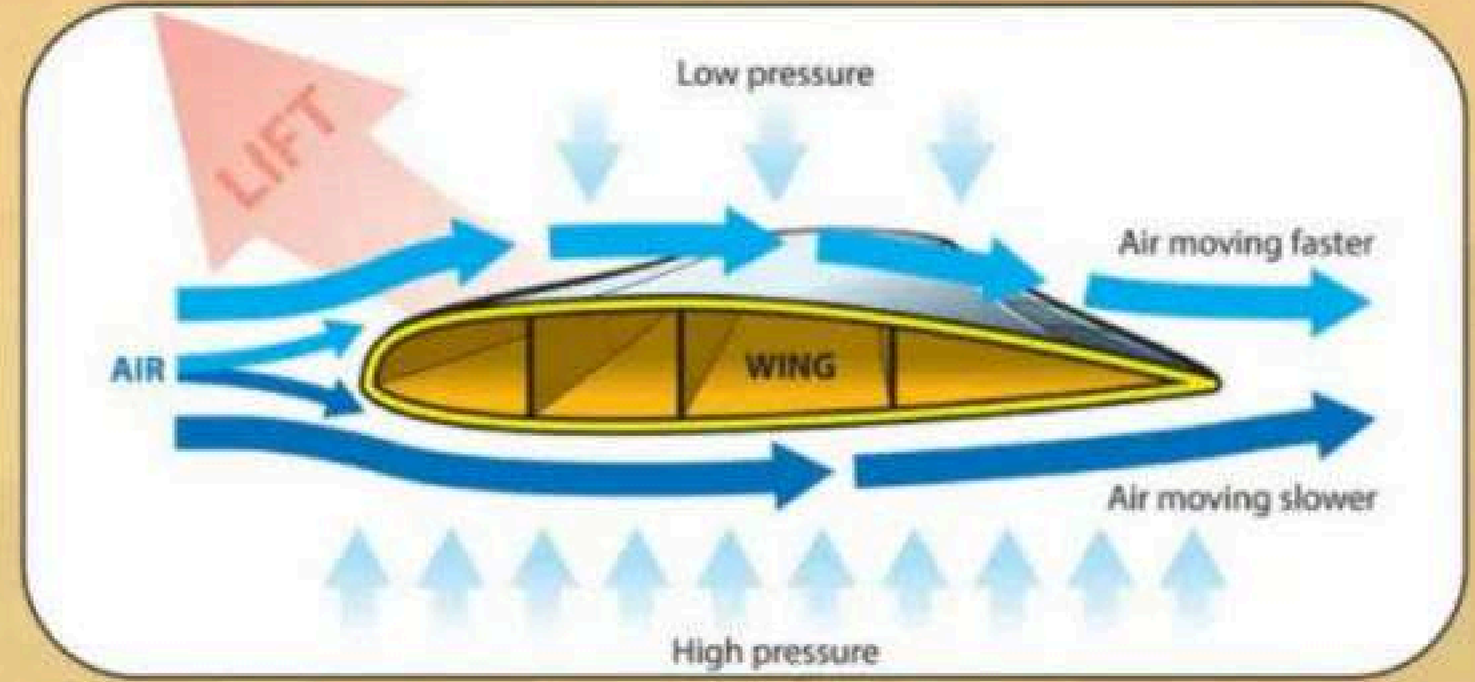

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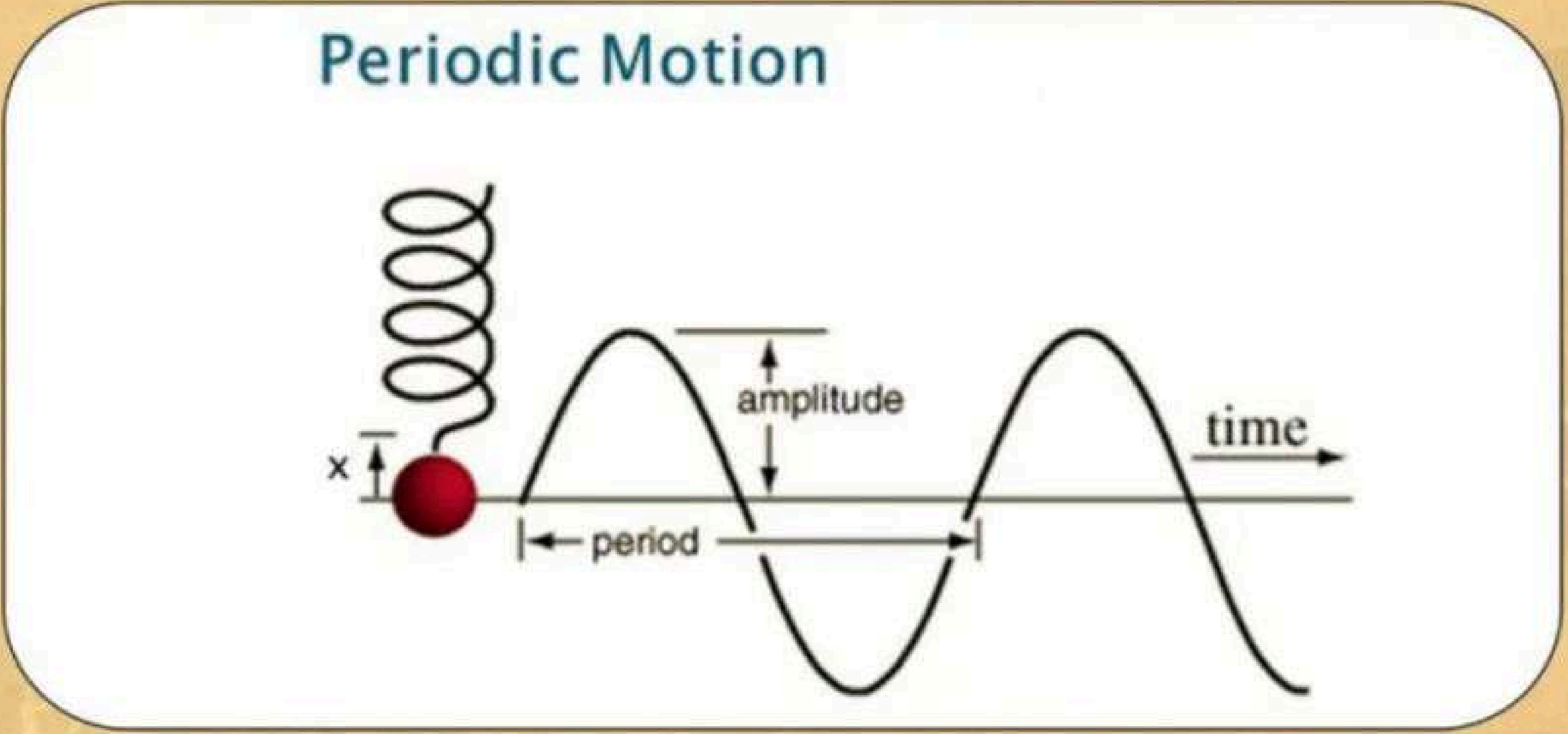
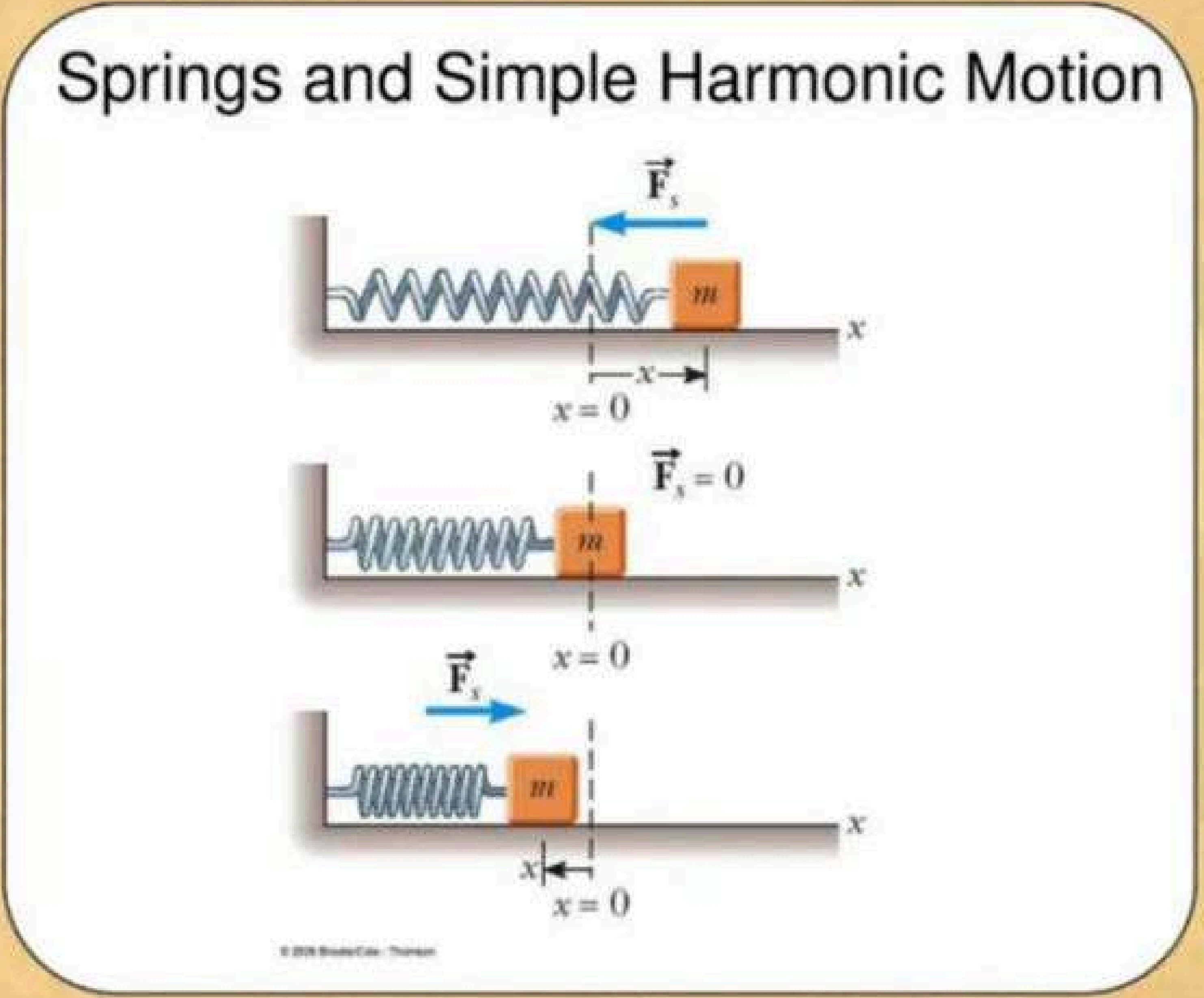
It states that Pressure energy + Kinetic energy + Datum or Potential energy = Constant

Periodic Motion



It is the motion repeated in equal intervals of time.

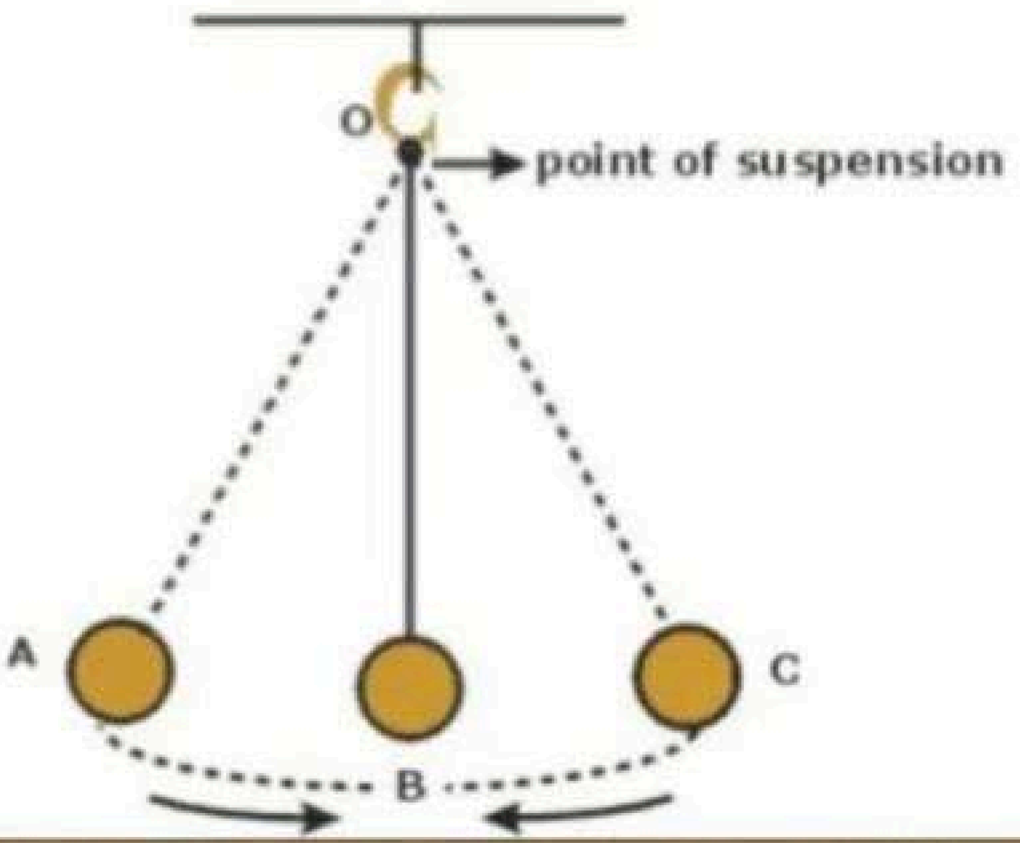
Simple harmonic motion



It is the back and forth motion that is caused by a force that is directly proportional to the displacement.

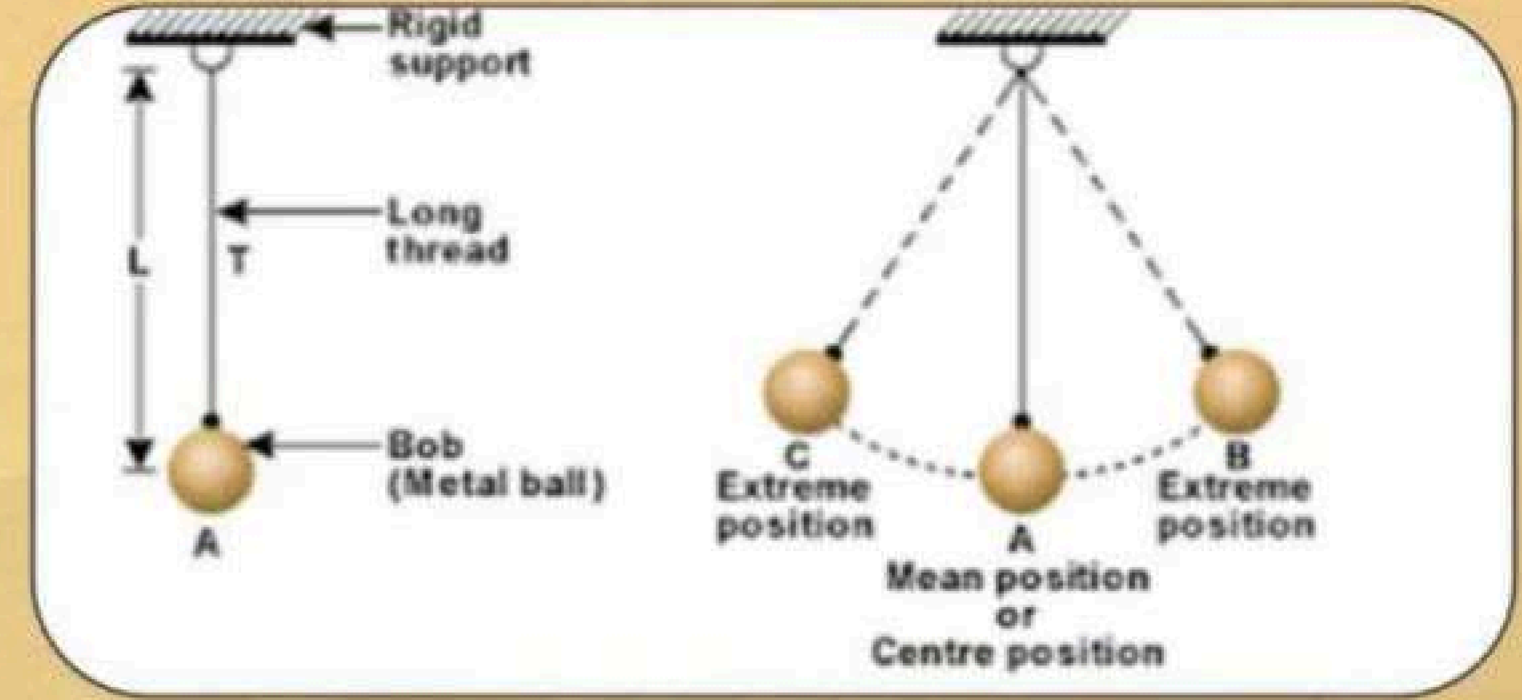
Oscillatory Motion

Oscillatory motion



It is a motion that repeats itself in a regular cycle for example a sine wave or pendulum.
The time taken for an oscillation to occur is often referred to as the oscillatory period.

Simple Pendulum



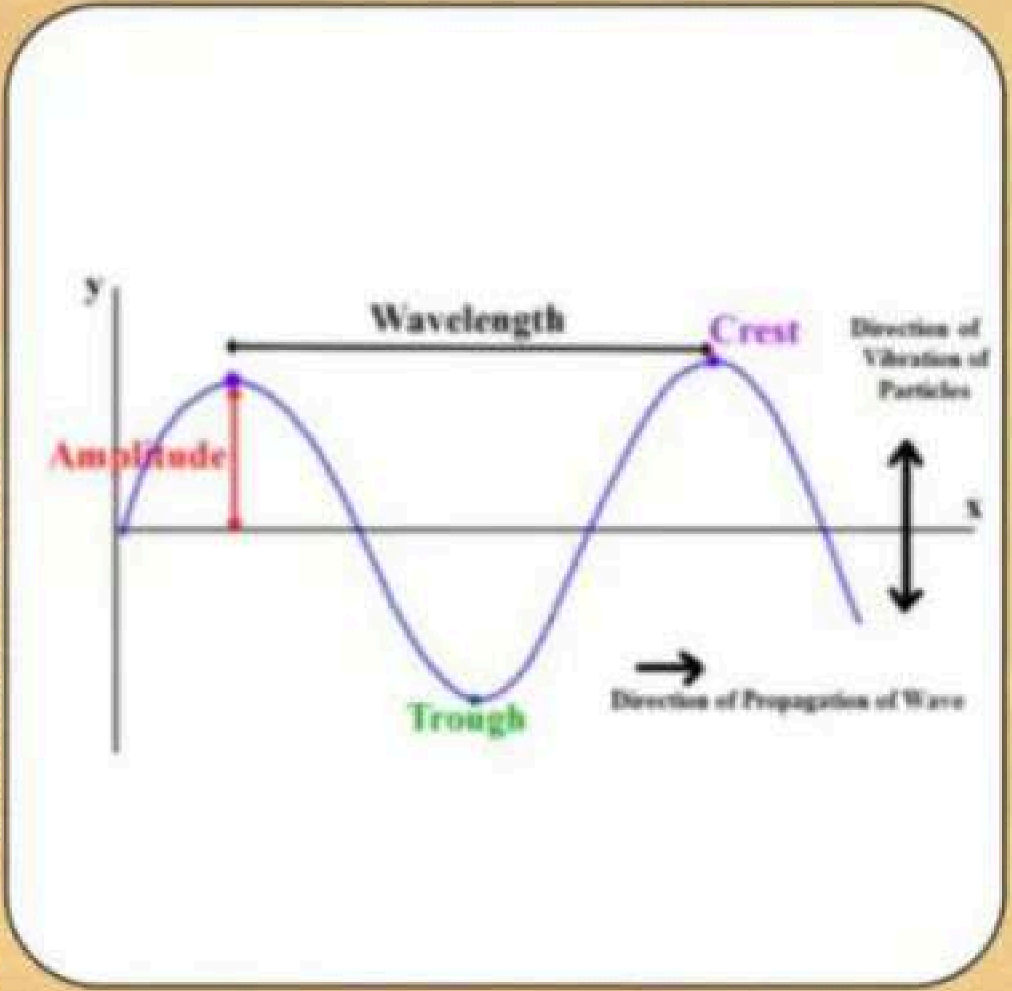
The period of swing of a simple gravity pendulum depends on its length. The maximum angle that the pendulum swings away from vertically, θ0, is called the amplitude.
Where,
T is the period in seconds (s)
L is the length of the rod or wire in meters or feet
g is the acceleration due to gravity (9.8 m/s²)
For small swings
The period is independent of amplitude. This property, called isochronism, is the reason pendulums are so useful for timekeeping.

For larger amplitudes, the period increases gradually with amplitude.

WAVE AND WAVE MOTION

It is a vibration or disturbance in space.

A medium is the substance that all sound waves travel through and need to have in order to move.

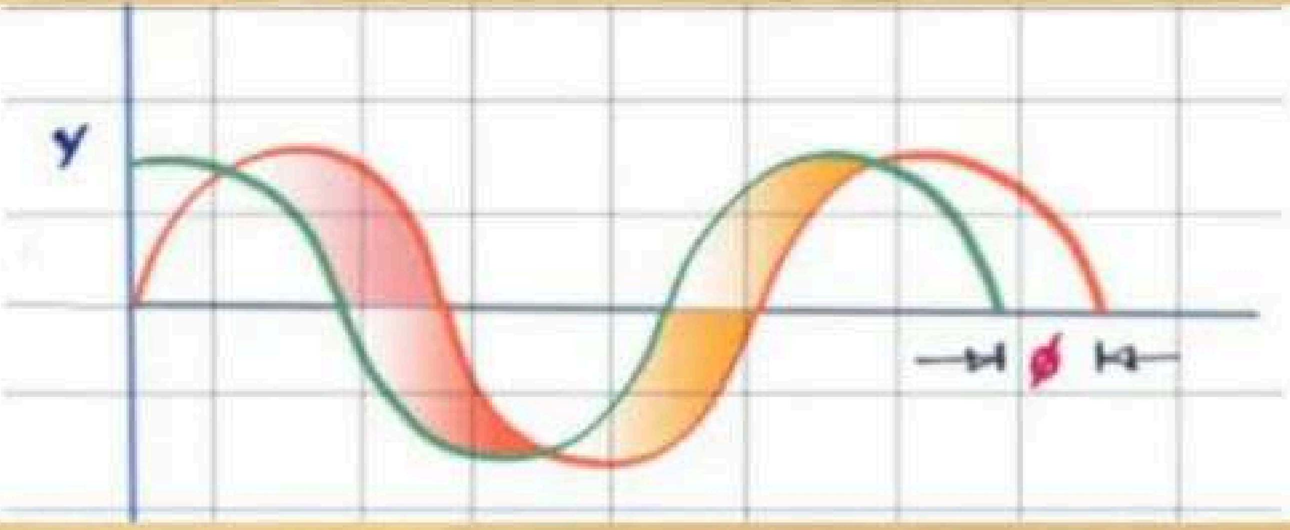


Types of Waves

1. Longitudinal Wave - move parallel with the wave motion.
2. Transverse Wave - move perpendicular with the wave motion.
3. Surface waves - particles travel in a circular motion.
4. Electromagnetic waves (including light) can move through a vacuum. 5. Physical waves require matter through which to propagate.

#GRAPHICS BY - AMAN SRIVASTAVA

Wave Motion



It transfers energy from one point to another, often with no permanent displacement of the particles of the medium.

Displacement (y): Position of an oscillating particle from its equilibrium position.

Amplitude (y0 or A): The maximum magnitude of the displacement from its equilibrium position.

Period (T): Time taken for a particle to undergo one complete cycle of oscillation.

Frequency (f): Number of oscillations performed by a particle per unit time.

Wavelength (λ): The distance between any two successive particles that are in phase, e.g. it is the distance between 2 consecutive crests or 2 troughs.

Wave speed (v): The speed at which the waveform travels in the direction of the propagation of the wave.

Wave front: A line or surface joining points which are at the same state of oscillation, e.g. a line joining crest to crest in a wave.

Ray: The path taken by the wave. Rays are always at right angles to the wave fronts.

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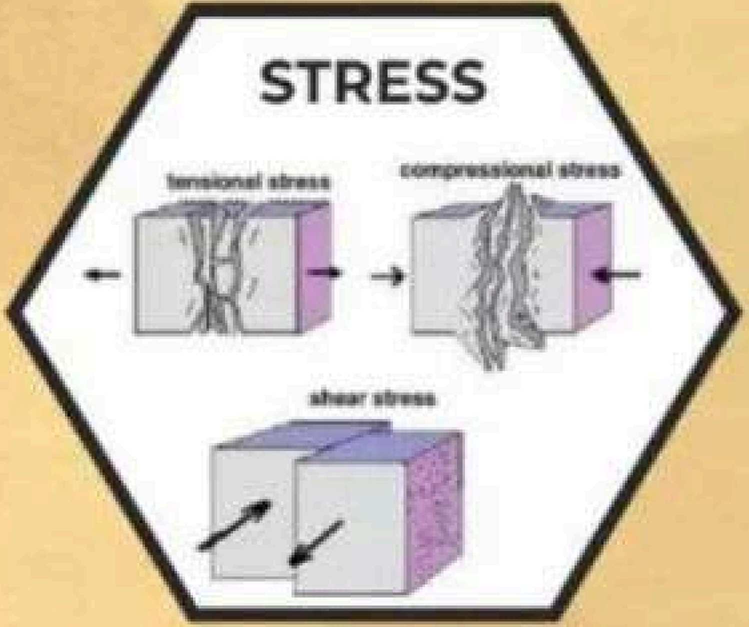

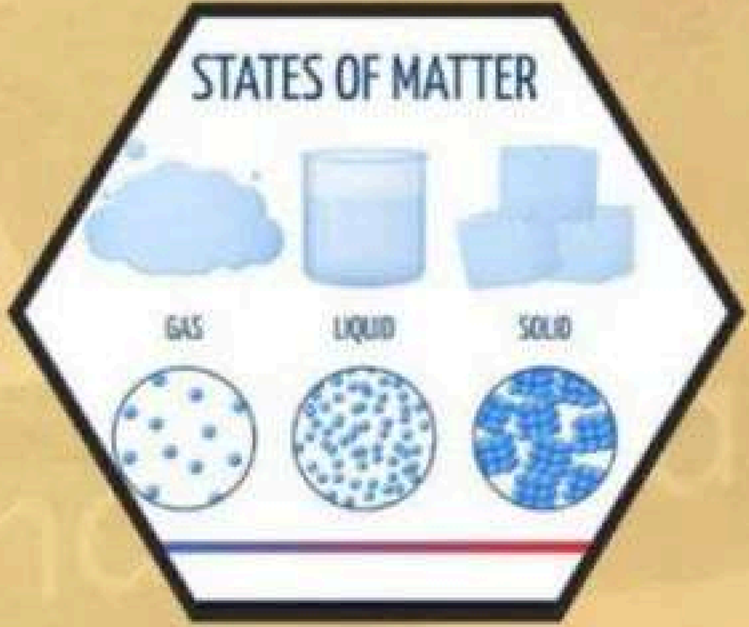

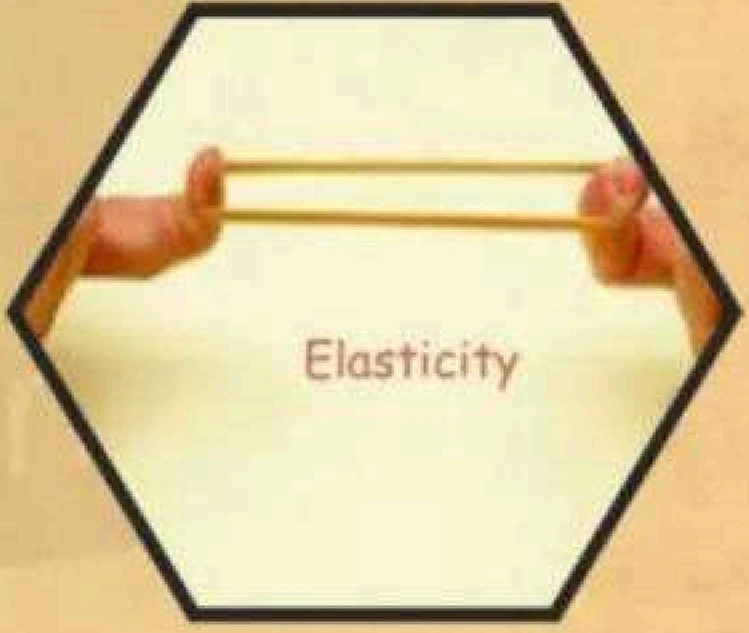

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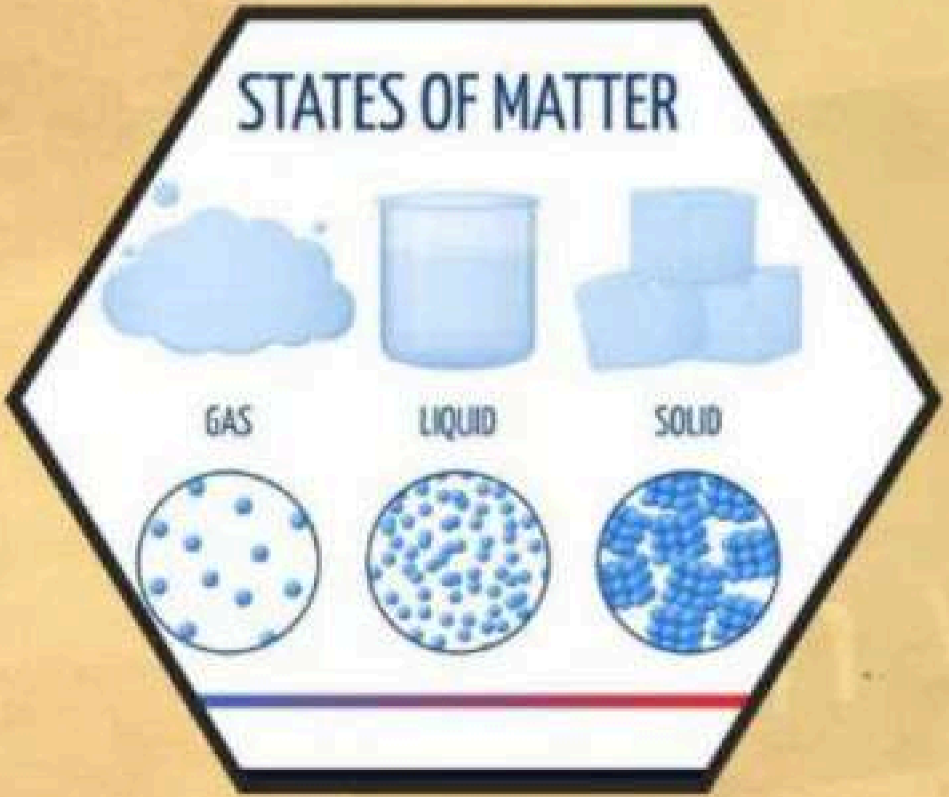

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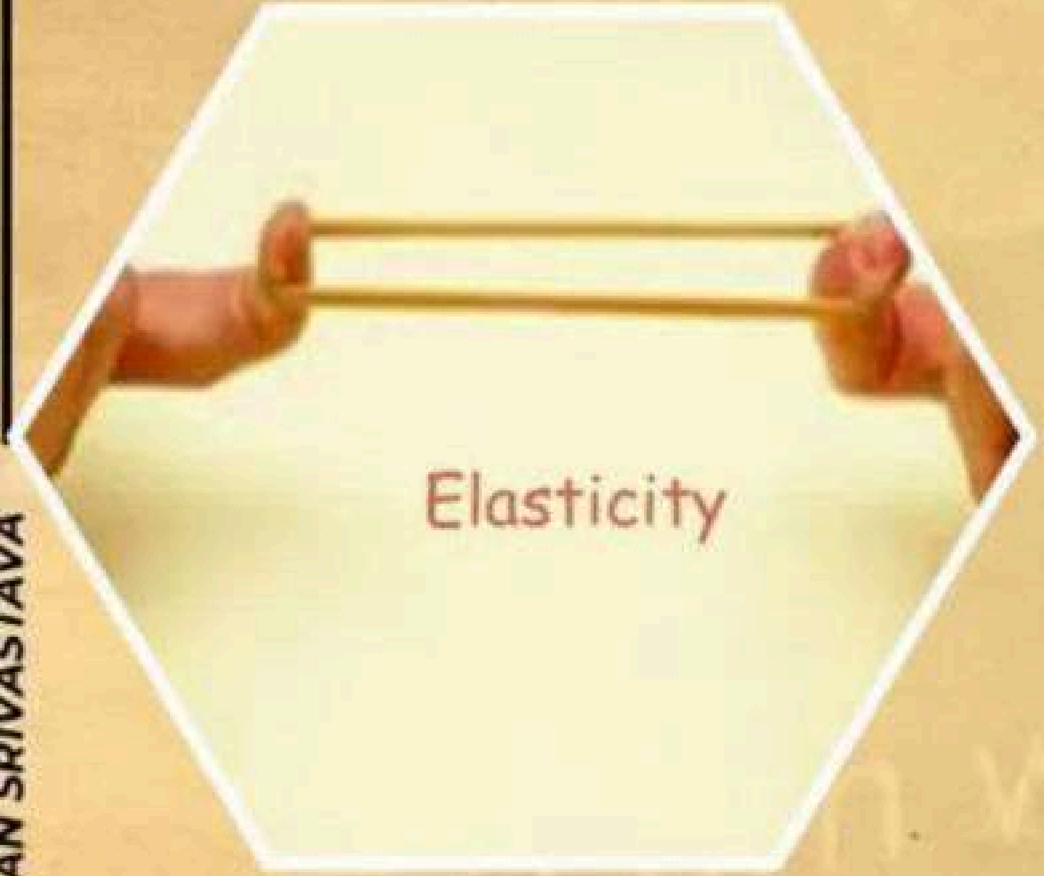

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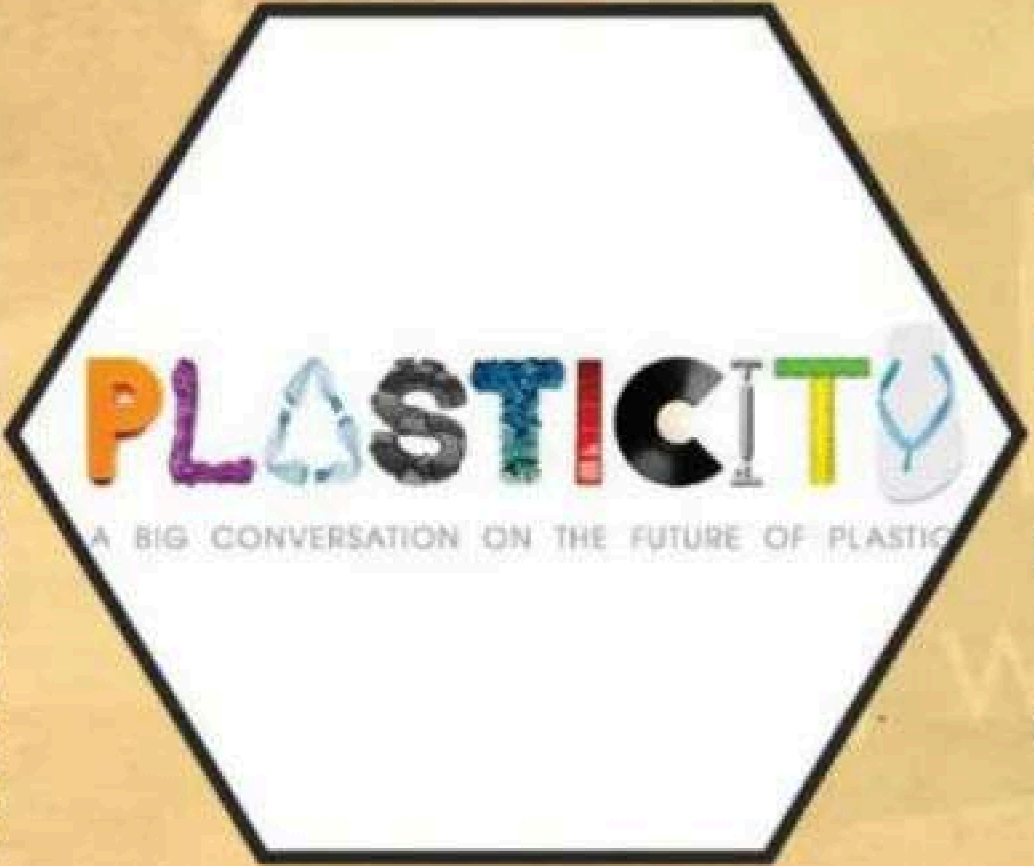

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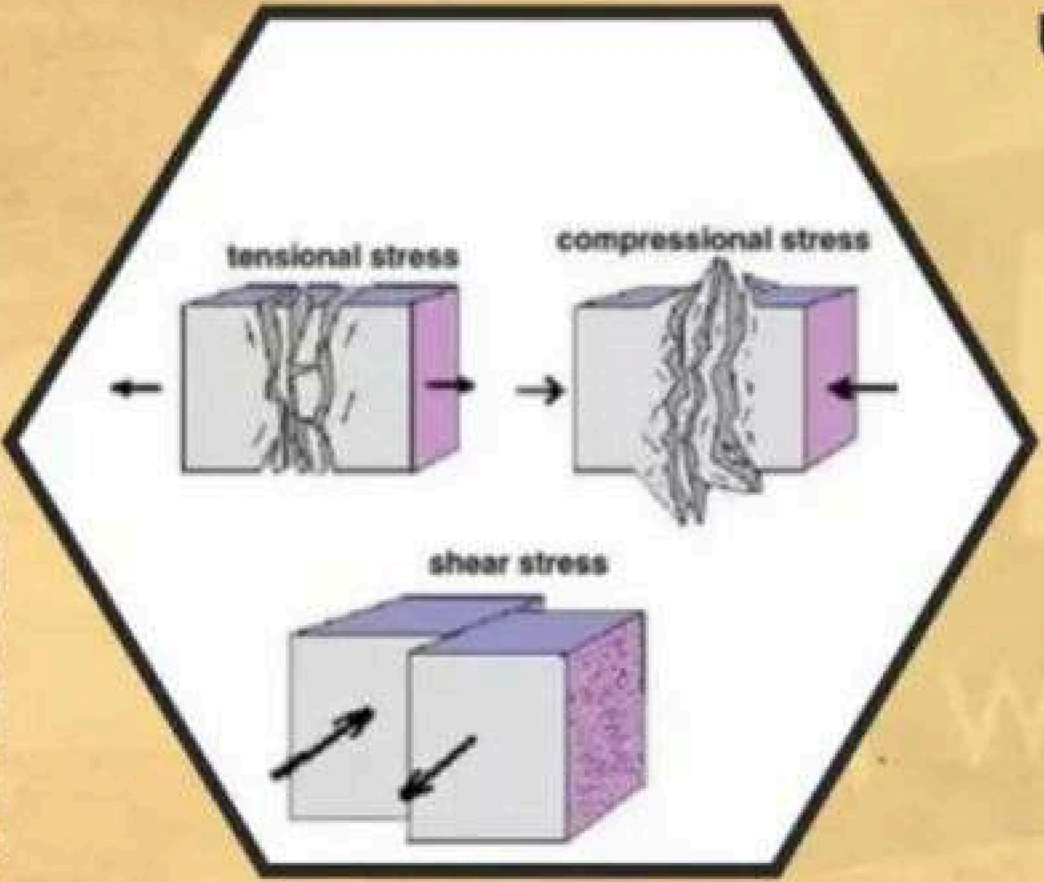

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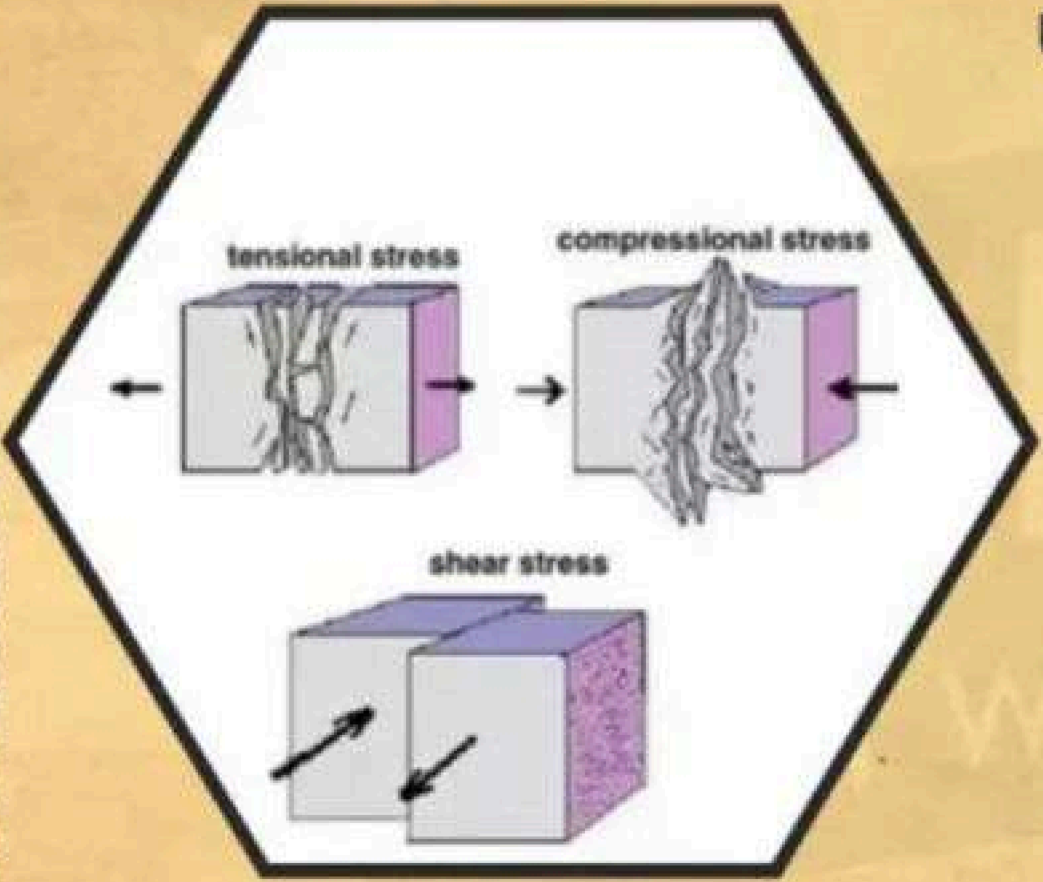

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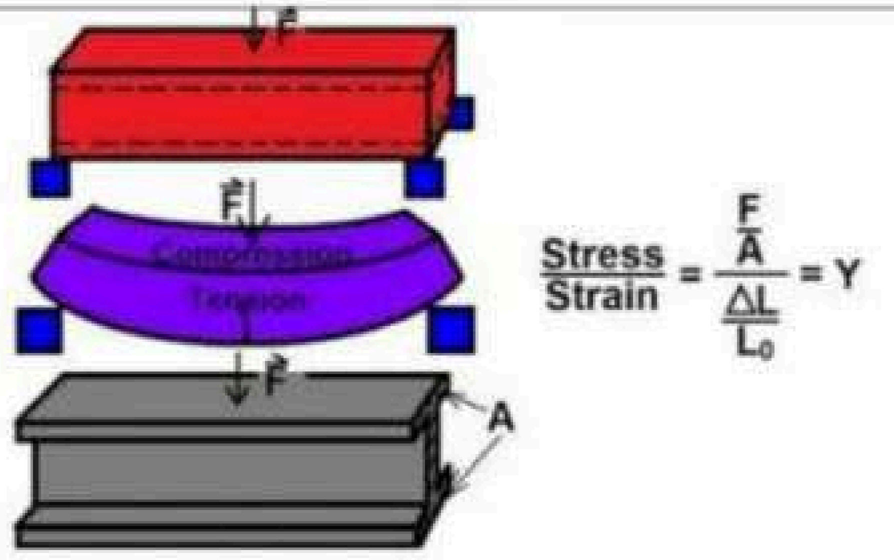

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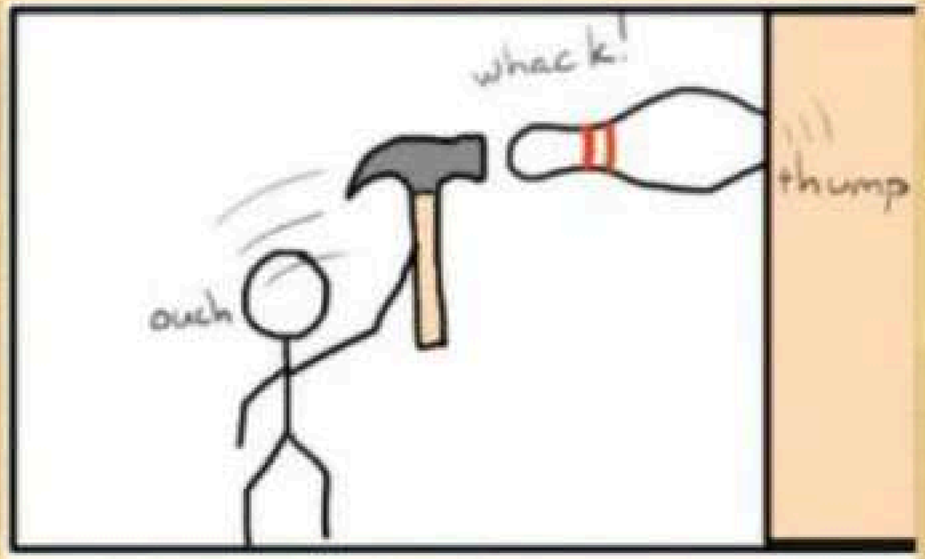

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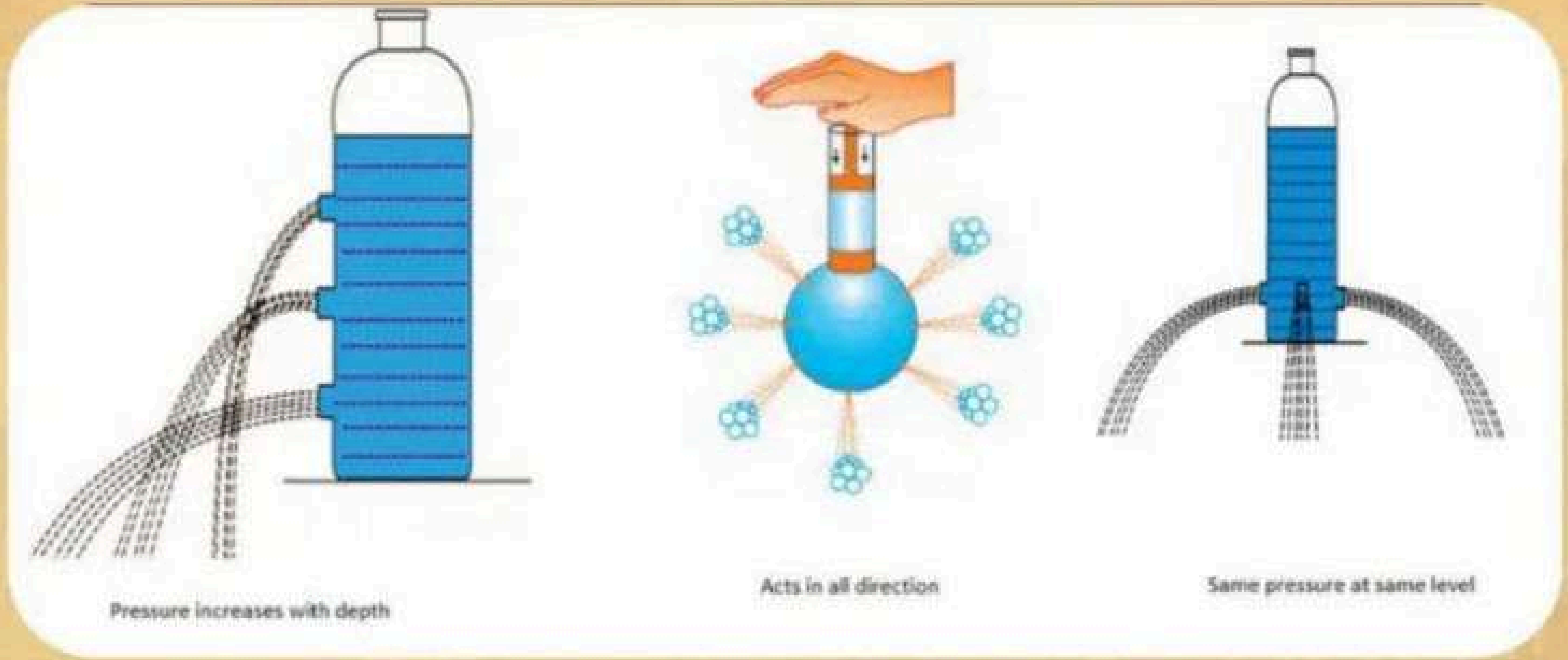
Liquid pressure



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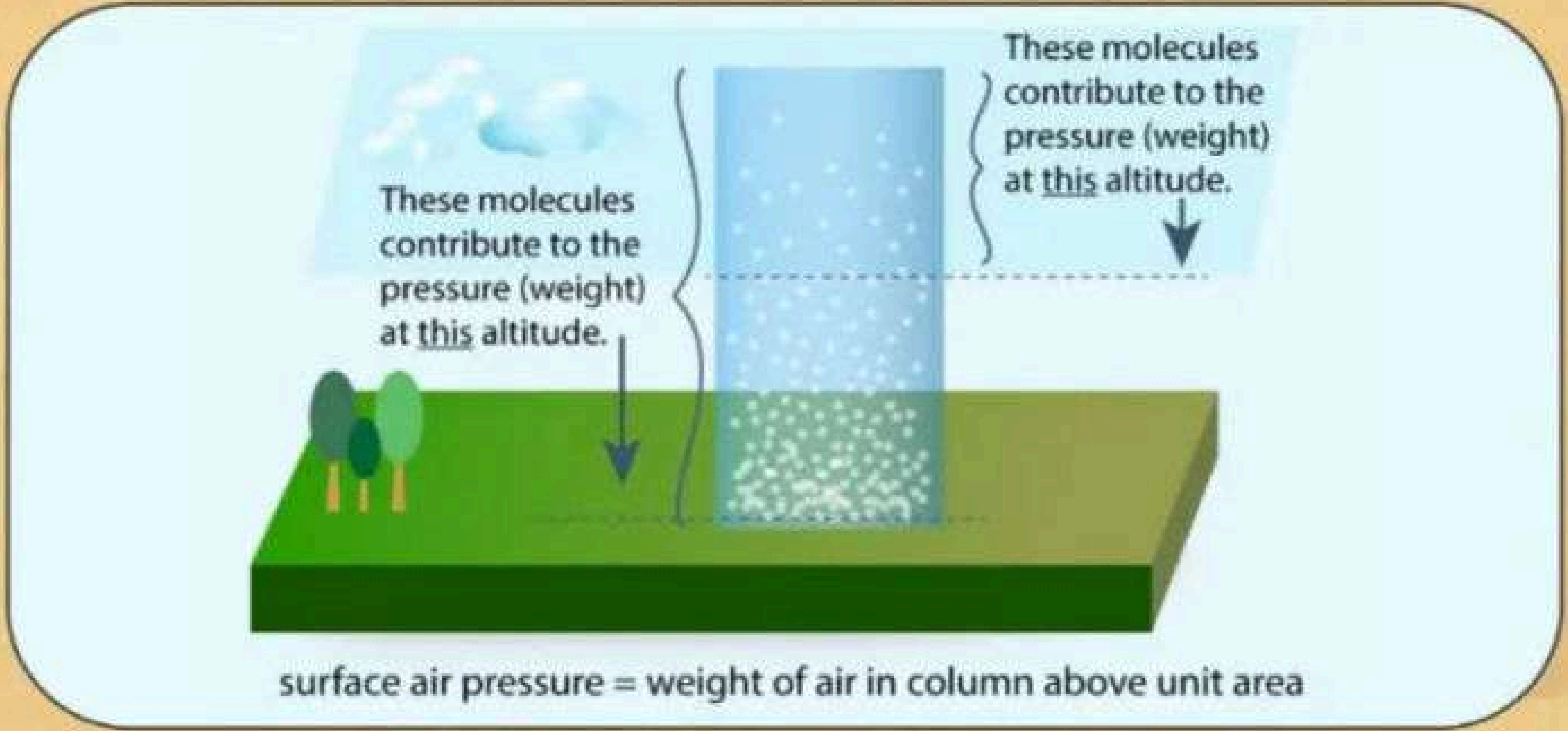

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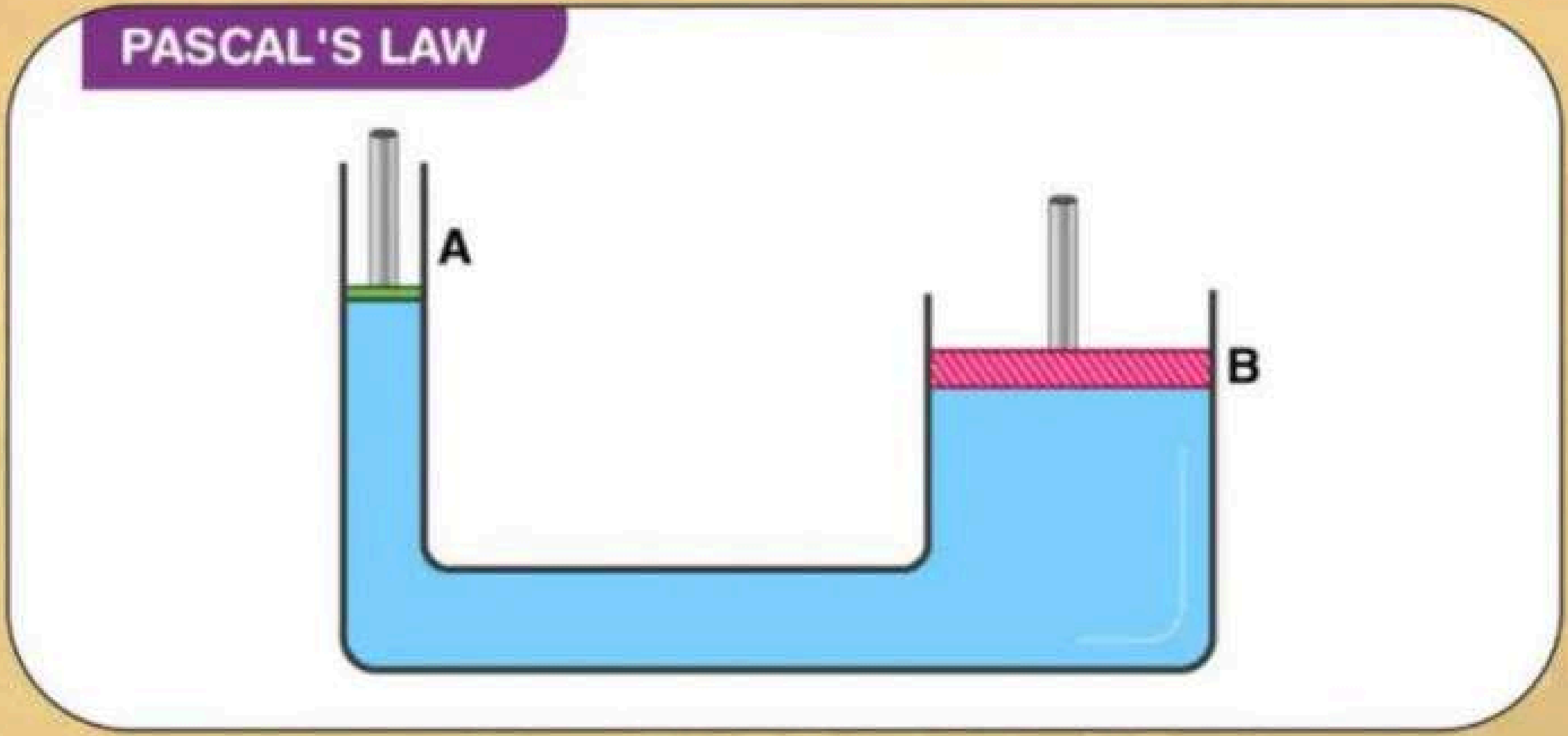

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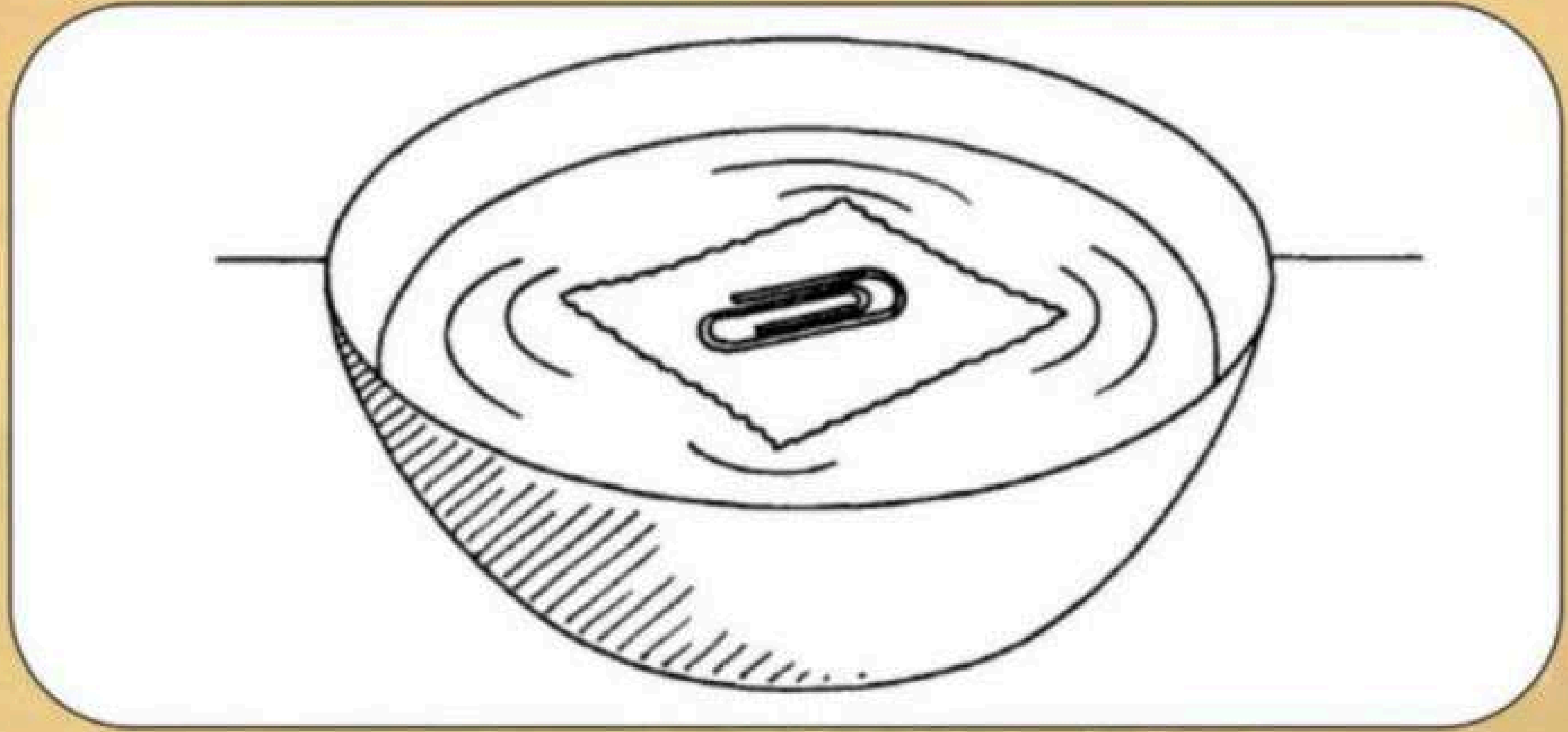

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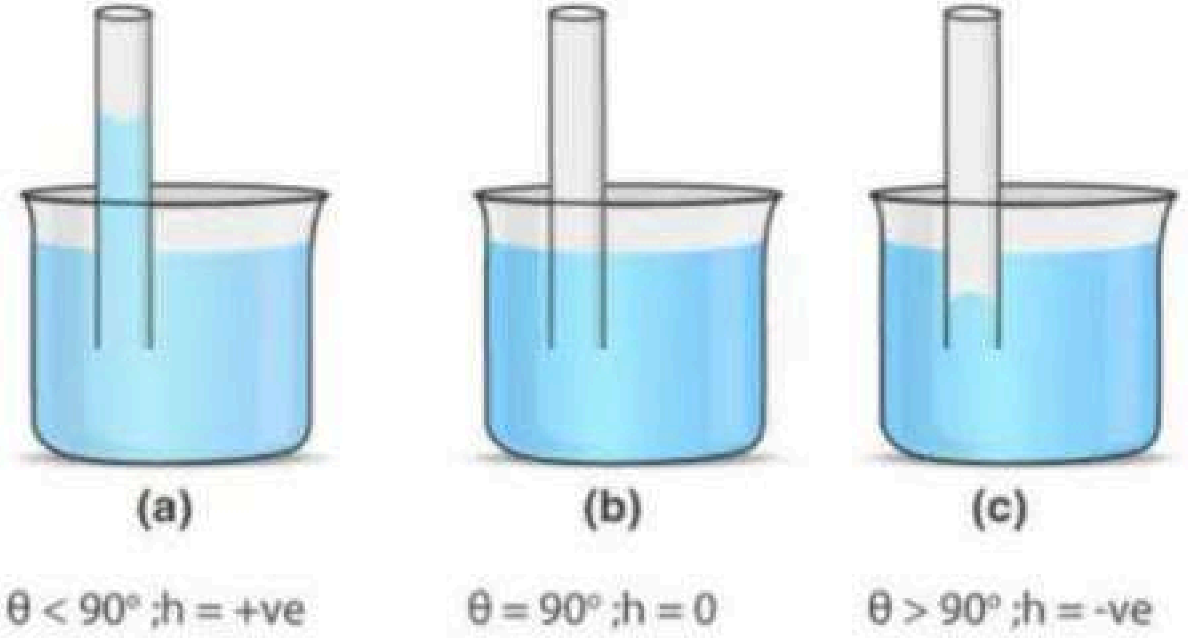

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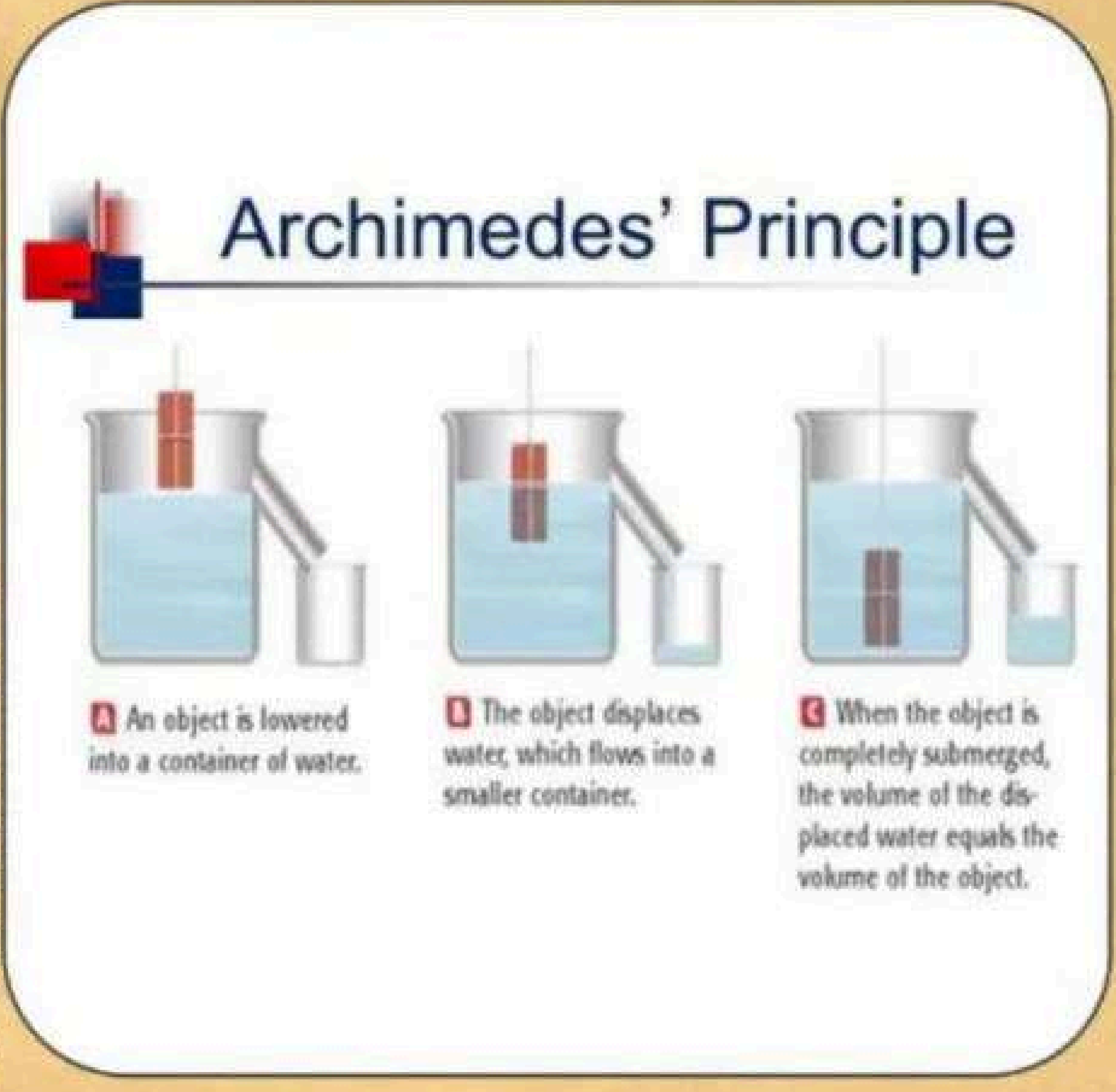

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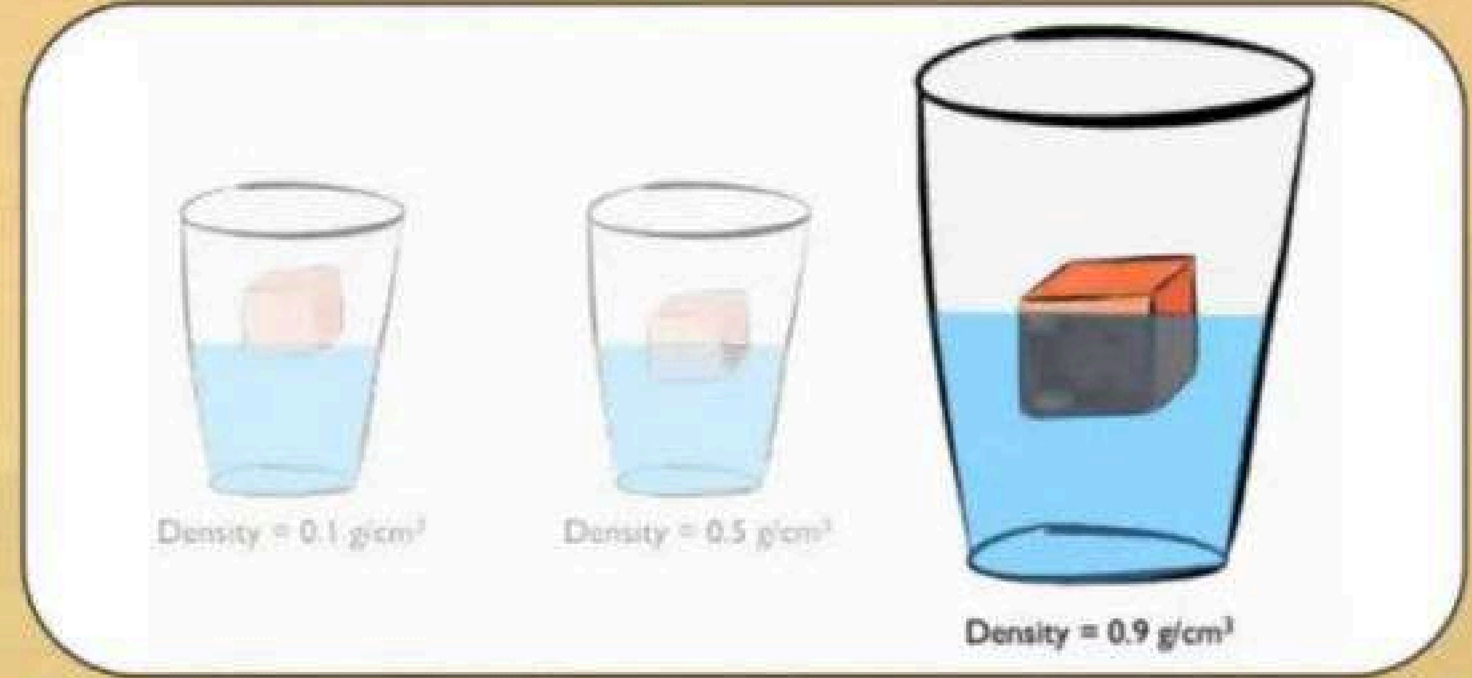

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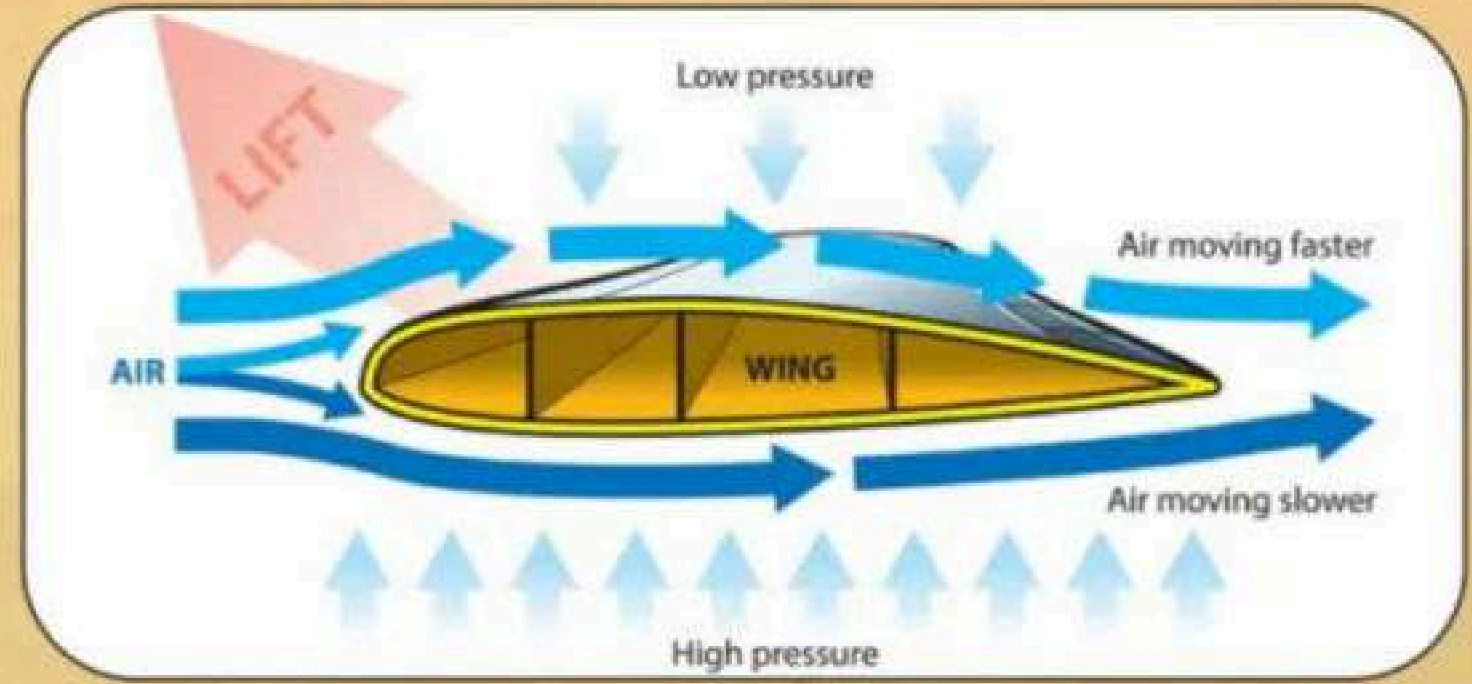

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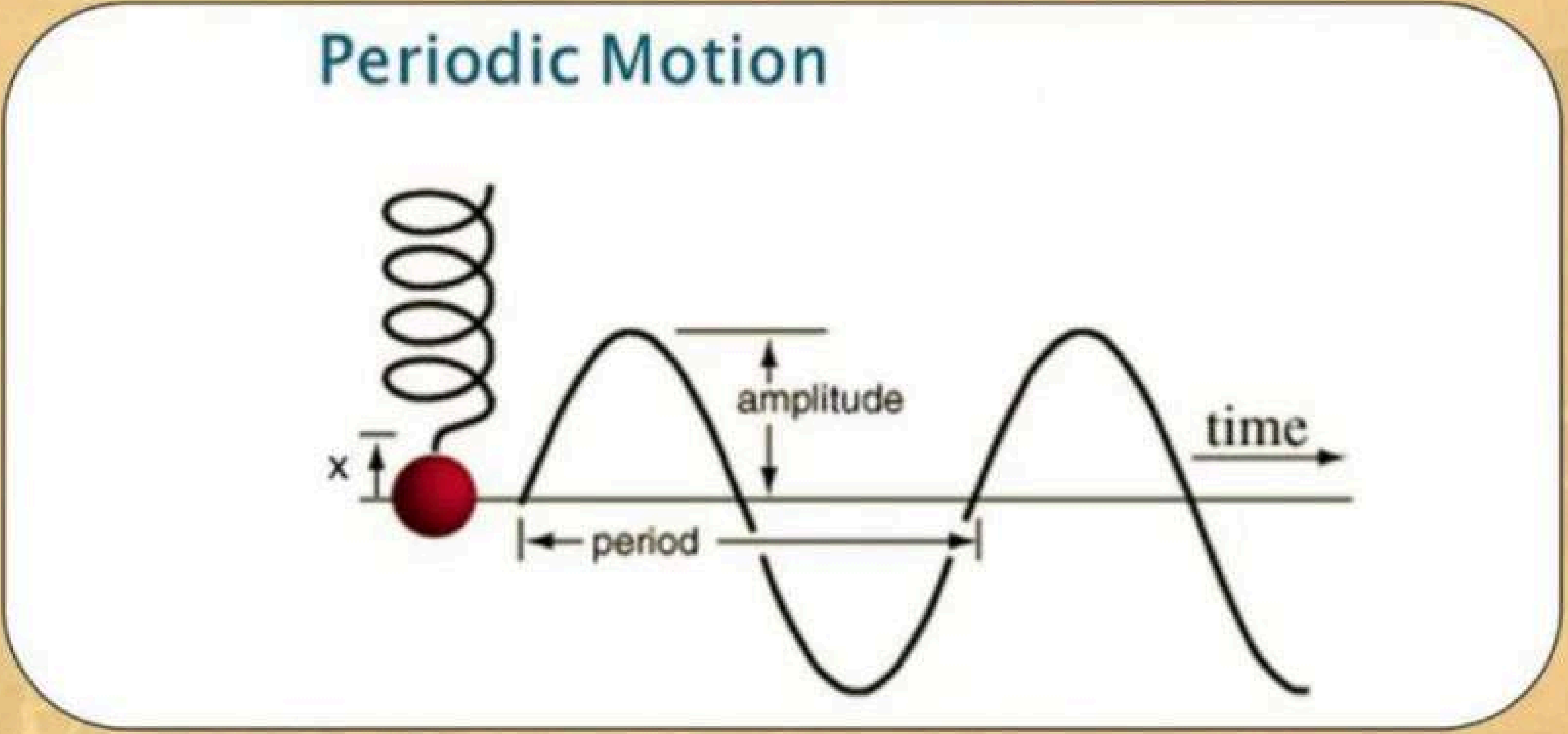

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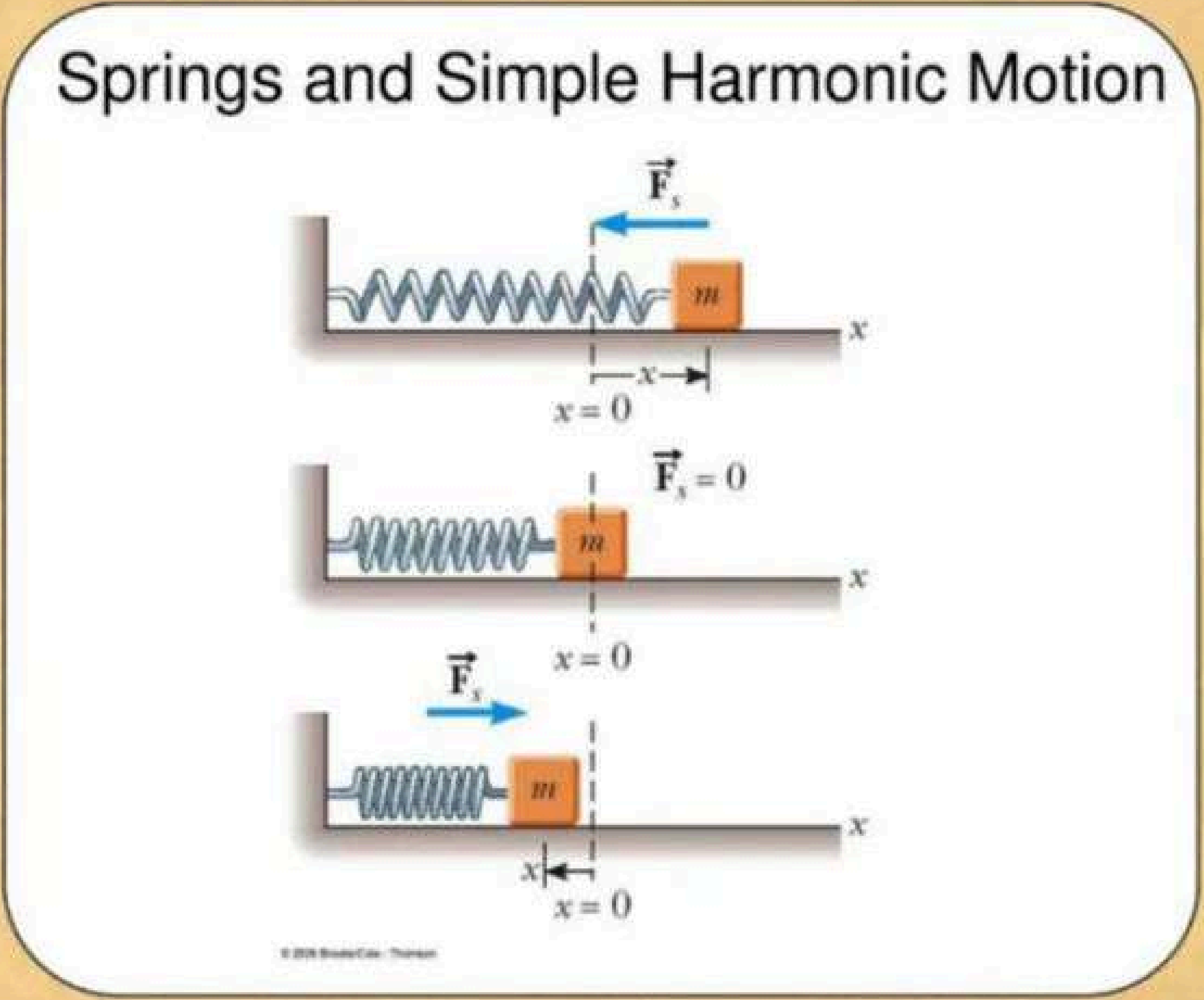

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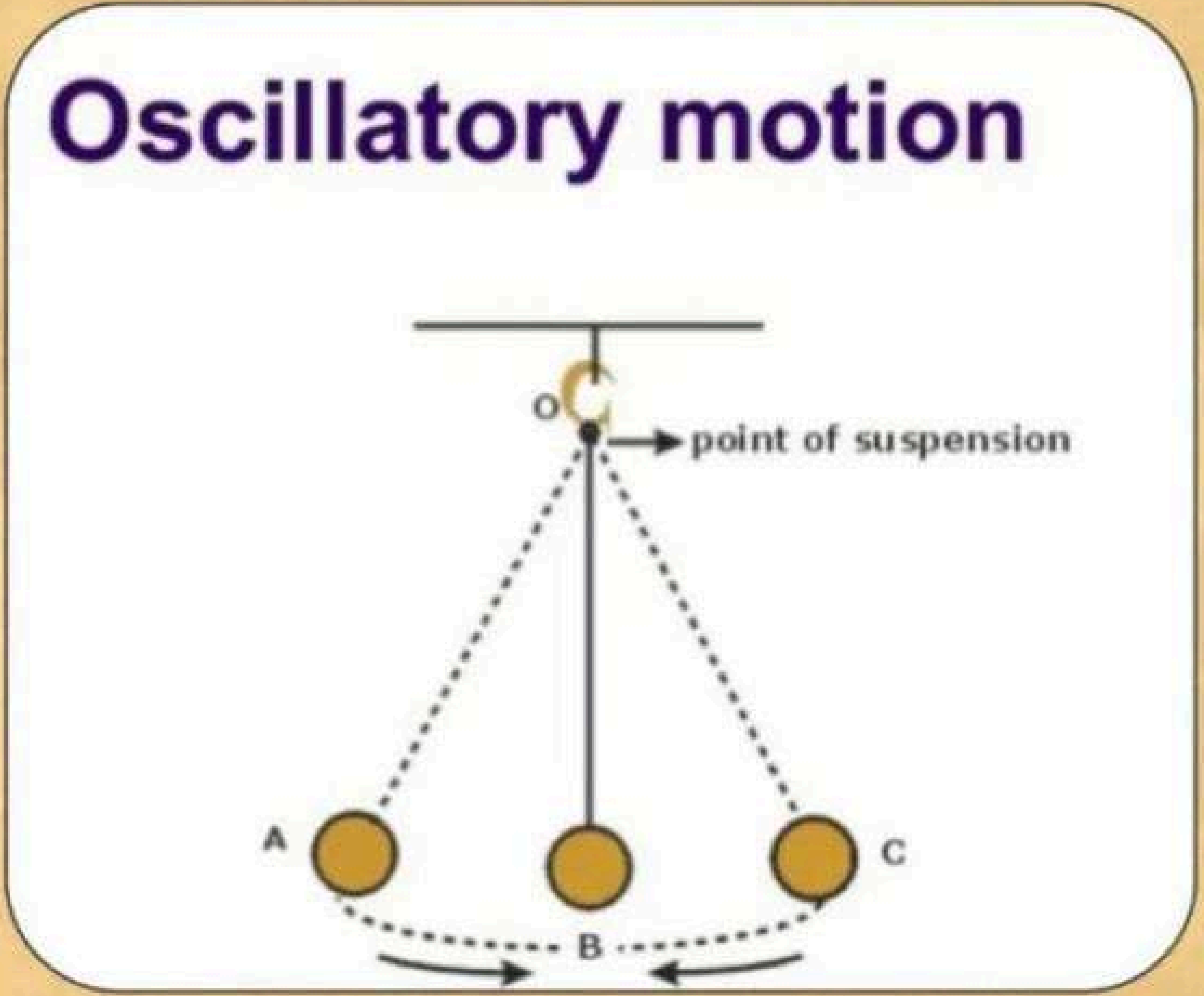

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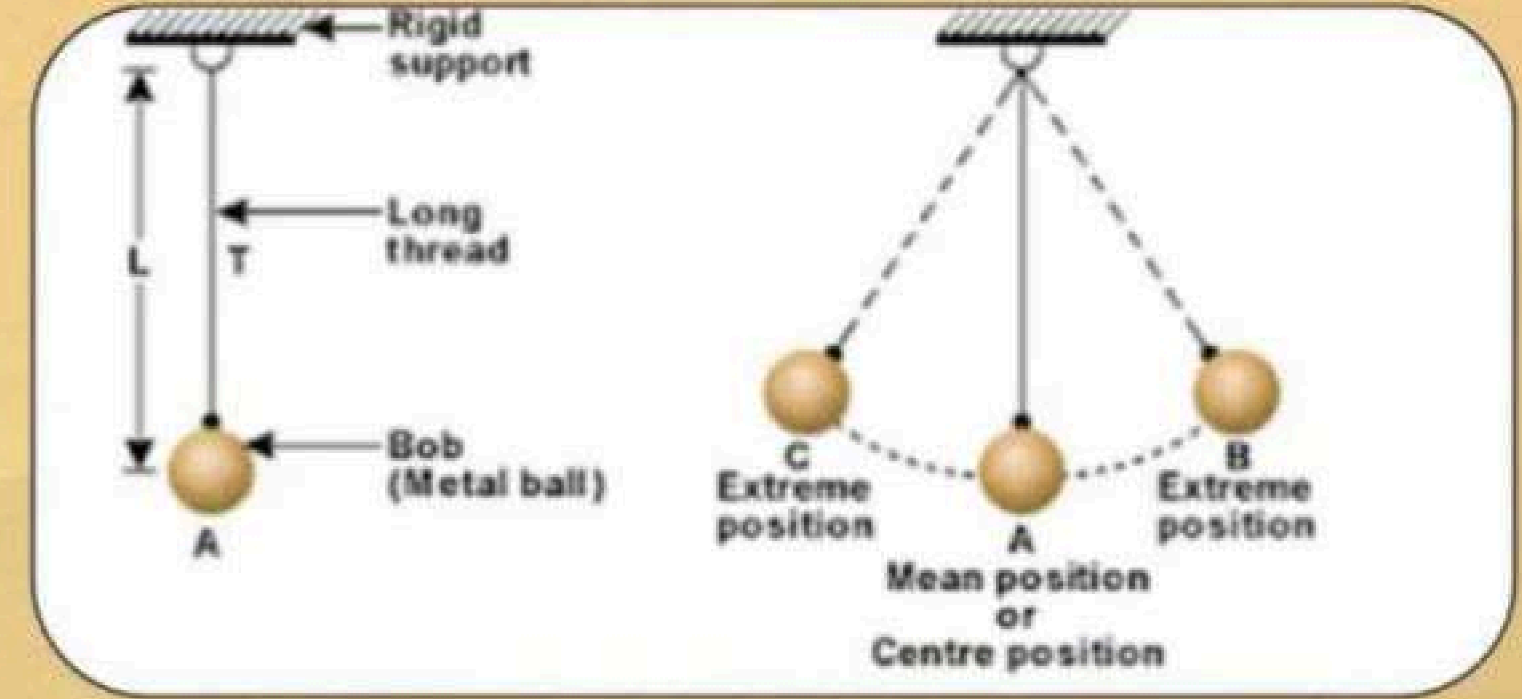
The time taken for an oscillation to occur is often referred to as the oscillatory period.

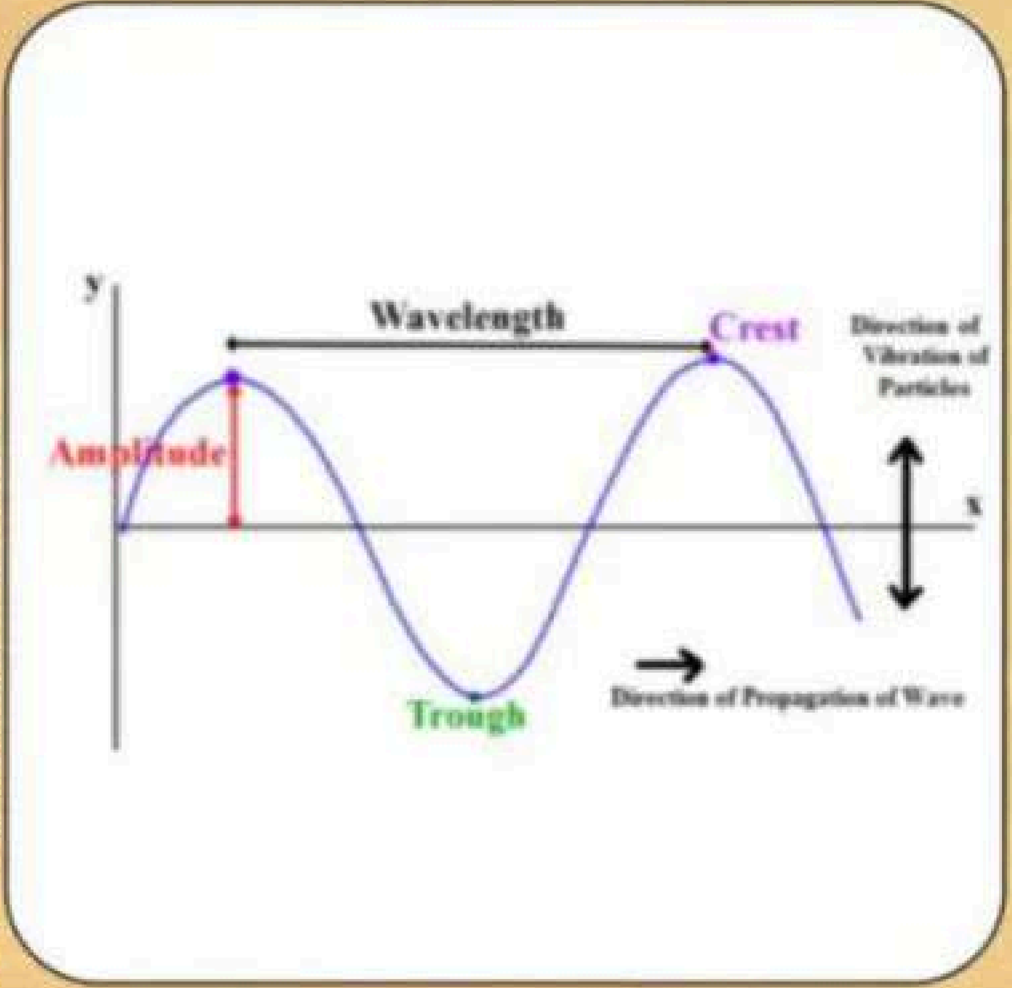
Simple Pendulum



The period of swing of a simple gravity pendulum depends on its length. The maximum angle that the pendulum swings away from vertically, θ0, is called the amplitude.
Where,
T is the period in seconds (s)
L is the length of the rod or wire in meters or feet
g is the acceleration due to gravity (9.8 m/s^2)
For small swings
The period is independent of amplitude. This property, called isochronism, is the reason pendulums are so useful for timekeeping.

For larger amplitudes, the period increases gradually with amplitude.

WAVE AND WAVE MOTION



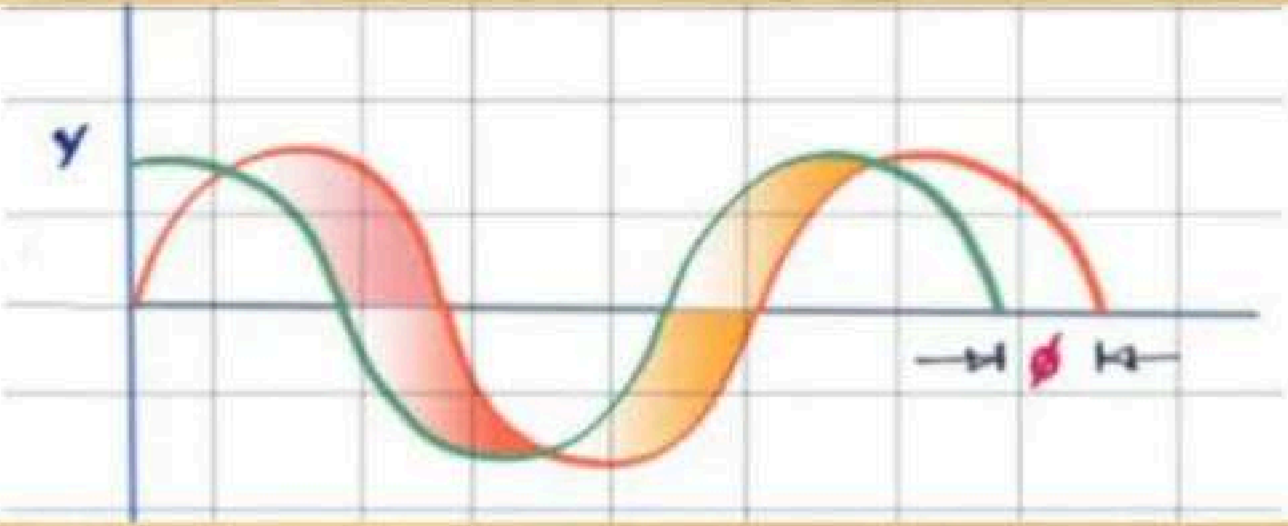
It is a vibration or disturbance in space.

A medium is the substance that all sound waves travel through and need to have in order to move.

Types of Waves

1. Longitudinal Wave - move parallel with the wave motion.
2. Transverse Wave - move perpendicular with the wave motion.
3. Surface waves - particles travel in a circular motion.
4. Electromagnetic waves (including light) can move through a vacuum. 5. Physical waves require matter through which to propagate.

Wave Motion



It transfers energy from one point to another, often with no permanent displacement of the particles of the medium.

Displacement (y): Position of an oscillating particle from its equilibrium position.

Amplitude (y0 or A): The maximum magnitude of the displacement from its equilibrium position.

Period (T): Time taken for a particle to undergo one complete cycle of oscillation.

Frequency (f): Number of oscillations performed by a particle per unit time.

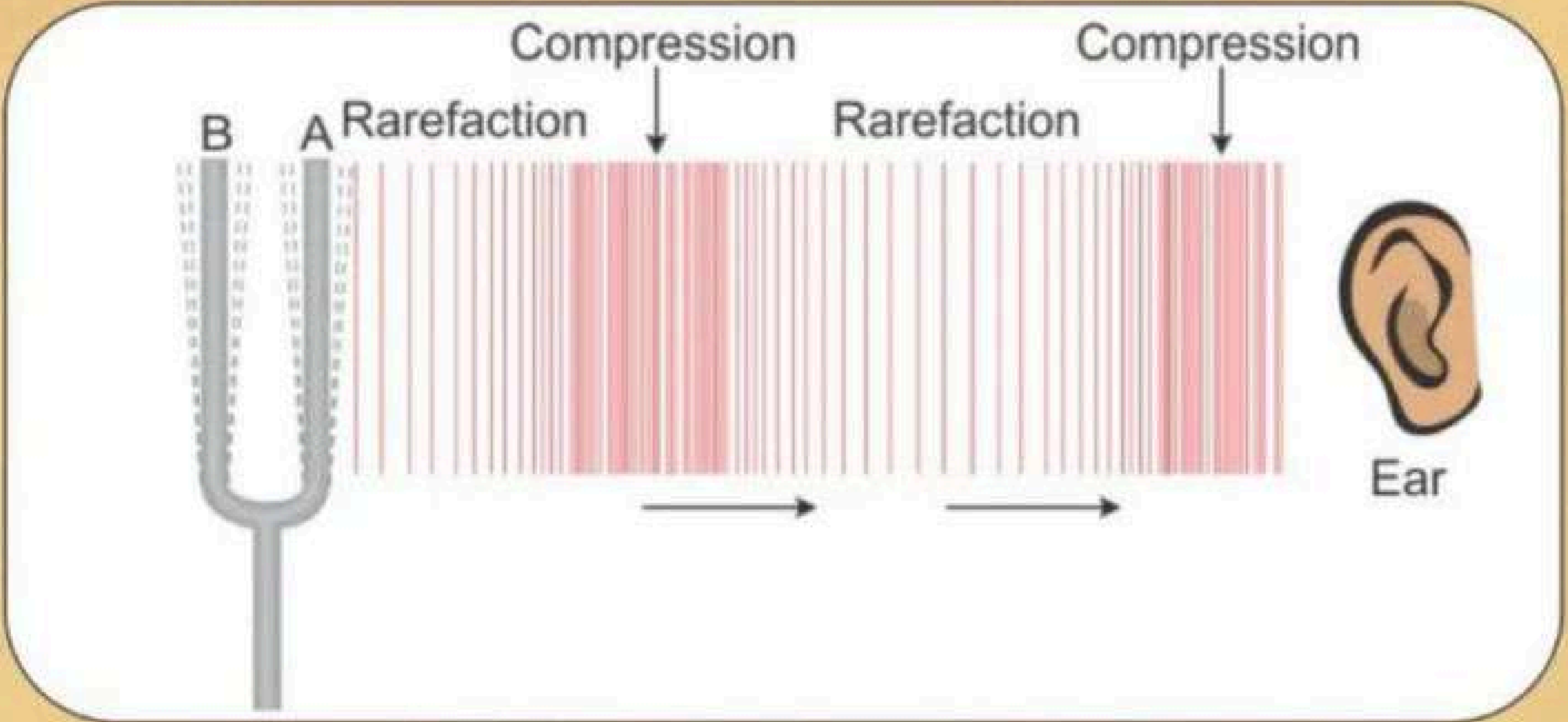
Wavelength (λ): The distance between any two successive particles that are in phase, e.g. it is the distance between 2 consecutive crests or 2 troughs.

Wave speed (v): The speed at which the waveform travels in the direction of the propagation of the wave.

Wave front: A line or surface joining points which are at the same state of oscillation, e.g. a line joining crest to crest in a wave.

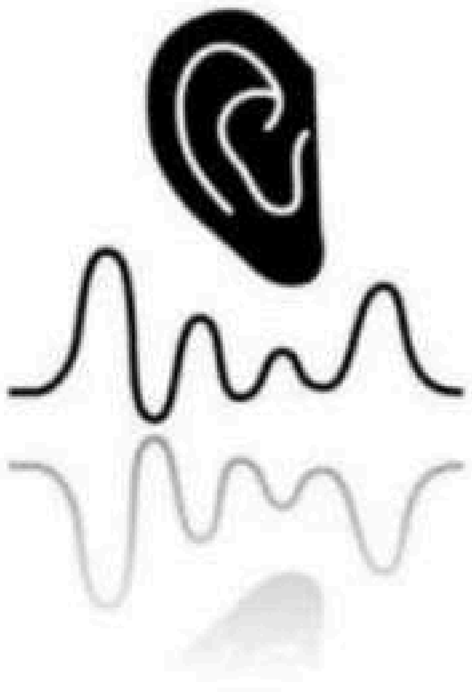
Ray: The path taken by the wave. Rays are always at right angles to the wave fronts.

Sound Wave



Sound waves exist as variations of pressure in a medium such as air.
The vibrating air then causes the human eardrum to vibrate, which the brain interprets as sound.
The scientific study of sound waves is known as Acoustics.

Facts about Sound



Sound can't travel through a vacuum (An area empty of matter).

The speed of sound is around 767 miles per hour (1,230 kilometers per hour).

When traveling through water, sound moves around four times faster than when it travels through air.

The sound of thunder is produced by rapidly heated air surrounding lightning which expands faster than the speed of sound.

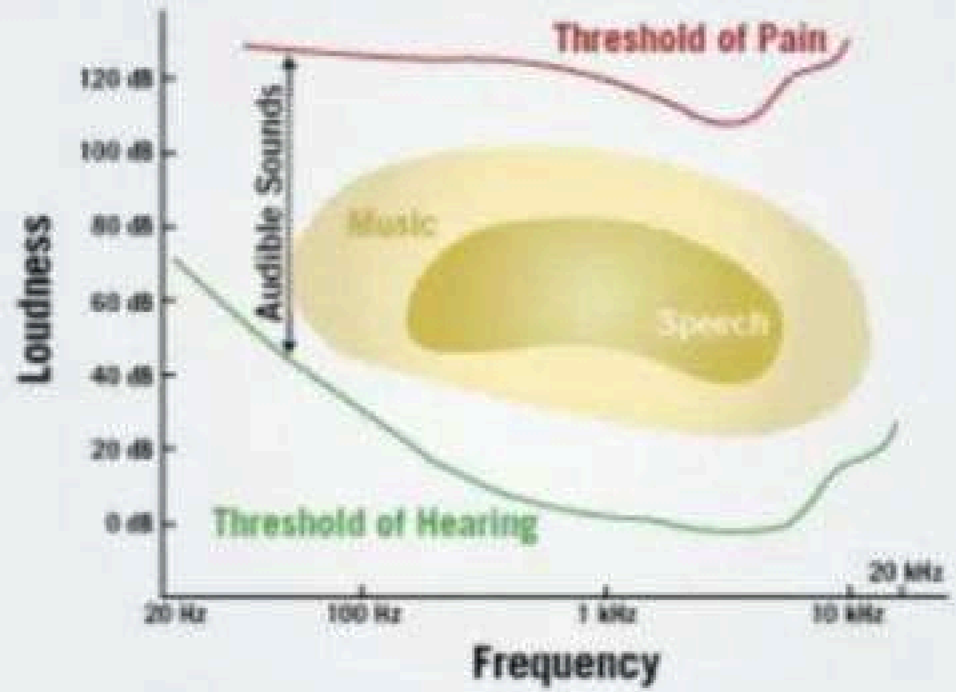
#Graphic By Aman Srivastava

Facts about Sound

Material	Speed of Sound
Air at 20^0 C	343 m/s
Air at 40^0 C	355 m/s
Water	1493 m/s
Sea Water	1533 m/s
Iron	5130 m/s
Rubber	1600 m/s

#Graphic By Aman Srivastava

Perception of Sound



The perception of sound in any organism is limited to a certain range of frequencies.

It can calculate with hertz (Hz).

For humans, hearing is normally limited to frequencies between about 20 Hz and 20,000 Hz (20 kHz).

#Graphic By Aman Srivastava

Intensity (I)

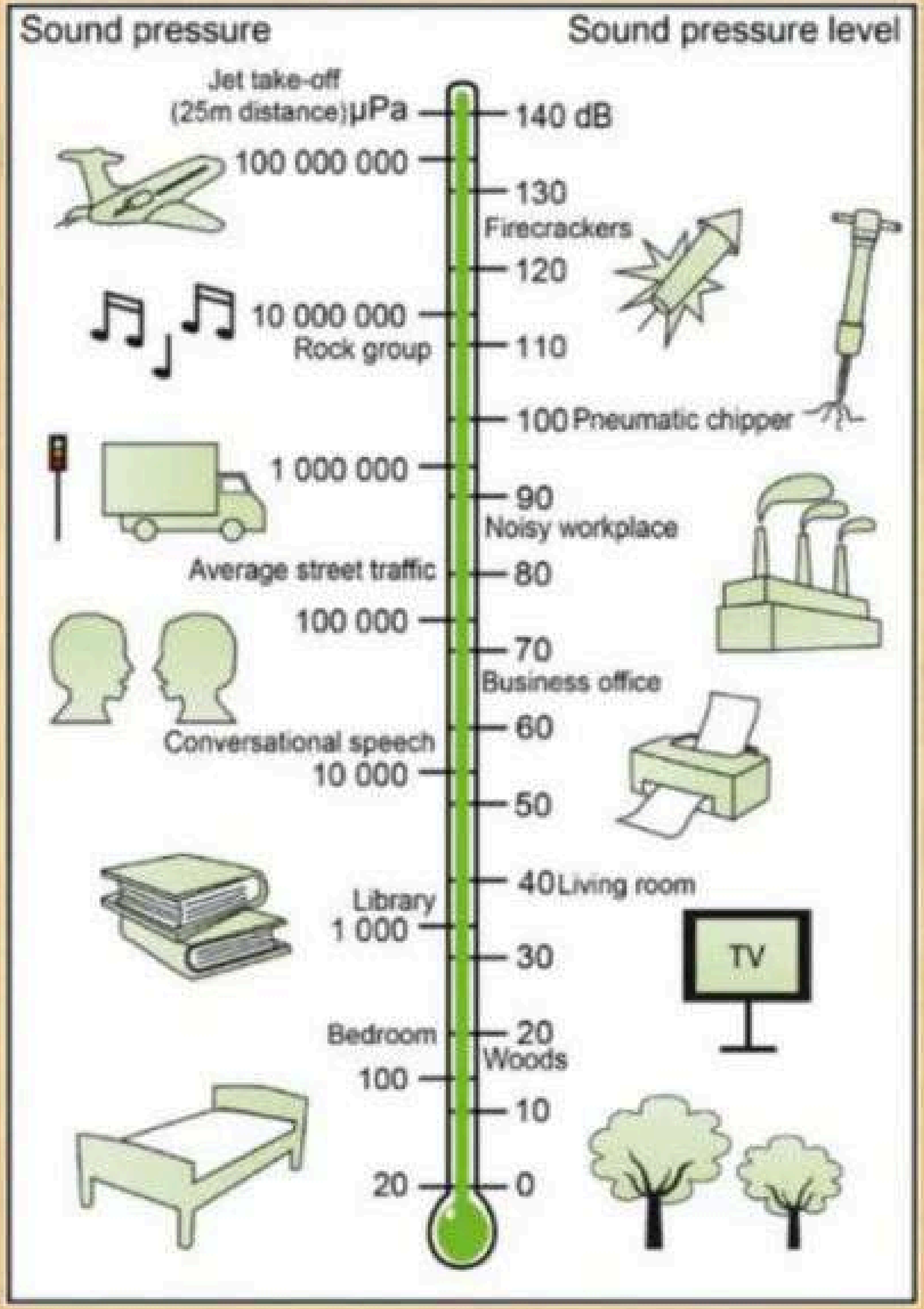
It is the power transferred per unit area.

Its unit is watt per metre square (W/m2).

The intensity is the product of the sound pressure and the particle velocity: I= p v

The decibel (dB) is the unit used to measure the intensity of a sound.

Intensity of Various Sounds



Near total silence - 0 dB

A whisper - 15 dB

Normal conversation - 60 dB

A lawnmower - 90 dB

A car horn - 110 dB

A rock concert or a jet engine - 120 dB

A gunshot or firecracker - 140 dB

#Graphic By Aman Srivastava

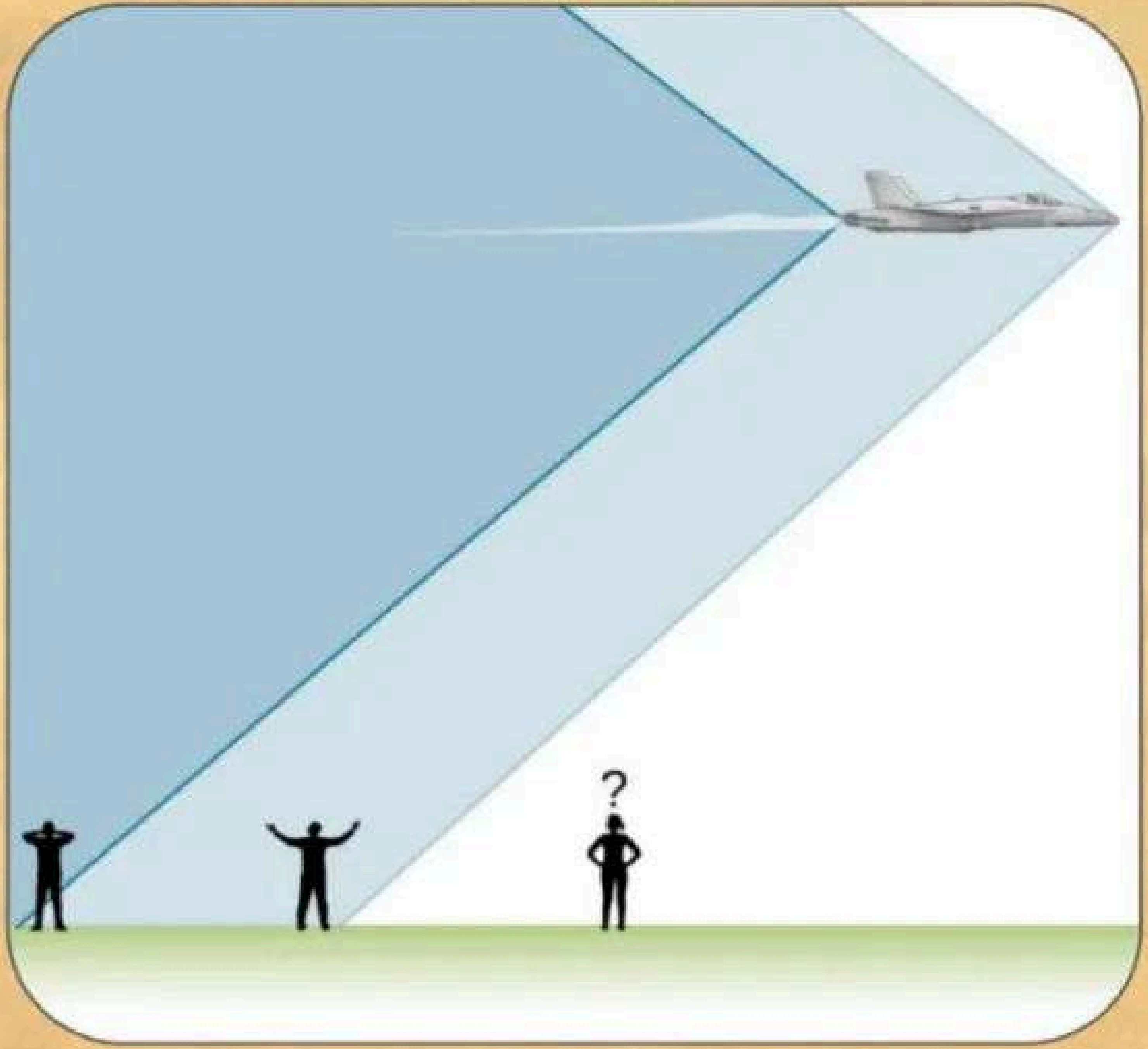
Pitch

Whistle
High pitch sound

Drum
Low pitch sound

It is the sensation of a frequency of a sound wave.

Shock Wave

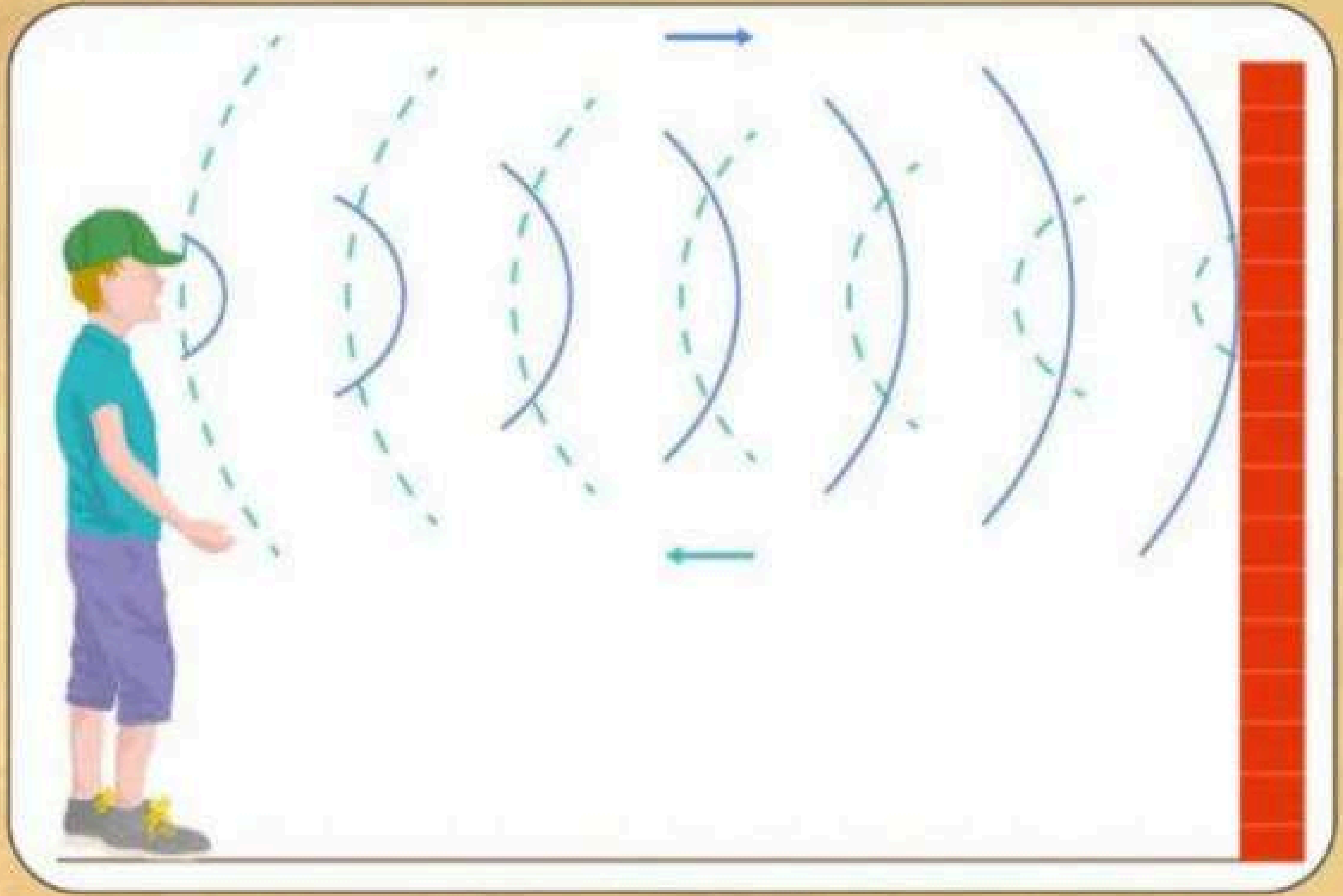


It is a thin transitive area propagating with supersonic speed in which there is a sharp increase of density, pressure and speeds of substance.

It arises at explosions, detonation, supersonic movements of bodies, powerful electric discharges etc.

#Graphic By Aman Srivastava

Echo



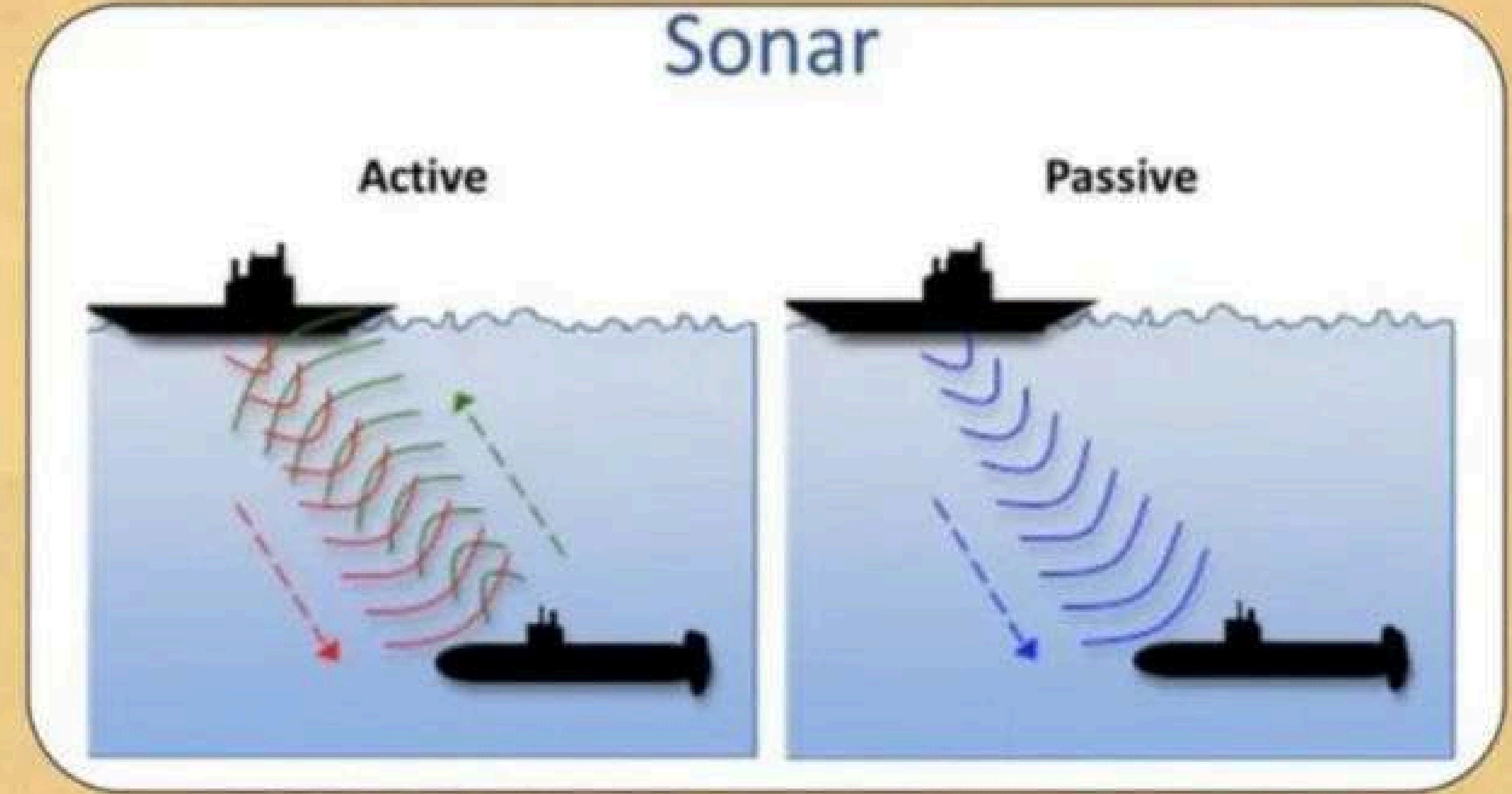
In other words it is the reflection of sound.

Sound travels 34 m in 0.1 seconds, so you only hear echoes from surfaces that are at least 17 m away.

The use of echoes to locate objects is called echolocation.

Reverberation is the collection of reflected sounds from the surfaces in an enclosure like an auditorium.

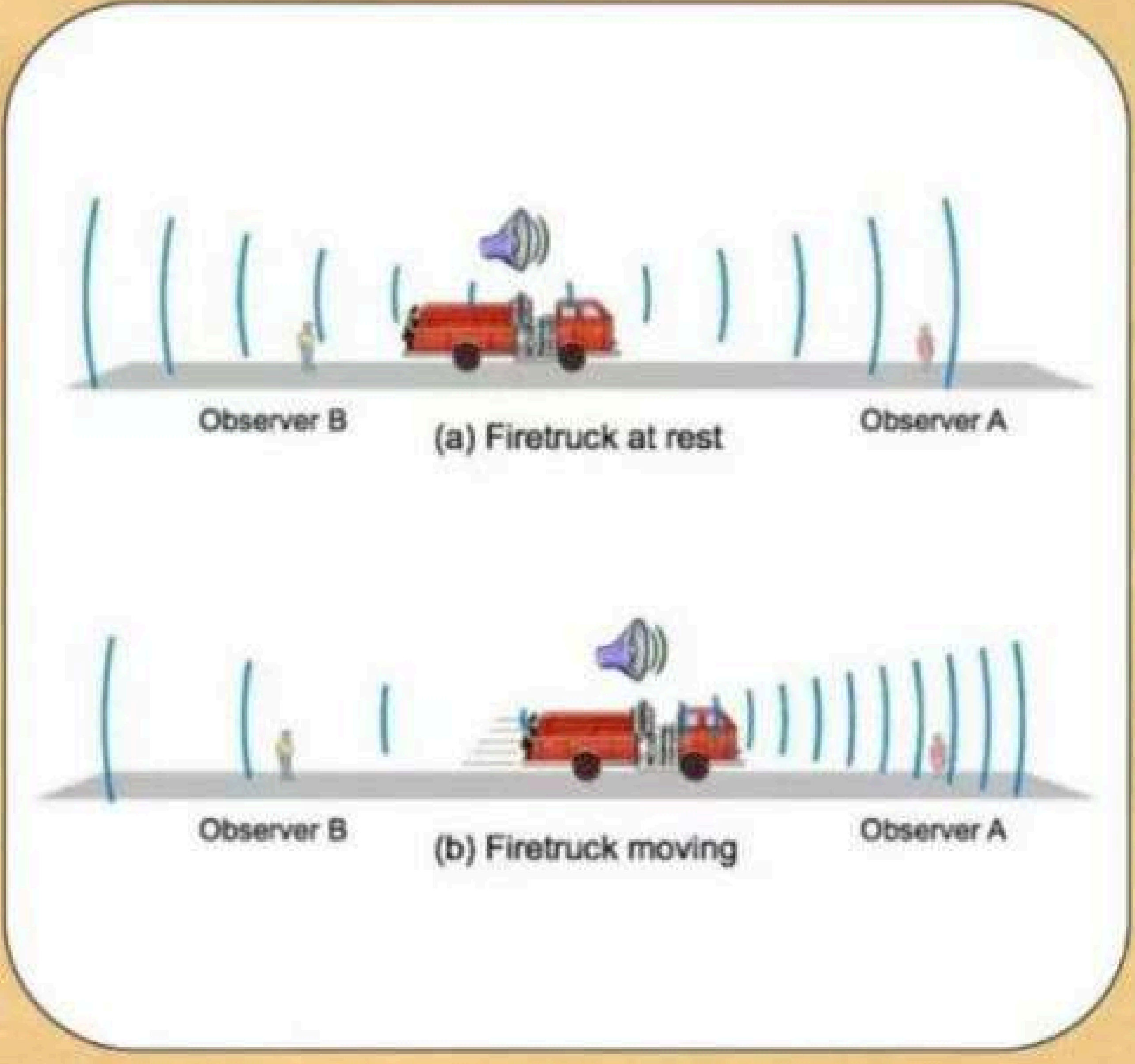
SONAR



Sonar (Sound Navigation And Ranging) is a technique that uses sound propagation (usually underwater, as in submarine navigation) to navigate, communicate with or detect objects on or under the surface of the water, such as other vessels.

#Graphic By Aman Srivastava

Doppler Effect



It is named after the Austrian physicist Christian Doppler, who proposed it in 1842 in Prague.

It can be noticed that when an ambulance or police car goes past, its siren is high-pitched as it comes towards a person, then becomes low-pitched as it goes away. This effect, where there is a change in frequency and wavelength, is called the Doppler Effect.

When a source moves towards an observer, the observed wavelength decreases and the frequency increases.

When a source moves away from an observer, the observed wavelength increases and the frequency decreases.

#Graphic By Aman Srivastava

Q.1) When a bullet is fired from a gun

(a) the gun moves forward

(b) the gun jumps up

(c) the gun does not move

(d) the gun recoils with the same momentum as the bullet

(d) the gun recoils with the same momentum as the bullet

Q.2) If you want to open a door with les difficulty you push it
(a) at the middle
(b) at a point away from the hinge (near the rim)
(c) near the hinge
(d) None of the above

(b) at a point away from the hinge (near the rim)

Q.3) The motion of the pendulum of a wall clock is an example of
(a) vibratory motion
(b) linear motion
(c) rotational motion
(d) None of the above

(a) vibratory motion

Q.4) The period of oscillation of a simple pendulum depends upon
(a) the mass of its bob
(b) the material of the bob
(c) the amplitude of vibration
(d) acceleration due to the gravity at the site of experiment

(d) acceleration due to the gravity at the site of experiment

Q.5) When water is cooled from 4°C to 2°C its density

(a) increases

(b) decreases

(c) remains the same

(d) first increases then decreases

(b) decreases

Q.6) When a steel ball is placed on the surface of mercury, it does not sink because
(a) of the surface tension of mercury
(b) mercury is a semi-solid
(c) of the high viscosity of mercury
(d) the density of mercury is greater than that of steel

(d) the density of mercury is greater than that of steel

Q.7) A piece of ice is Boating In water kept in a beaker. When all the ice melts the level of water will

(a) first rise and then fall

(b) fall

(c) remain the same

(d) rise

(c) remain the same

Q.8) A person does not sink in the Dead Sea because

(a) the sea contains a large amount of other salts besides sodium chloride

(b) the density of the person is less than the density of the Dead Sea water

(c) of the surface tension due to salt water in the Dead Sea

(d) of difference in mass

(a) the sea contains a large amount of other salts besides sodium chloride

Q.9) A ship sailing from a river to the sea

(a) sinks less in the sea

(b) sinks more in the sea

(c) neither sinks more nor less in the sea

(d) sinking more or less depends on sea

(a) sinks less in the sea

Q.10) A balloon ruled with hydrogen will

(a) continue going upwards uninterrupted

(b) reach a particular height and remain floating

(c) burst after reaching some height

(d) reach a particular height and start coming down

(b) reach a particular height and remain floating

Q.11) When a body is immersed in a fluid the force of buoyancy of the fluid on the body depends on
(a) the immersed volume of the body
(b) density of the liquid
(c) acceleration due to the gravity at the place
(d) All the above

(d) All the above

Q.12) A hydraulic brake in an automobile uses
(a) a fluid to transmit the braking force
(b) the force applied by the driver
(c) hydrogen gas and not any liquid
(d) a vacuum brake

(a) a fluid to transmit the braking force

Q.13) In a hydraulic pressure

(a) force on each square centimetre of the small piston is less than the force on each square centimetre of the large piston

(b) the distance the small piston moves is equal to the distance the large piston moves

(c) applied pressure is equally transmitted throughout the liquid in all directions

(d) force acting on small piston is equal to the force acting on large piston

(c) applied pressure is equally transmitted throughout the liquid in all directions

Q.14) The attraction of unlike molecules at the common surface is known as
(a) adhesion
(b) cohesion
(c) surface tension
(d) capillarity

(a) adhesion

Q.15) In compact porous soil, the rising of the water is due to

(a) capillarity

(b) cohesion

(c) adhesion

(d) viscosity

(a) capillarity

Q.16) The property of a fluid by which it resists relative motion within itself is known as
(a) cohesive force
(b) surface tension
(c) diffusion
(d) viscosity

(d) viscosity

Q.17) A man weighing 50 kg floats on water in a lake. His apparent weight is
(a) 50 kg
(b) 45 kg
(c) zero
(d) 150 kg

(c) zero

Q.18) The modulus of rigidity is the ratio of :

[a] longitudinal stress to longitudinal strain
[b] volume stress to volume strain
[c] shearing stress to shearing strain
[d] Tensile stress to tensile strain

[c] shearing stress to shearing strain

Q.19) Which of the following is a result of surface tension?

[a] Gravitational pull
[b] Viscosity
[c] Capillary action
[d] Radiation

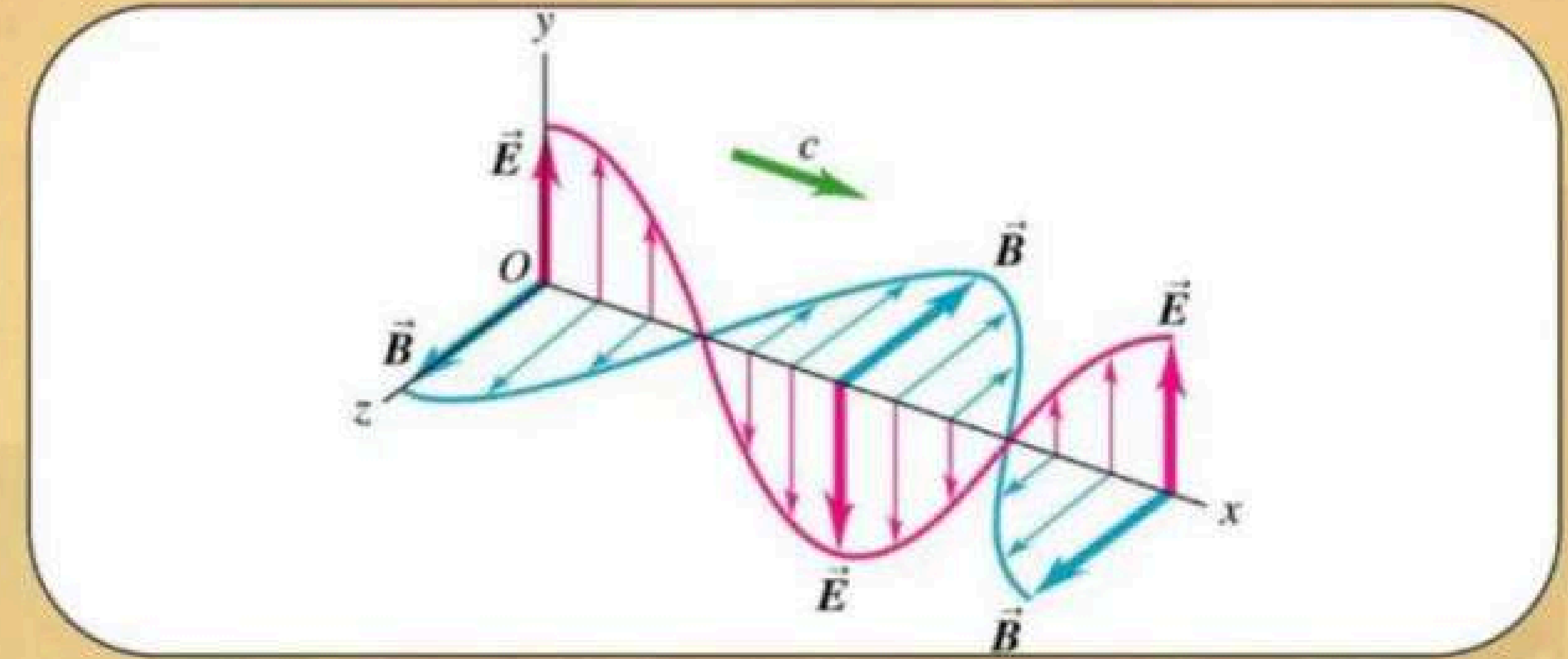
[c] Capillary action

Q.20) What is the SI unit of Torque?

[a] Newton/meter
[b] Newton meter
[c] Newton second
[d] Newton/meter squared

[b] Newton meter

Light



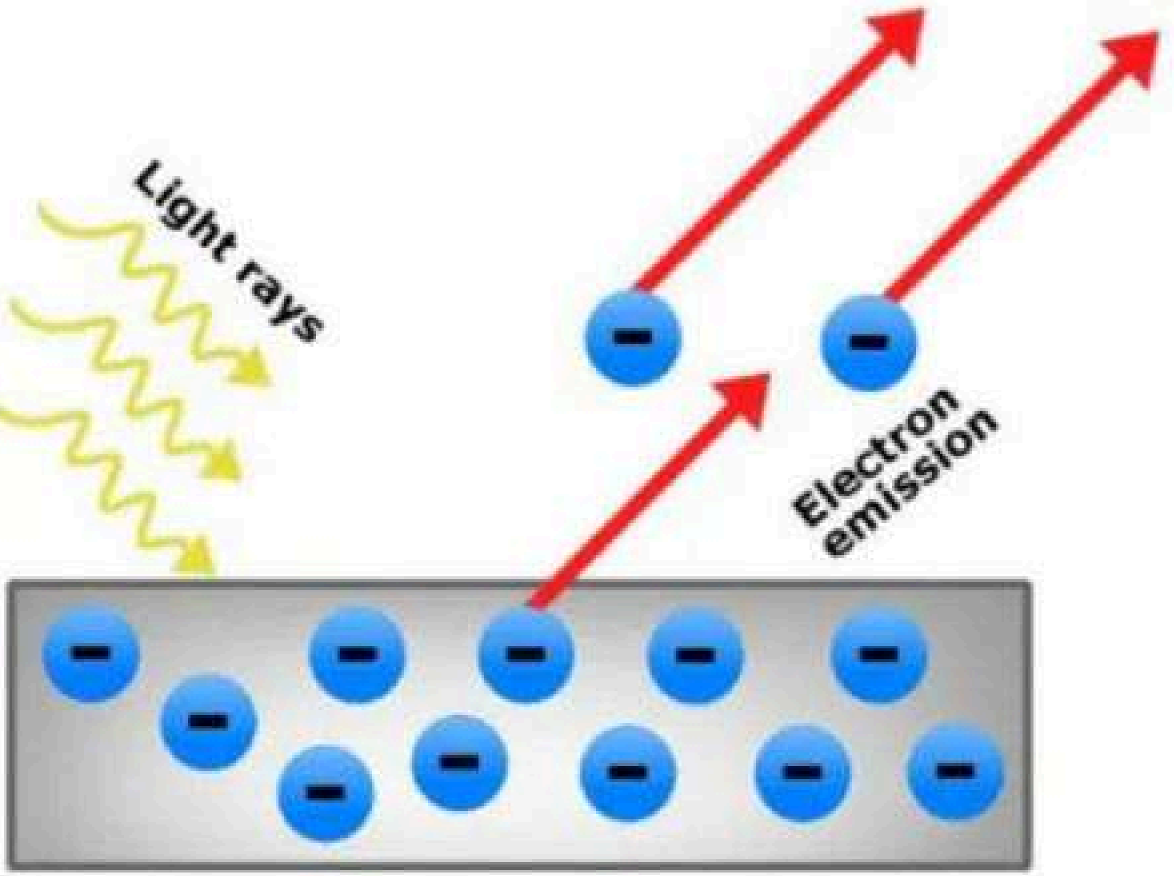
Study of light is called optics

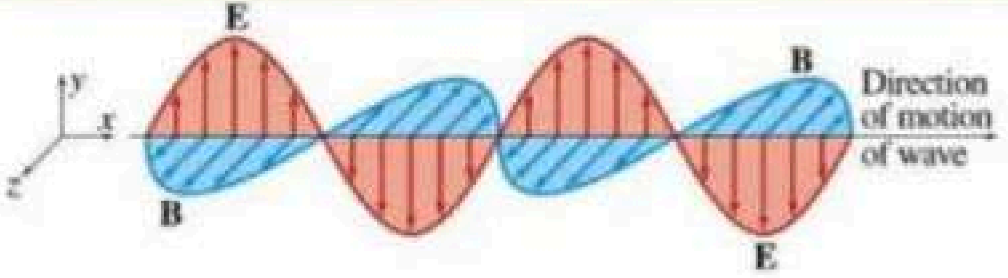
Light is a form of energy

Light is an electromagnetic wave

Speed of all electromagnetic wave is 3×10^8 m/sec. in air or vacuum.

Light has dual nature





Physical Optics

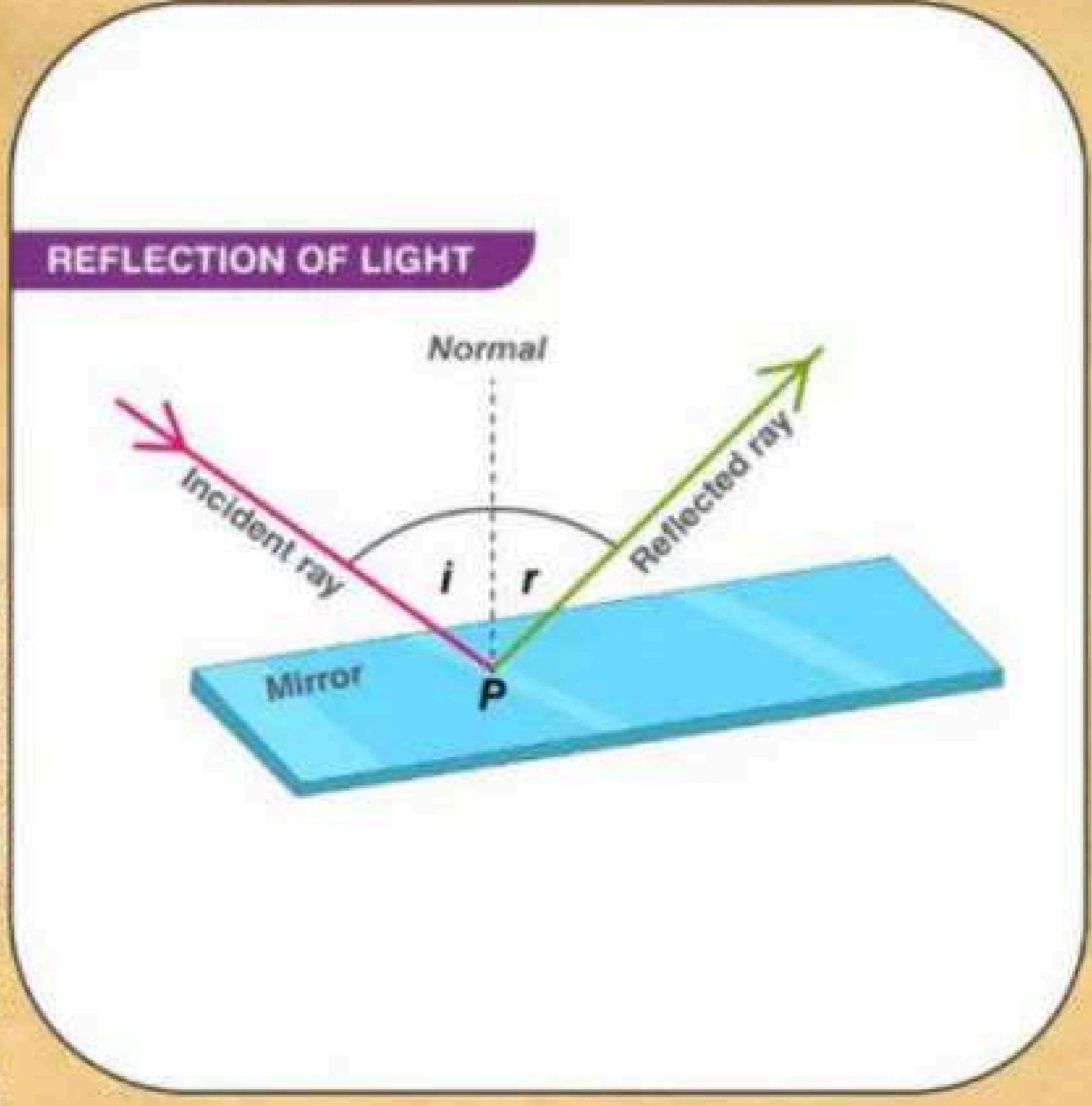
The wave nature of light

Interference

Diffraction

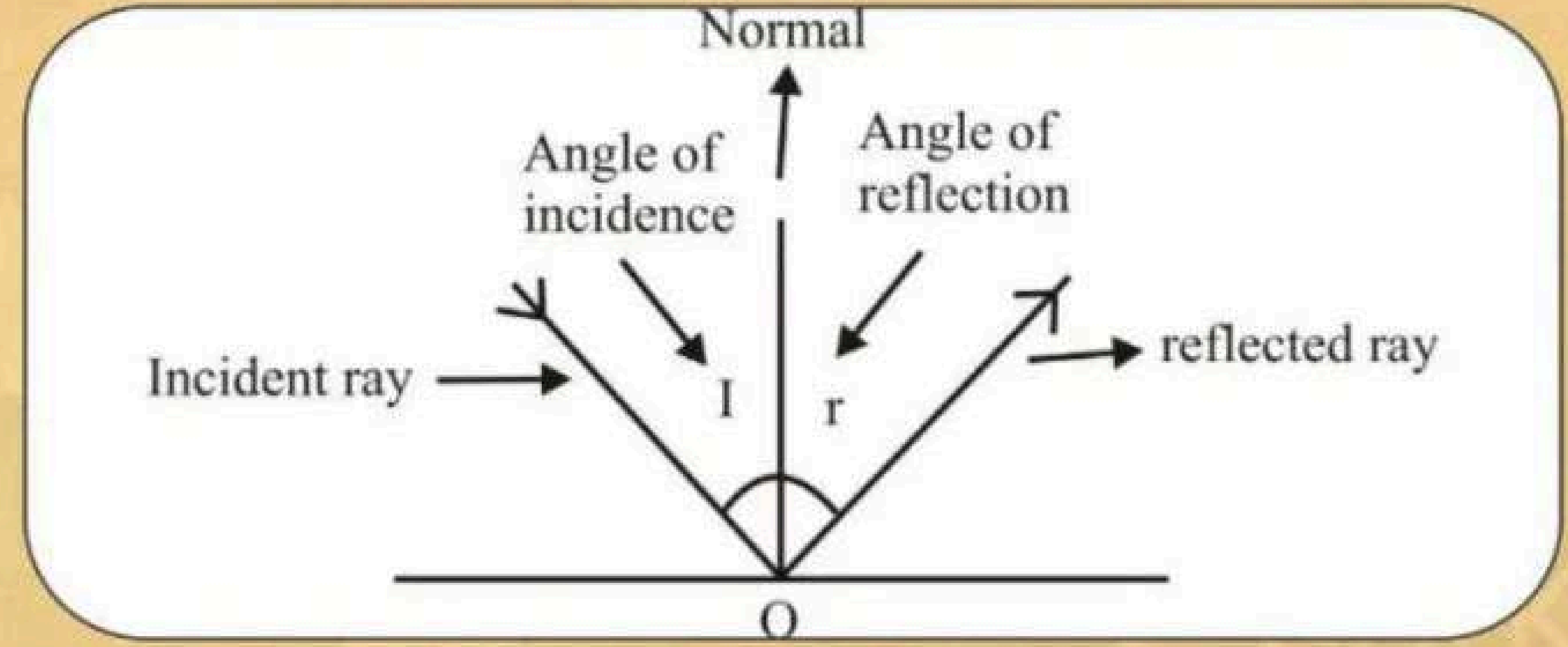
Polarization

Reflection of Light



If an object absorbs all the light. Which falls on it, then it will appear perfectly black. The process of sending back the light rays which fall on the surface of an object is called reflection of light.
Silver metal is one of the best reflectors of light ordinary mirrors are made by depositing a thin layer of silver metal on one side of a plane glass sheet.

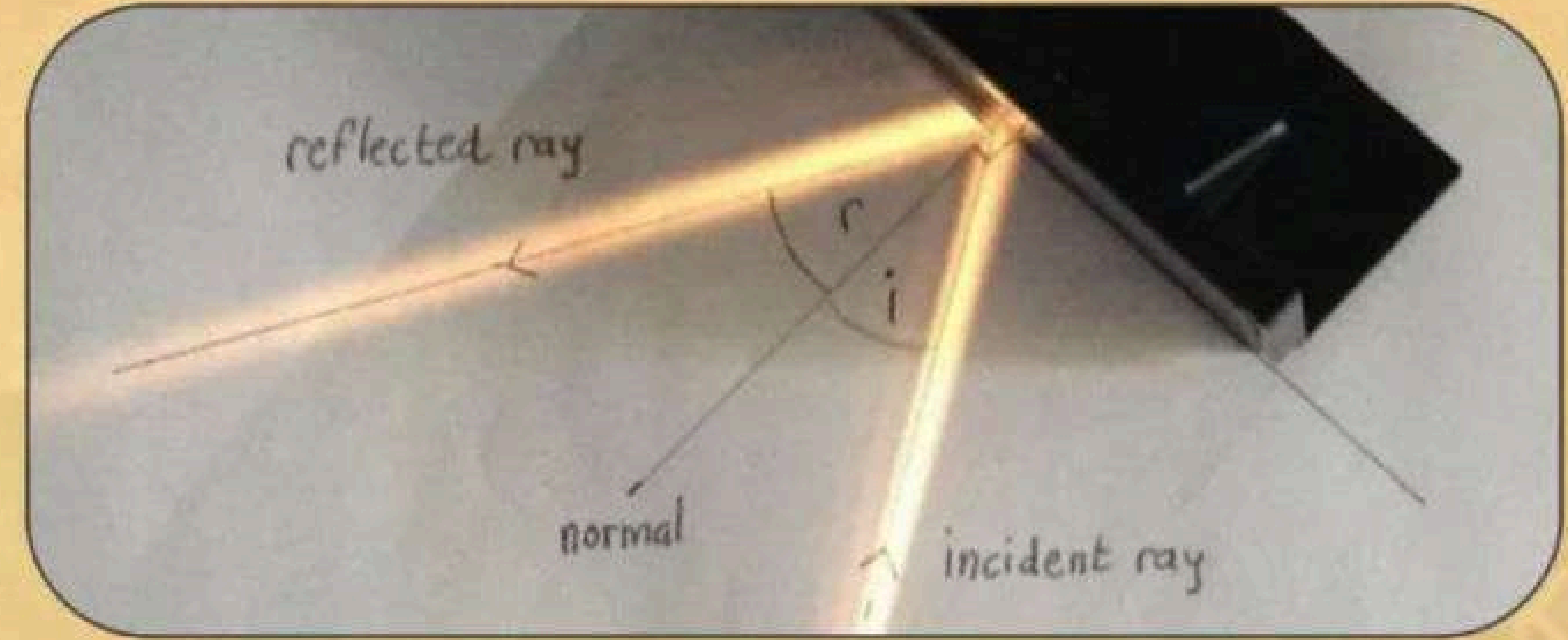
Laws of Reflection of Light



First law of reflection-

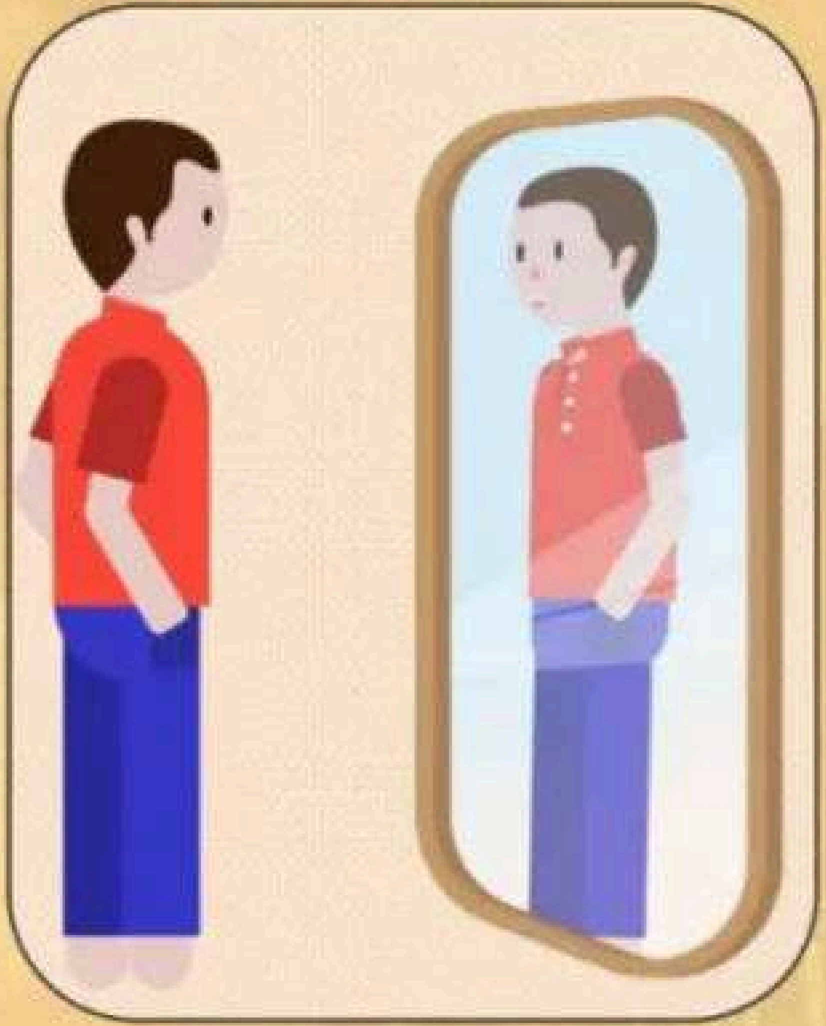
The incident ray, the reflected ray and the normal (at the point of incidence), all lie in the same plane.

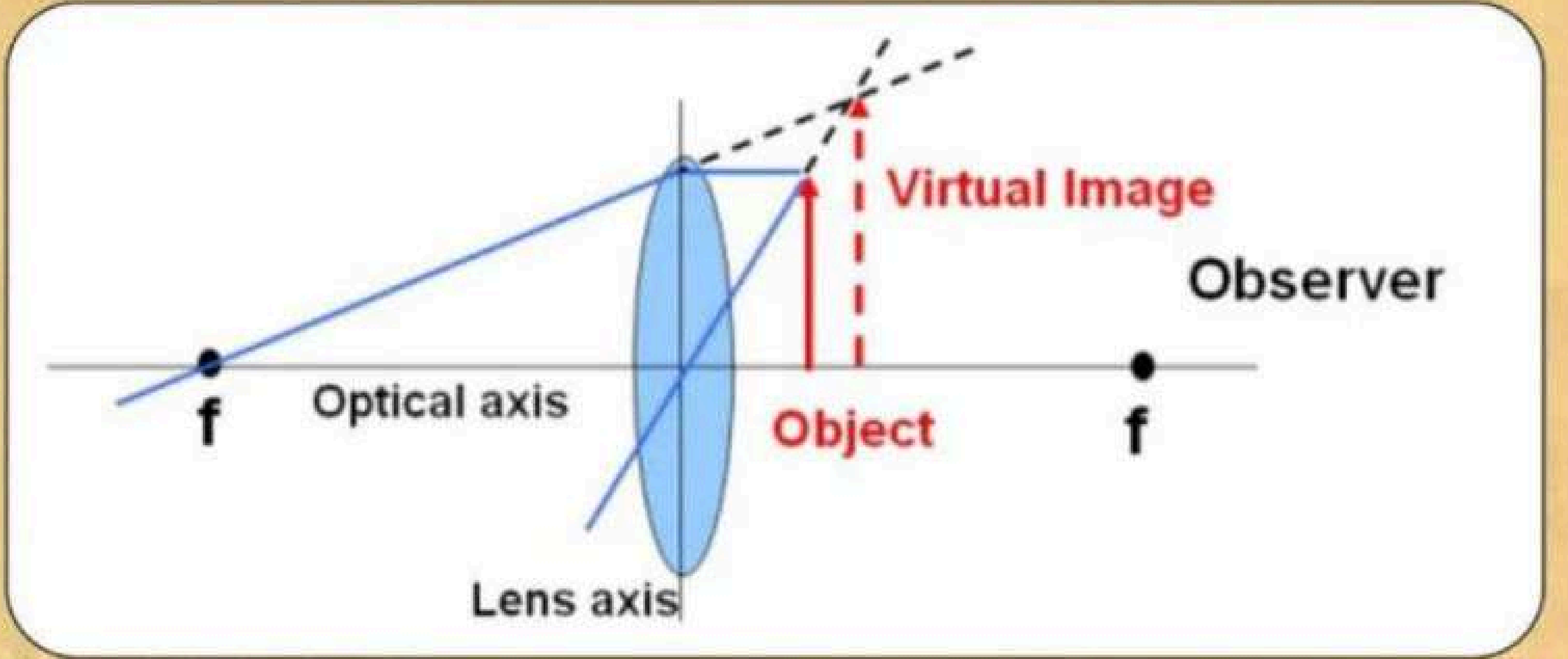
Second Law of Reflection



The angle of reflection is always equal to the angle of incidence.

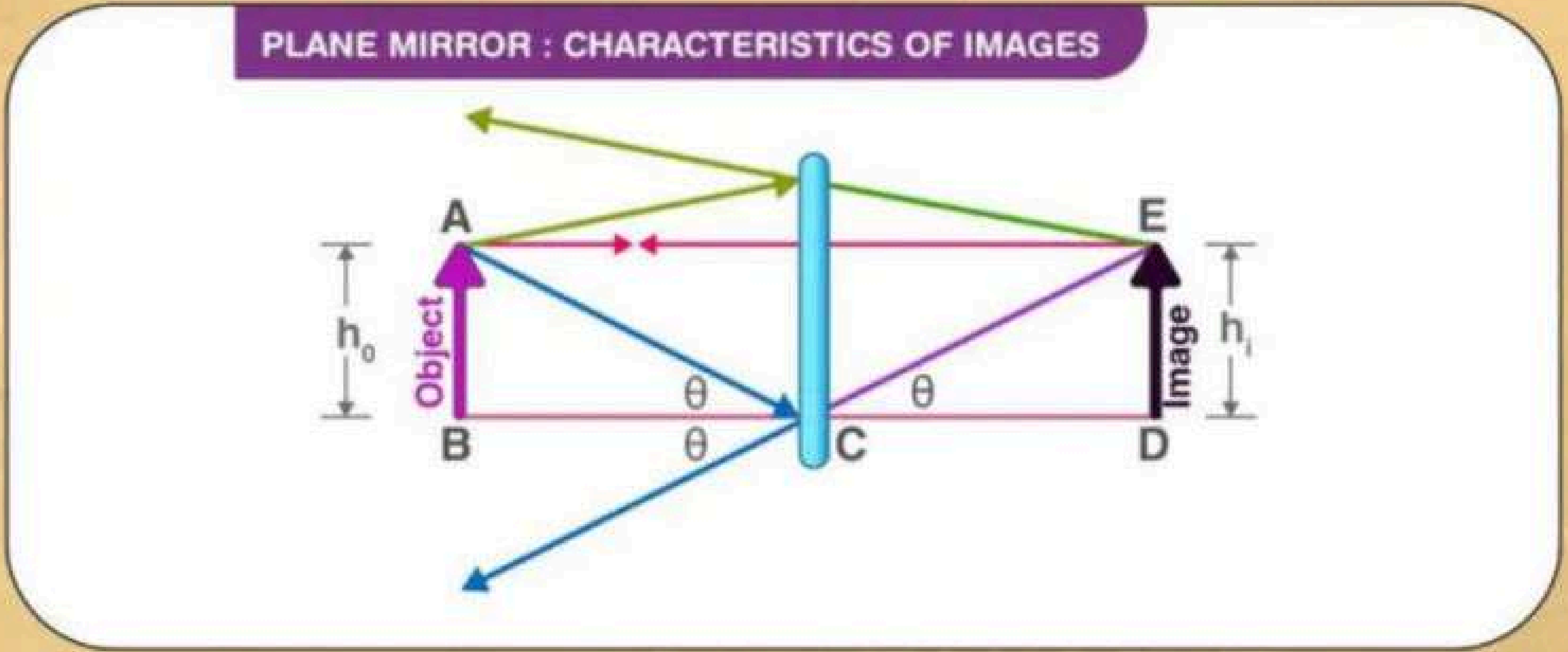
Virtual Images





The image which cannot be obtained on a screen is called a virtual image. A virtual image can be seen only by looking into a plane mirror (or a lens). The image of our face in a plane mirror is an example of virtual image.

The characteristics of an image formed by a plane mirror:

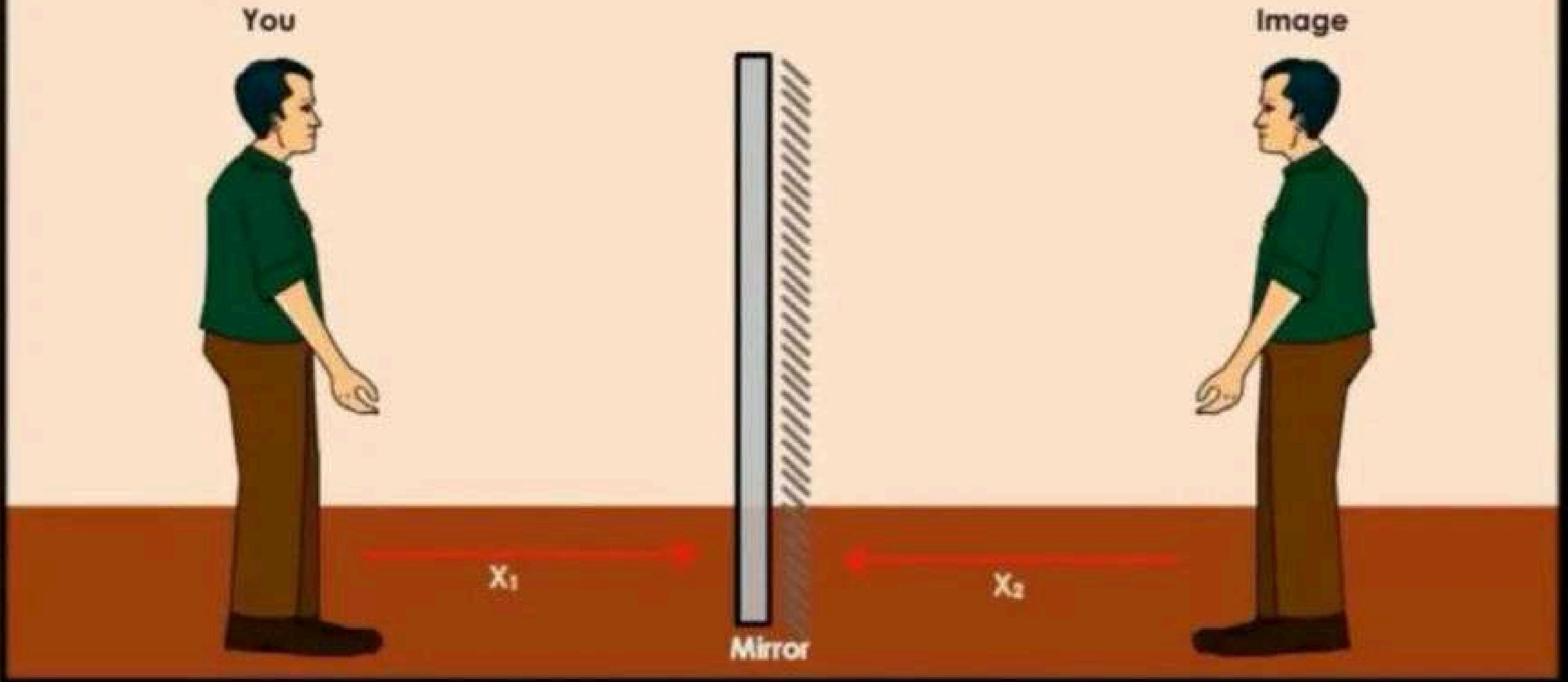


The image is formed in a plane mirror is virtual. It cannot be received on a screen.
The image formed in a plane mirror is erect. It is the same side up as the object.
The image in a plane mirror is of the same size as the object.
The image formed by a plane mirror is at the same distance behind the mirror as the object is in front of the mirror.
The image formed in a plane mirror is laterally inverted (sideways reversed).

Image formed by a plane mirror

Plane mirrors

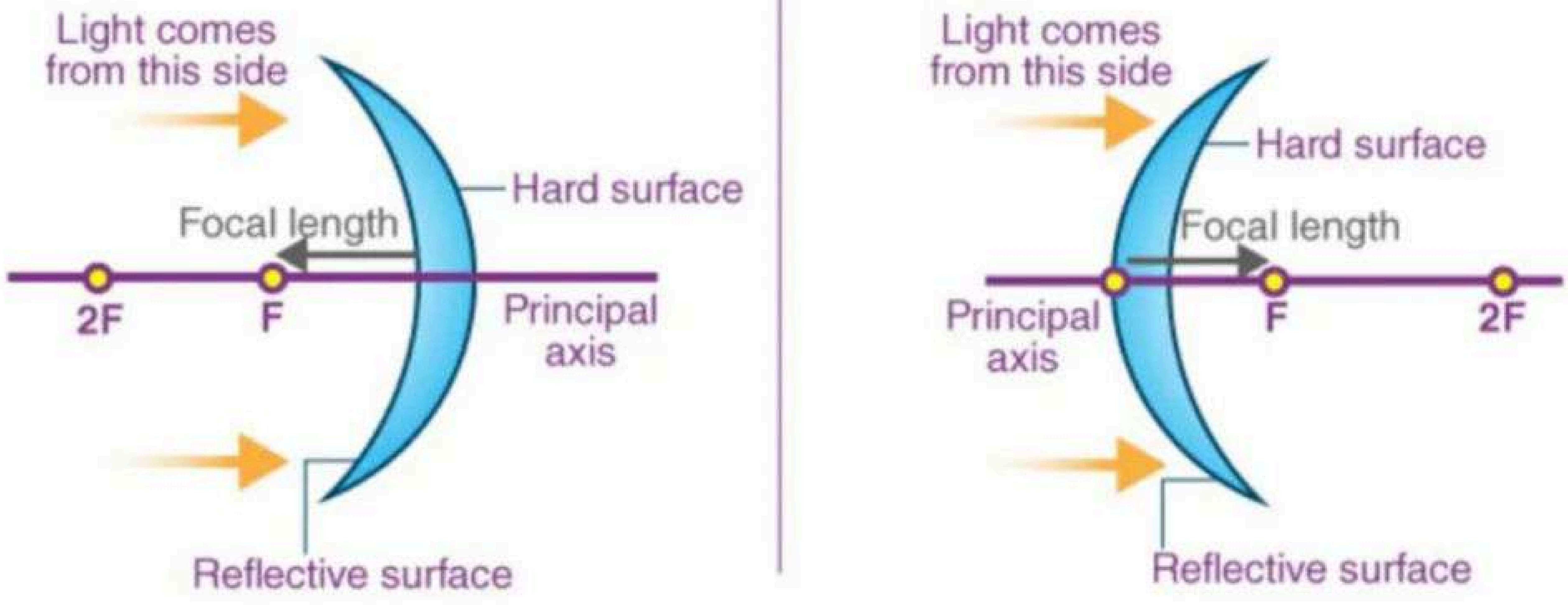
Nature of image formed by a plane mirror



If you move your right hand, your image in the mirror moves its left hand.

Spherical Mirrors

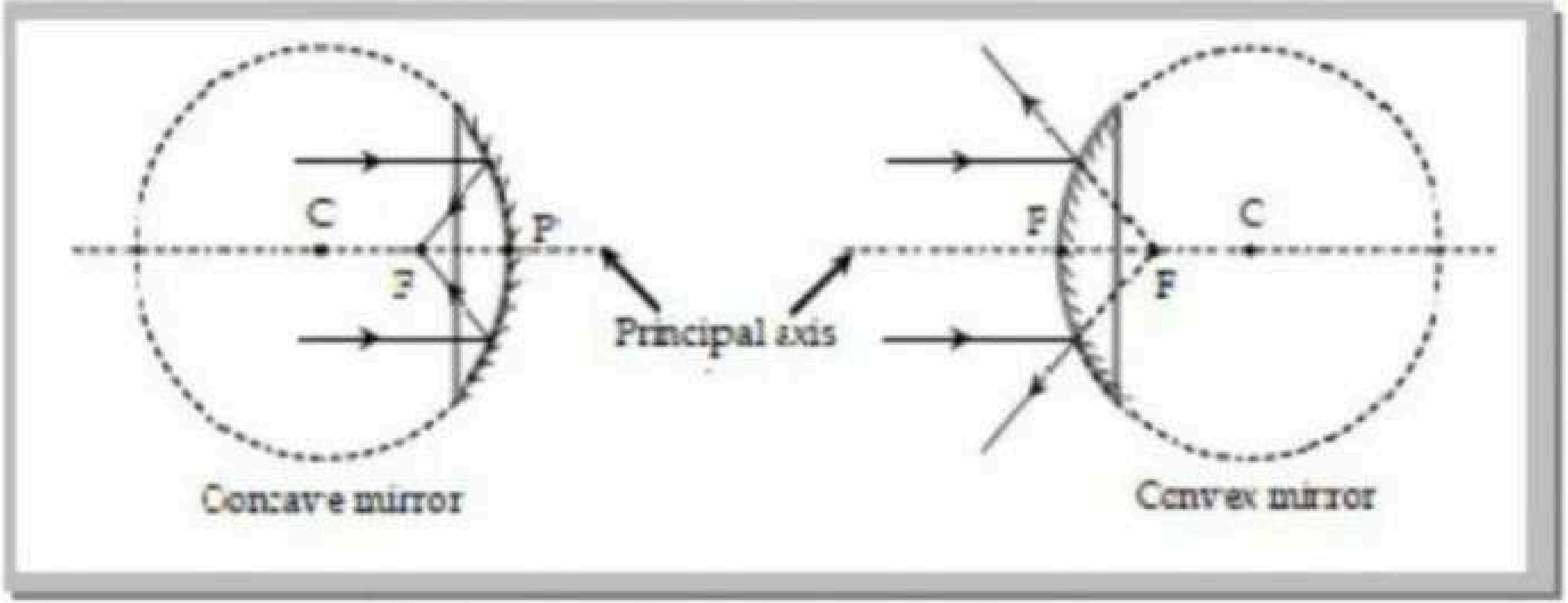
TYPES OF SPHERICAL MIRRORS



Concave mirror

Convex mirror

Relation between radius of curvature and focal length of a spherical mirror



C = centre of curvature

PC = Radius of curvature (R)

P = Pole of mirror

F = Focus

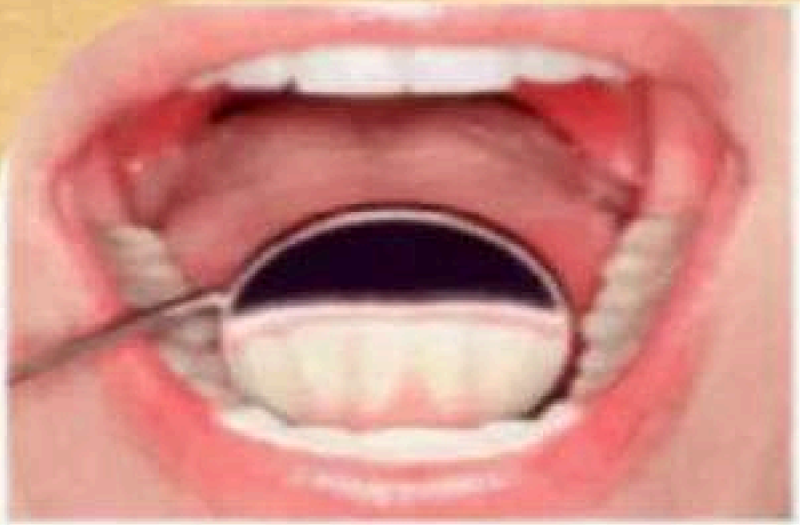
PF = Focal length(f)

Formation of Different types of Images by a concave mirror

Position of the object	Position of the image	Size of the image	Nature of the image
At infinity	At the focus F	Highly diminished, point-sized	Real of inverted
Beyond C	Between F and C	Diminished	Real and invented
At C	At C	Same Size	Real and invented
Between C and F	Beyond C	Enlarged	Real and invented
At F	At infinity	Highly enlarged	Real and invented
Between P and F	Behind the mirror	Enlarged	Virtual and effect

We can place the object at different positions (or different distance) from a concave mirror to get different types of images.

Uses of concave mirrors



Testing of teeth by concave mirror

burning mirror

convave mirron in torch light

Solar cooker

head light of a car

Formation of Images by a convex mirror

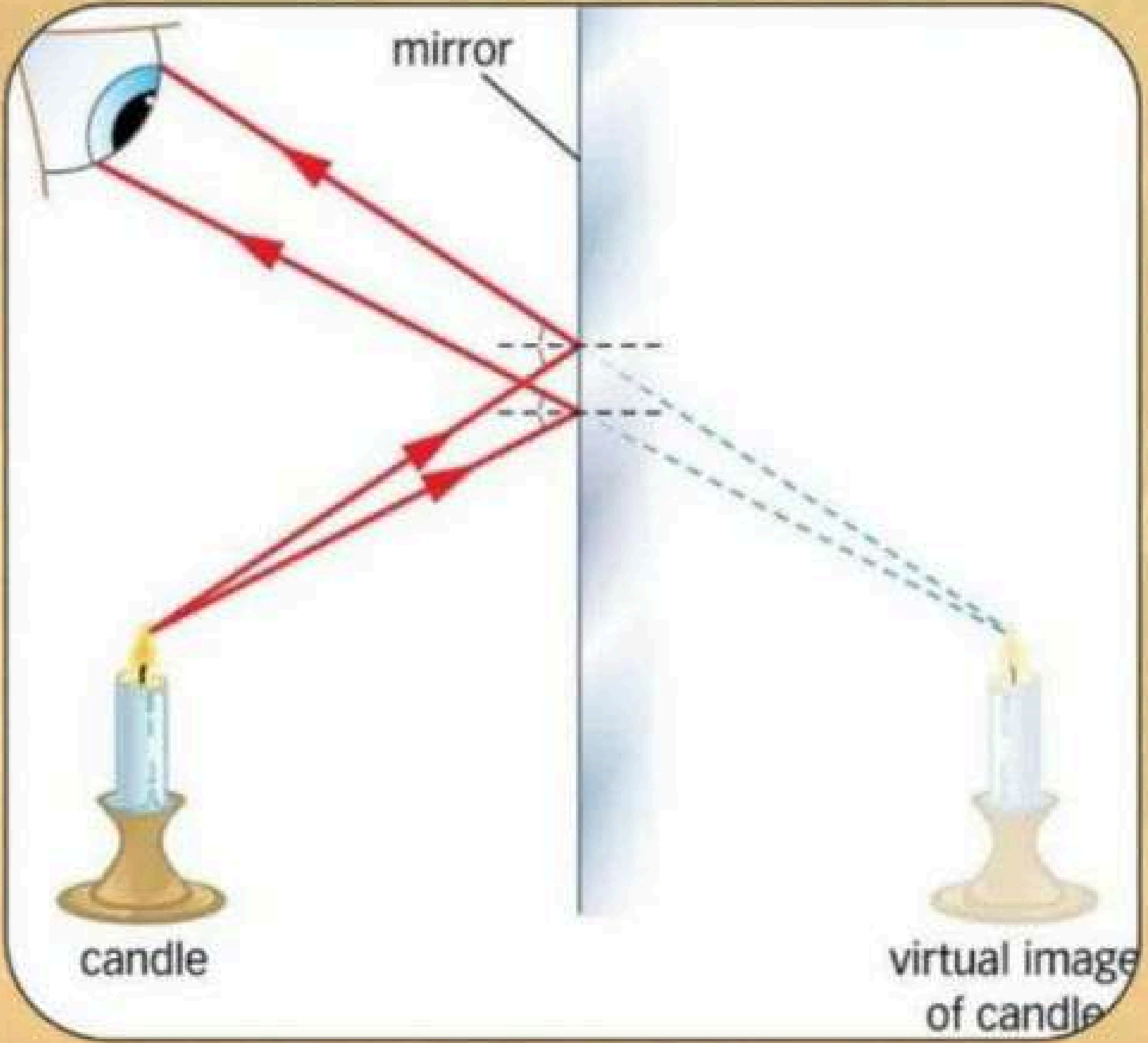
Position of the object	Position of the image	Size of image	Nature of the image
At infinity	At the focus F, Behind the mirror	Highly diminished point-sized	Virtual and erect
Between infinity and the pole P of the mirror	Between P and F, Behind the mirror	Diminished	Virtual and erect

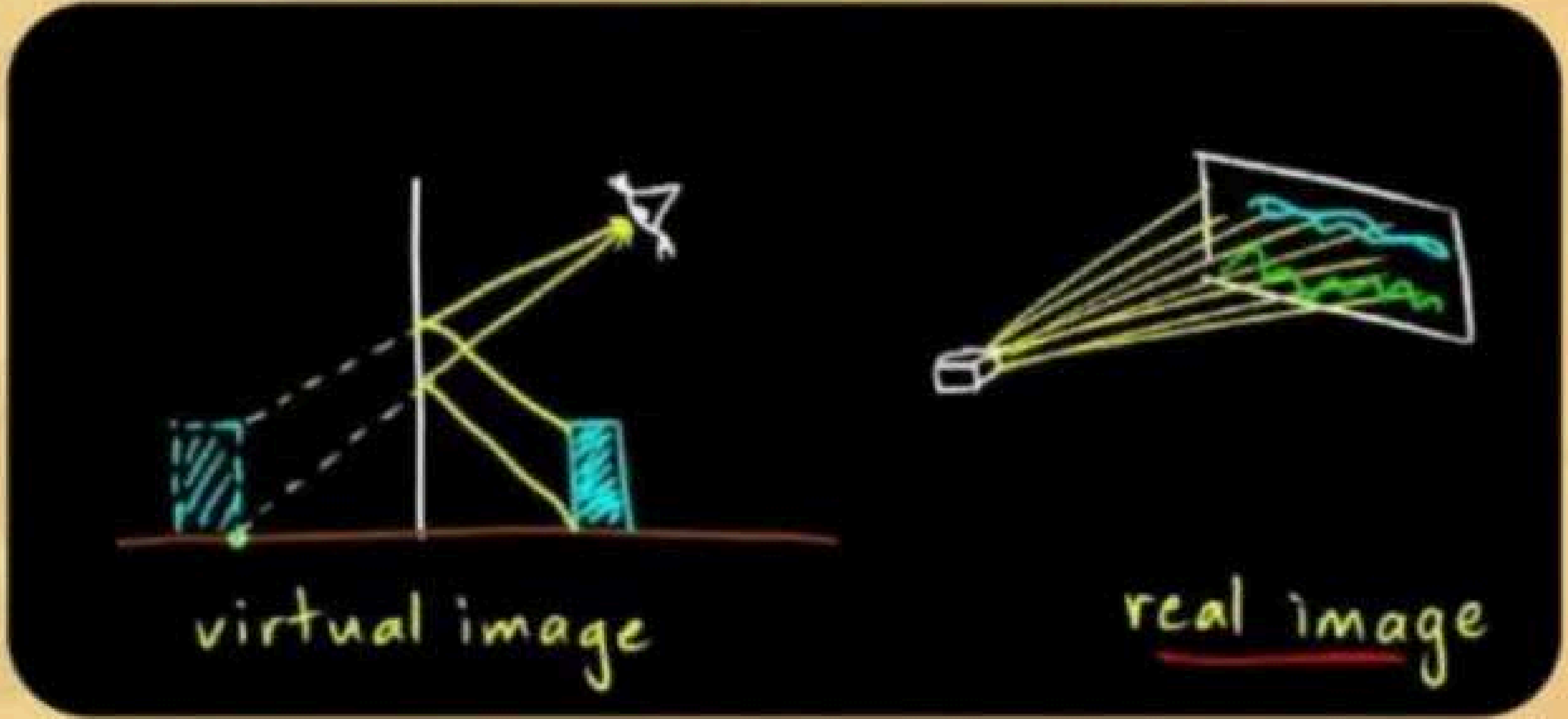
Uses of convex mirrors

Uses of Convex Mirrors

- Because convex mirrors produce small, virtual, upright images they are well suited for:
  - Security Mirrors
  - Rear View Mirrors

Nature of Real Image & Virtual Image





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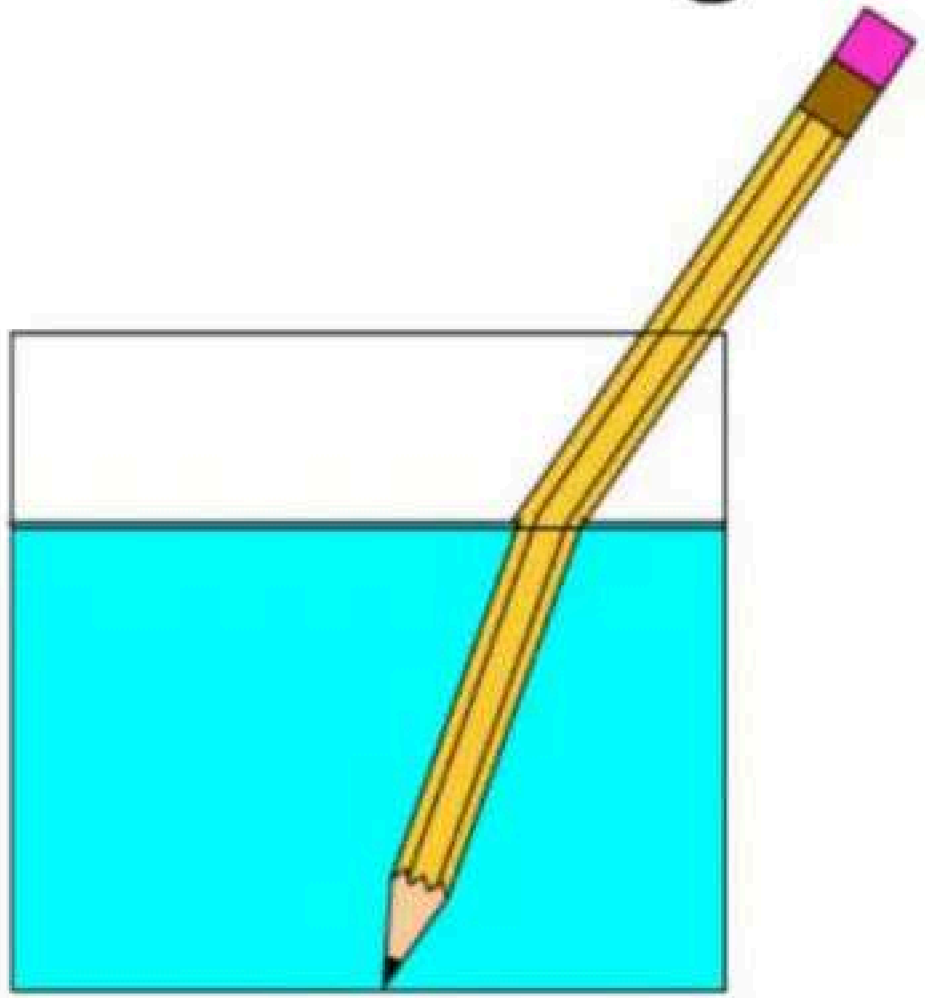
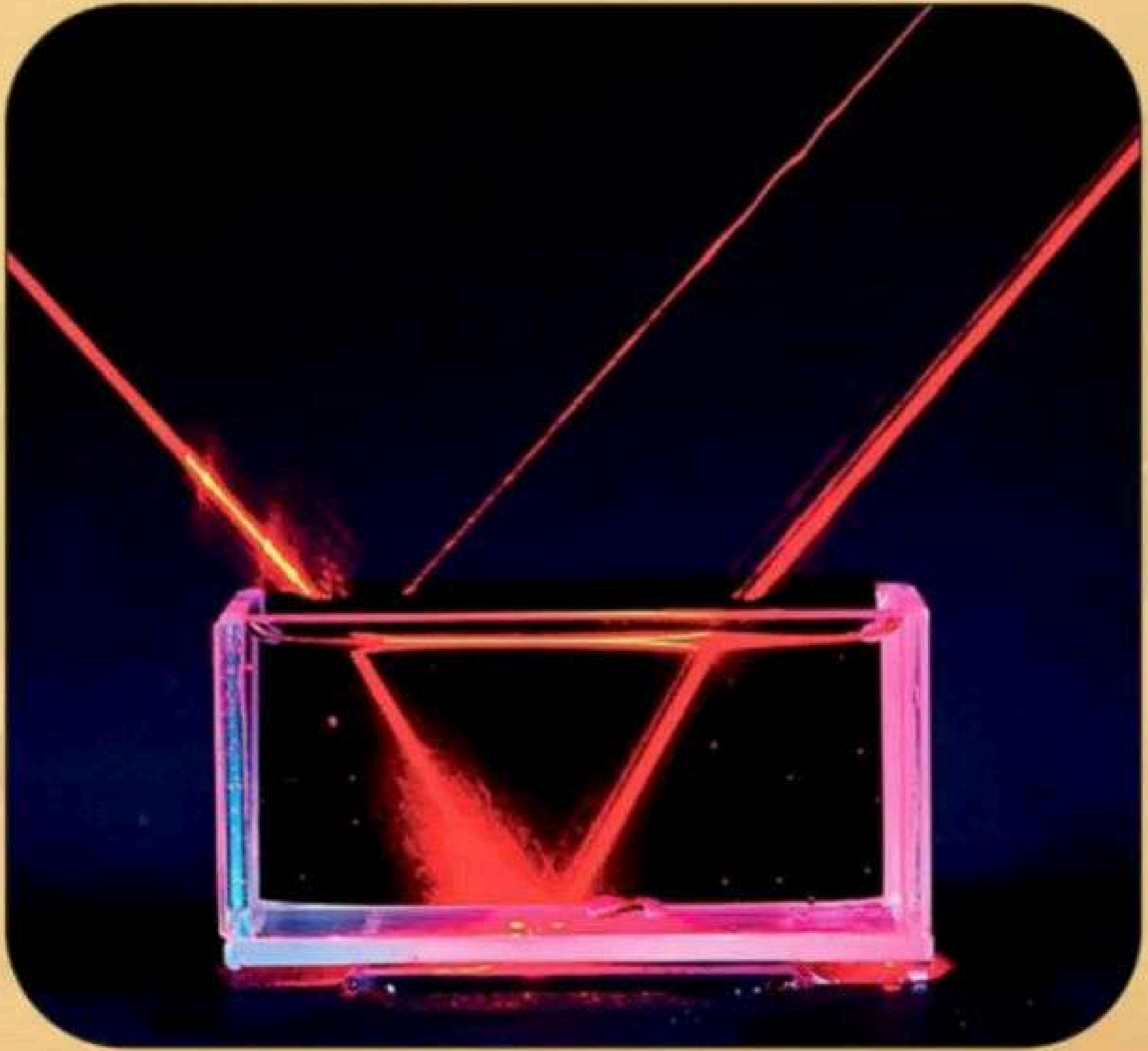
Refraction

Refraction of Light

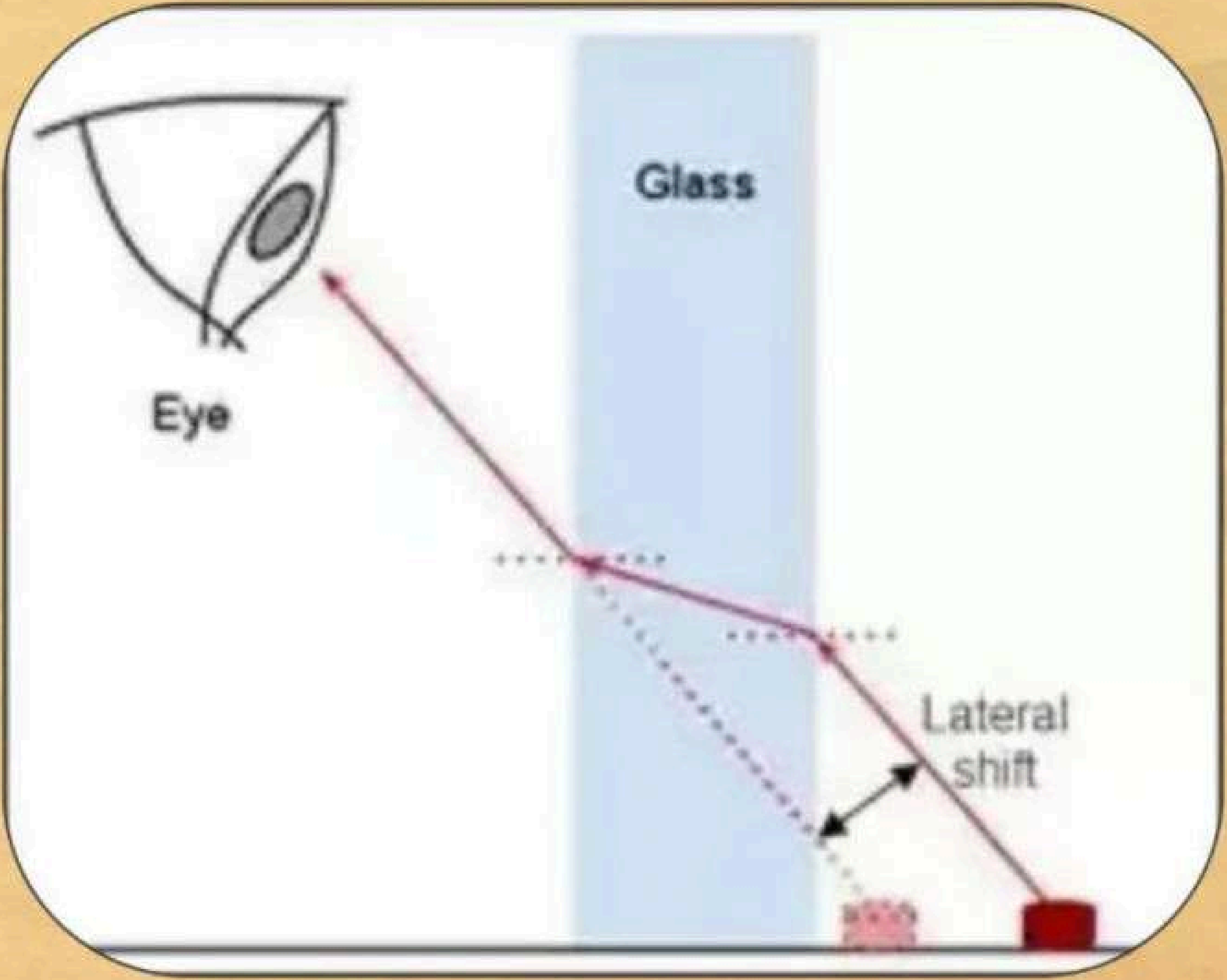


Light bends inwards because the speed of light is slower in water

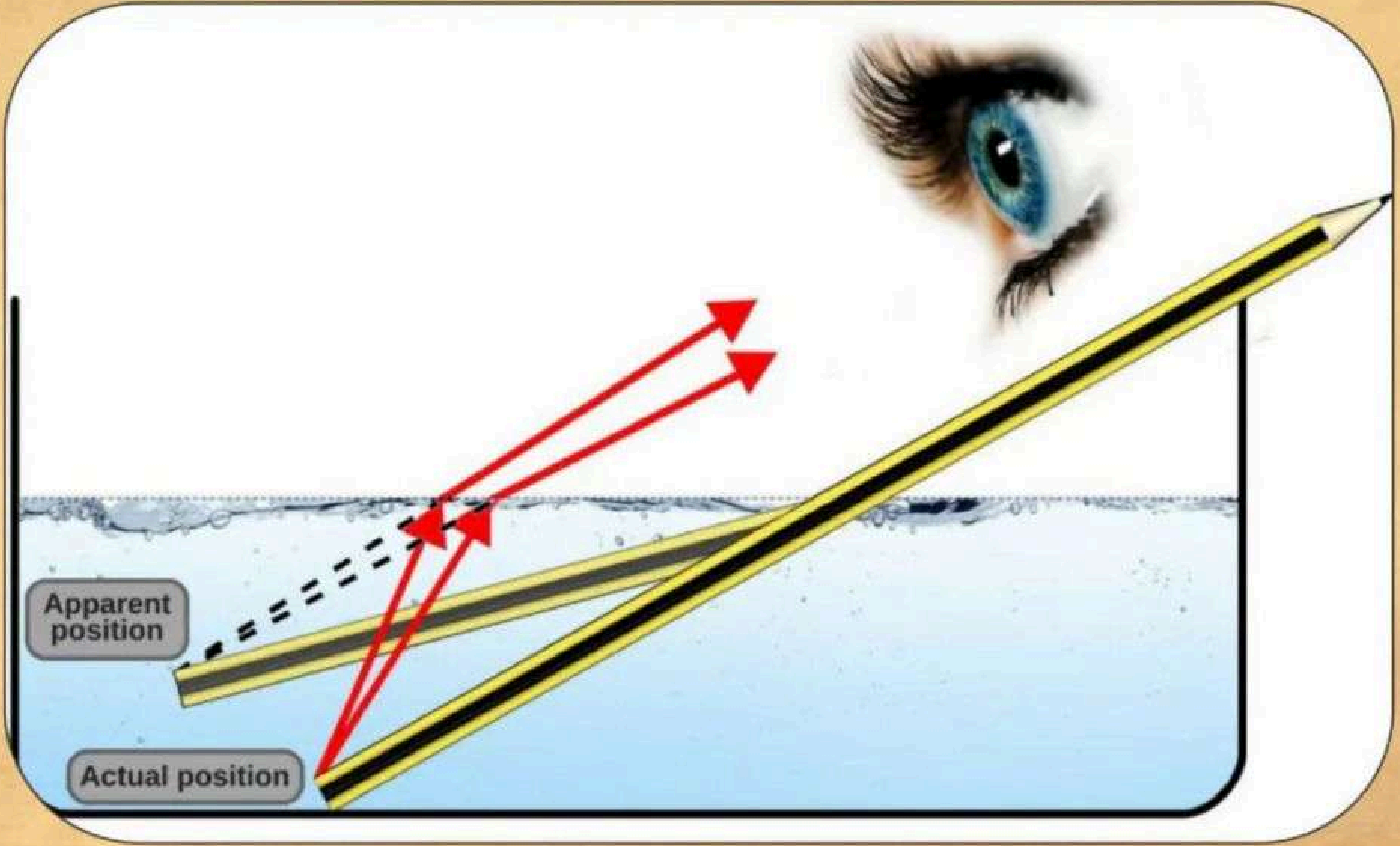
Rules for the deviation of Rays in another optical medium



Lateral Displacement



Simple Effects of Refraction of Light



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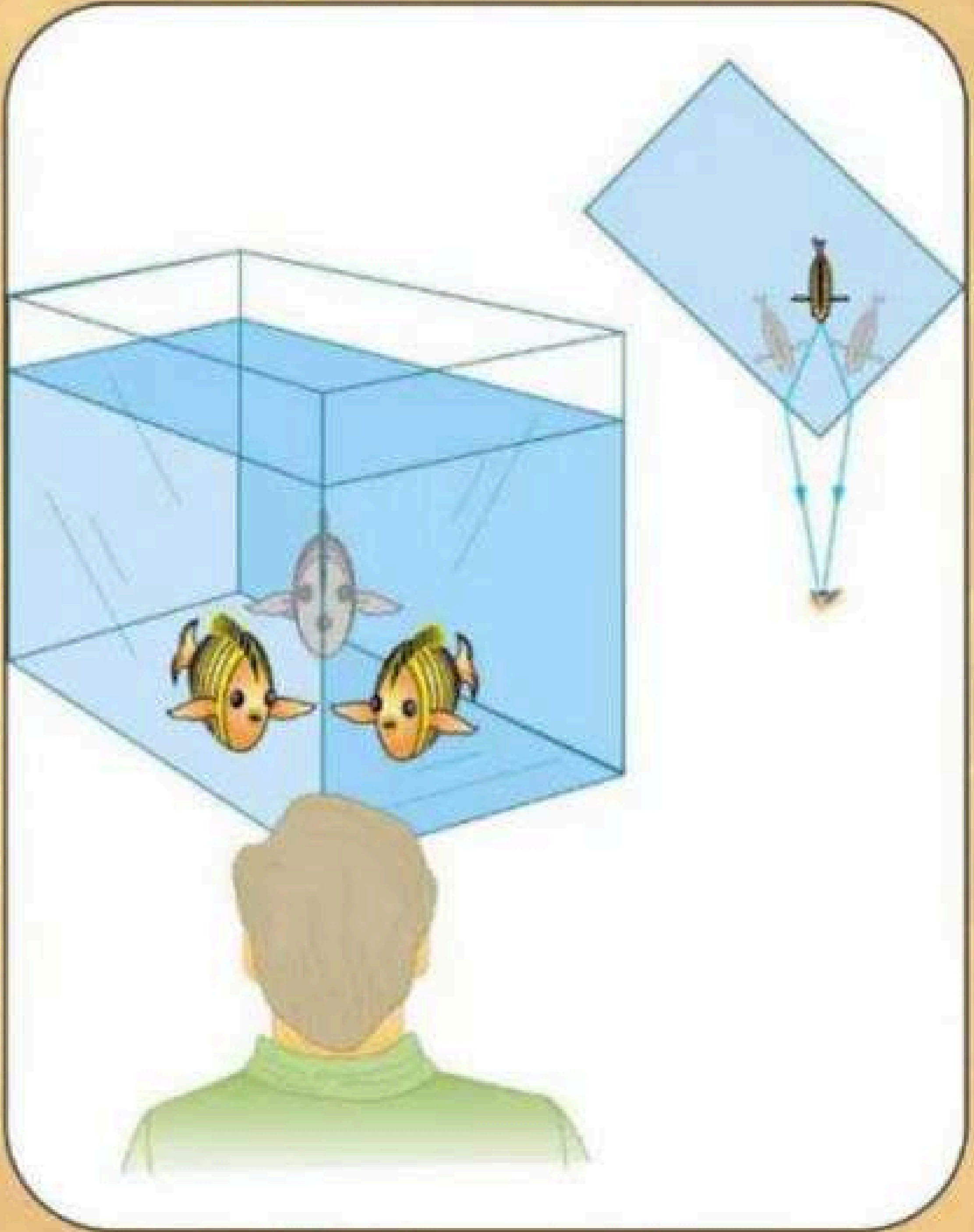
Laws of refraction



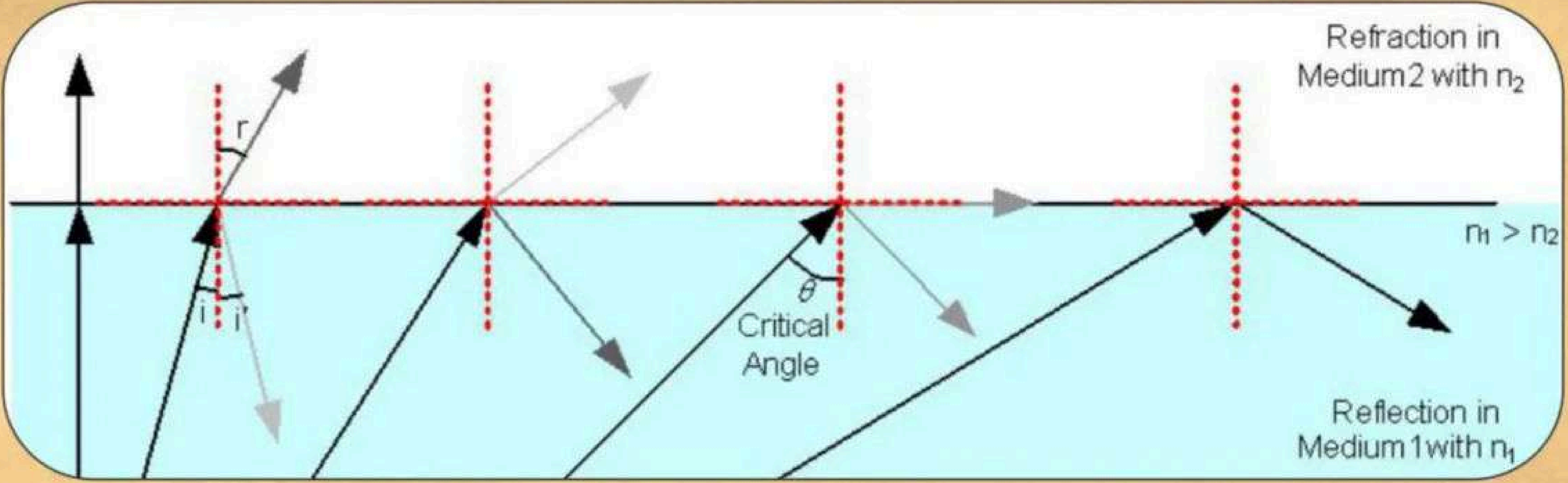
Incident Ray, Normal and refracted ray all lie is same plane

The ratio of the sine of the angle of incidence and sine of the angle of refraction is constant

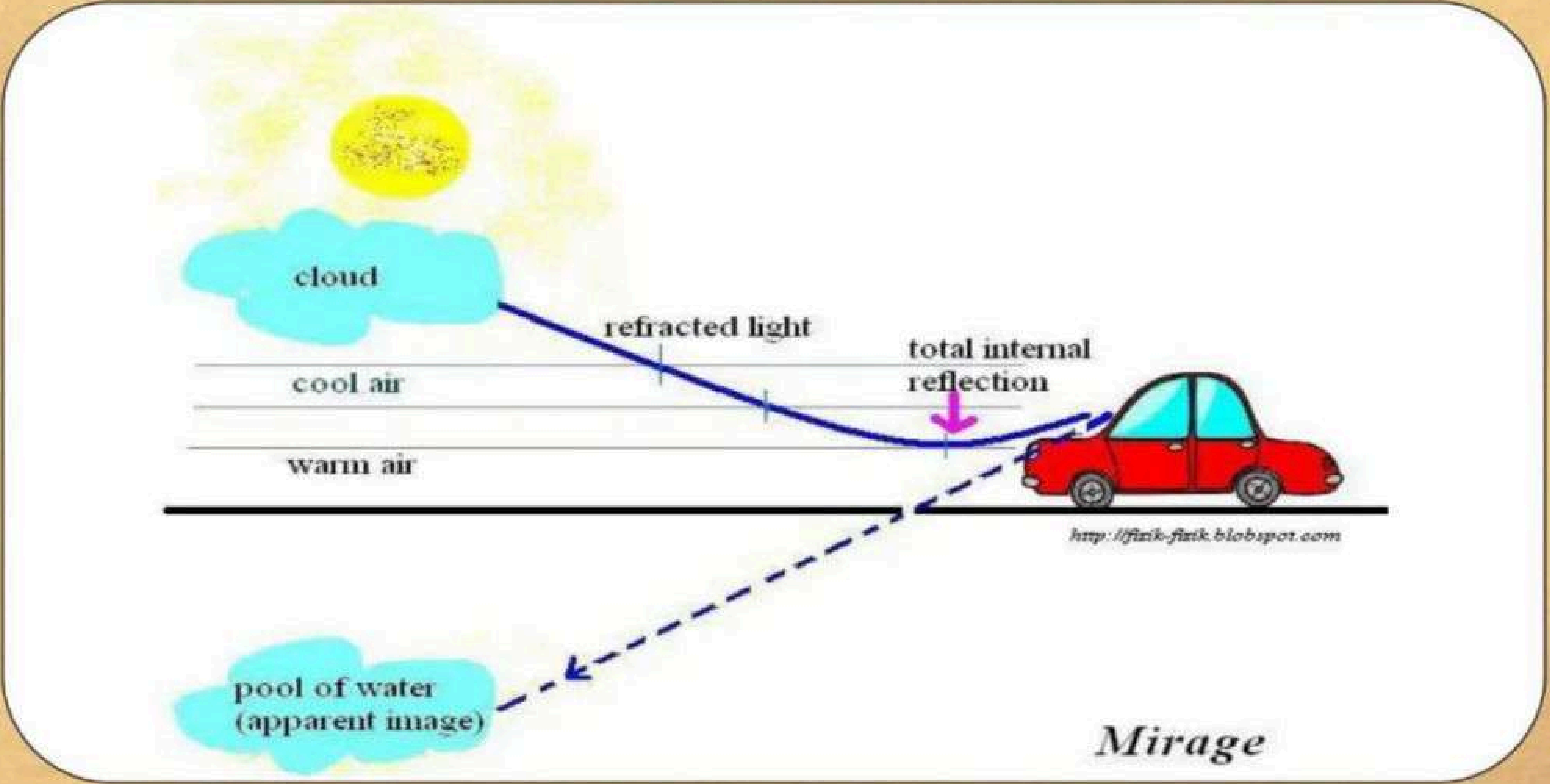
What exactly is Refractive Index ?

Indicates the light bending ability of a medium. Higher the refractive index means high light bending capacity of medium and lower the refractive index means low light bending capacity of medium

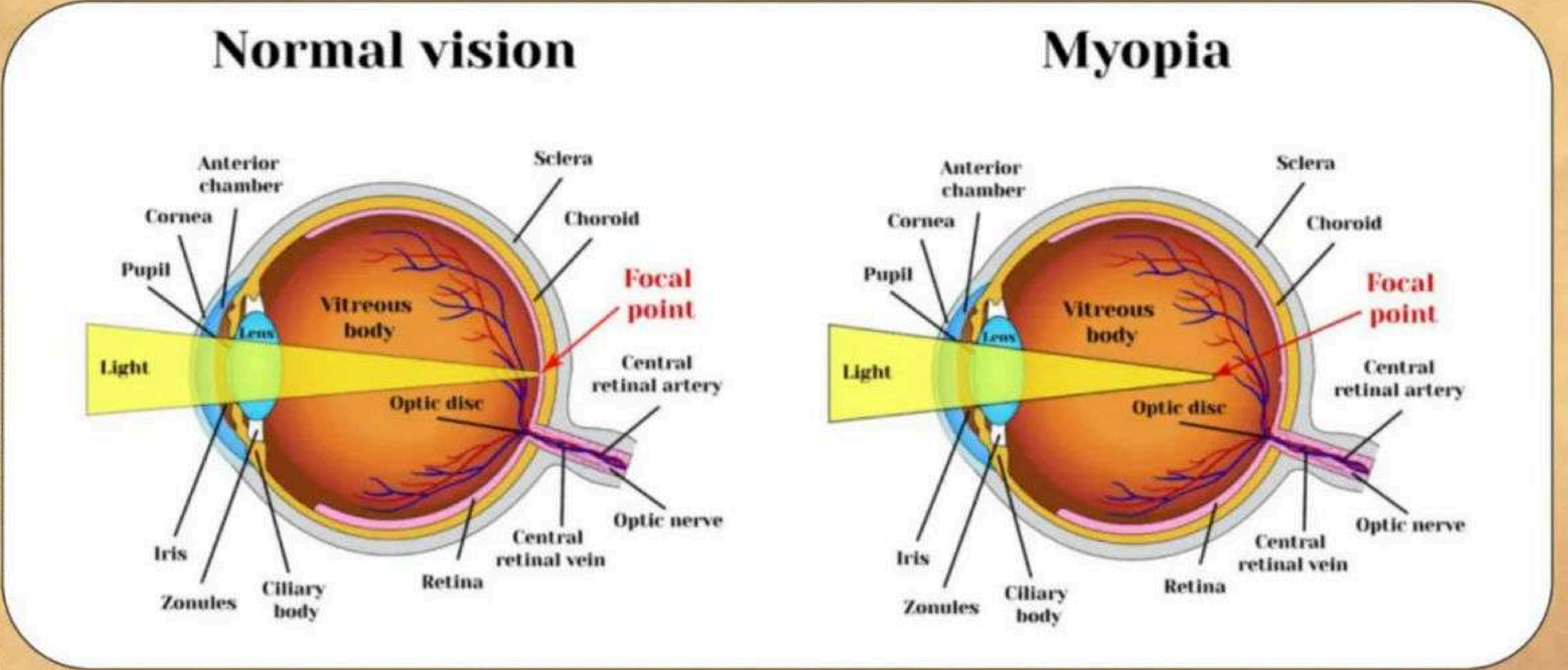
Total internal reflection : (TIR)



Phenomenon related to total internal Reflection



Myopia: Near Sightedness



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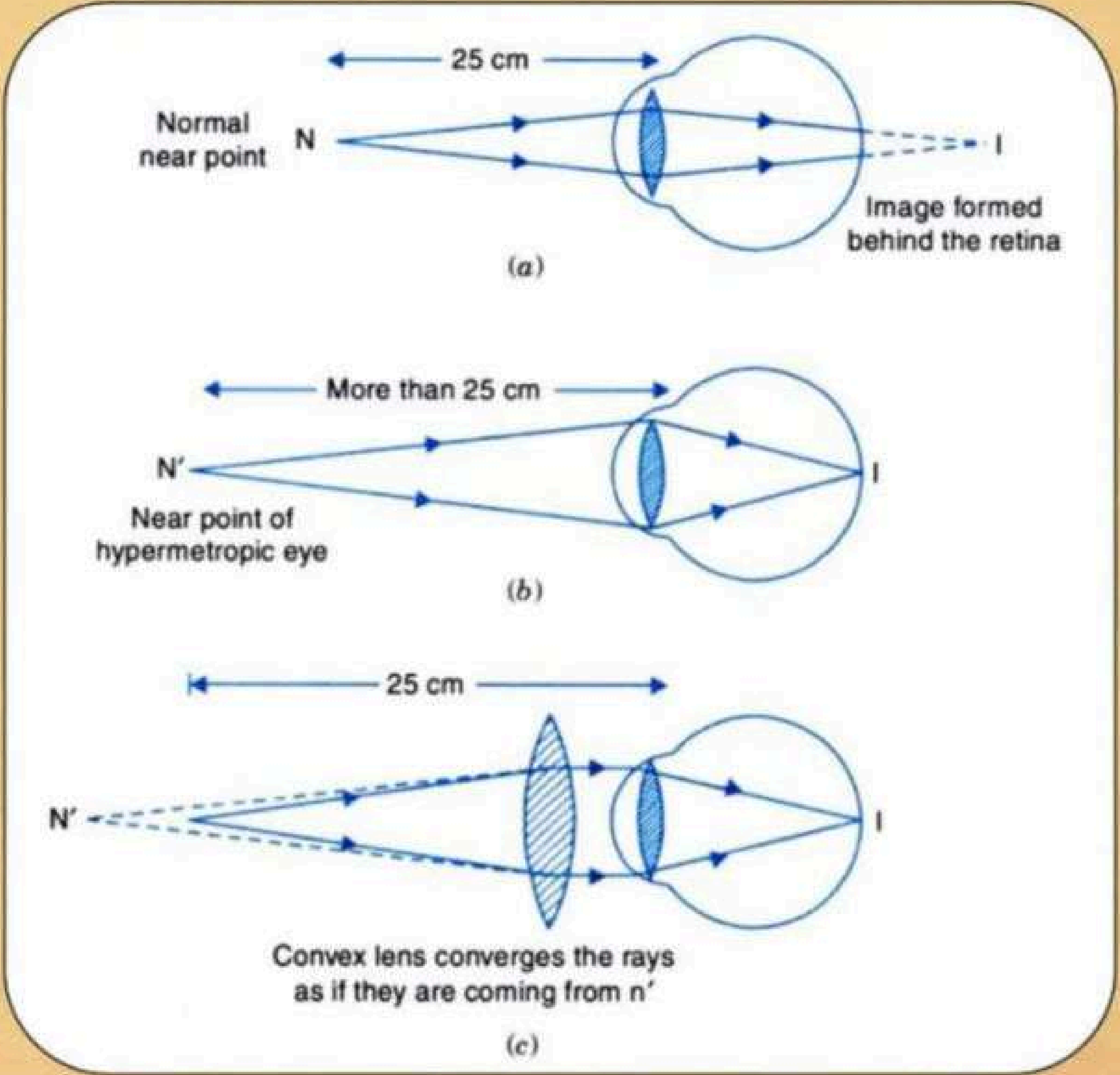
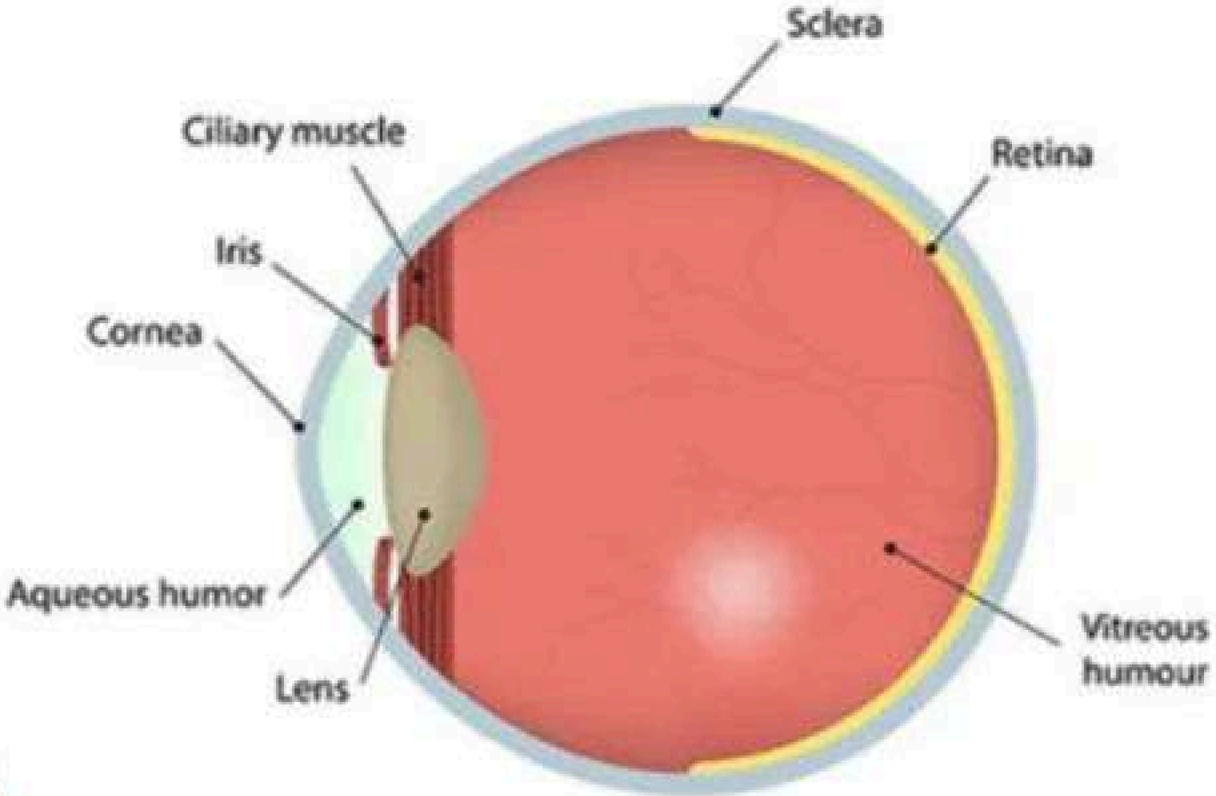
Hypermetropia

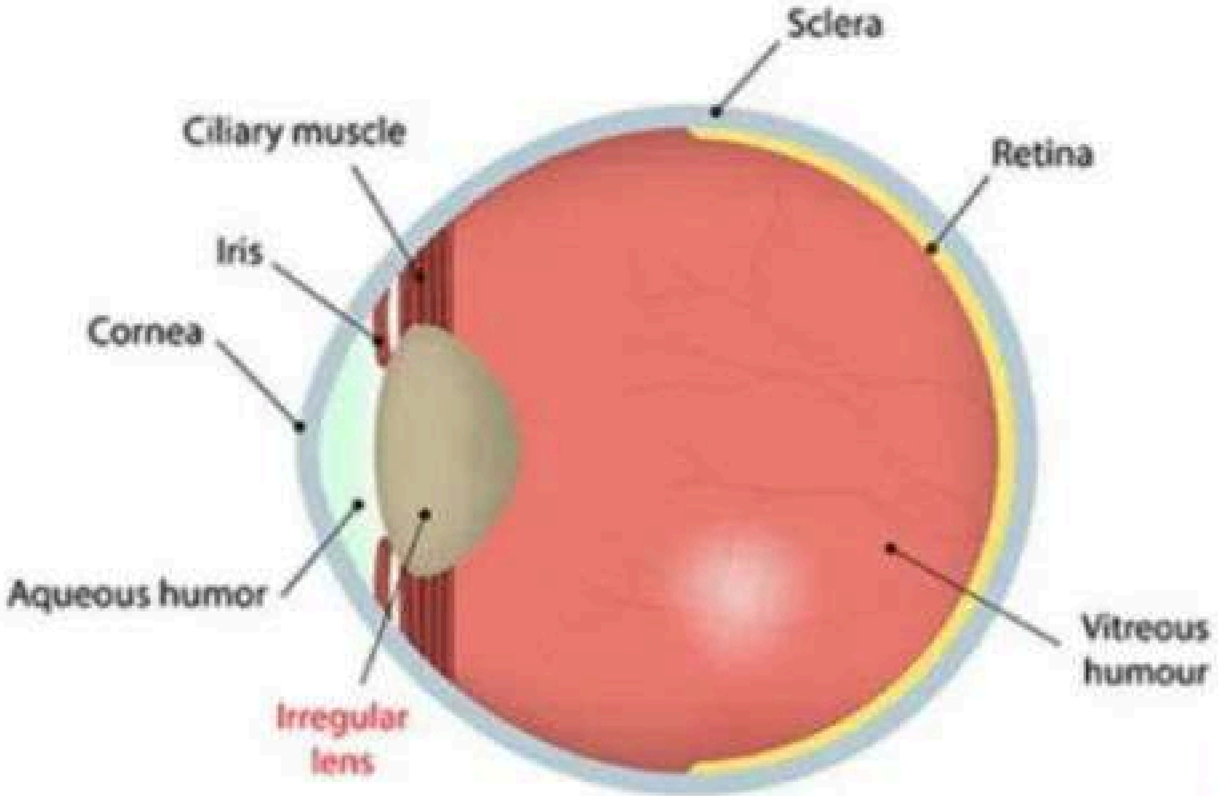


Astigmatism

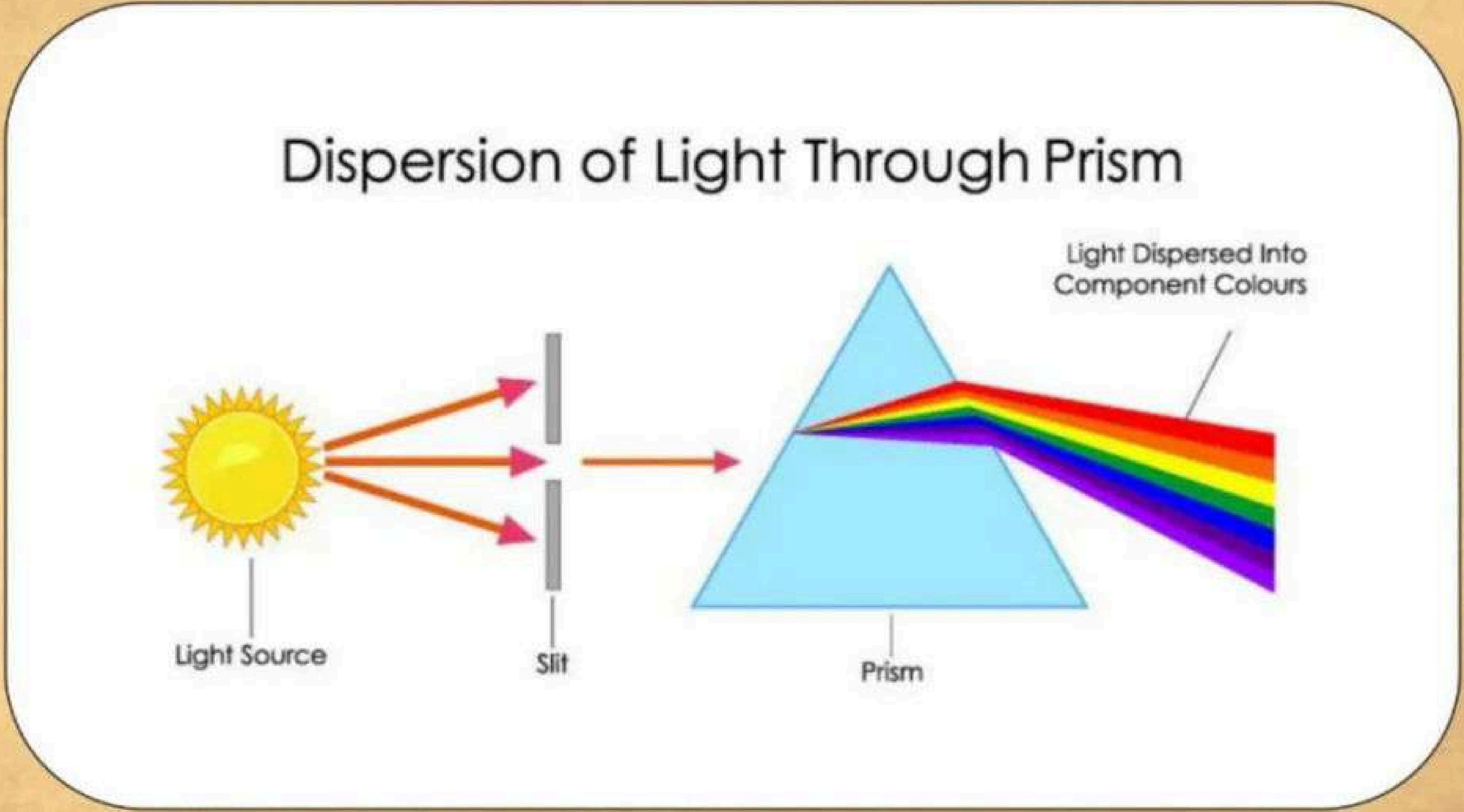
Healthy Eye



Eye with Astigmatism



Dispersion of light :



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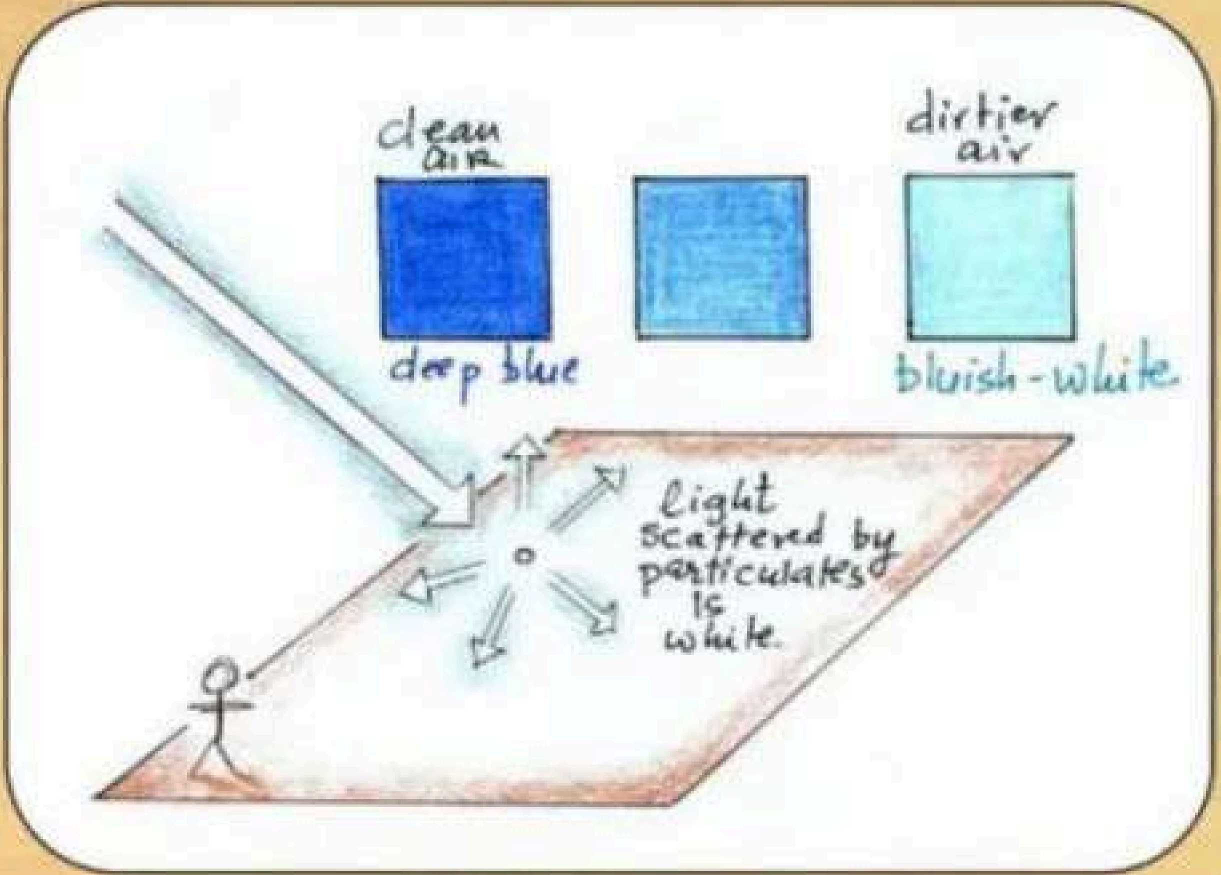
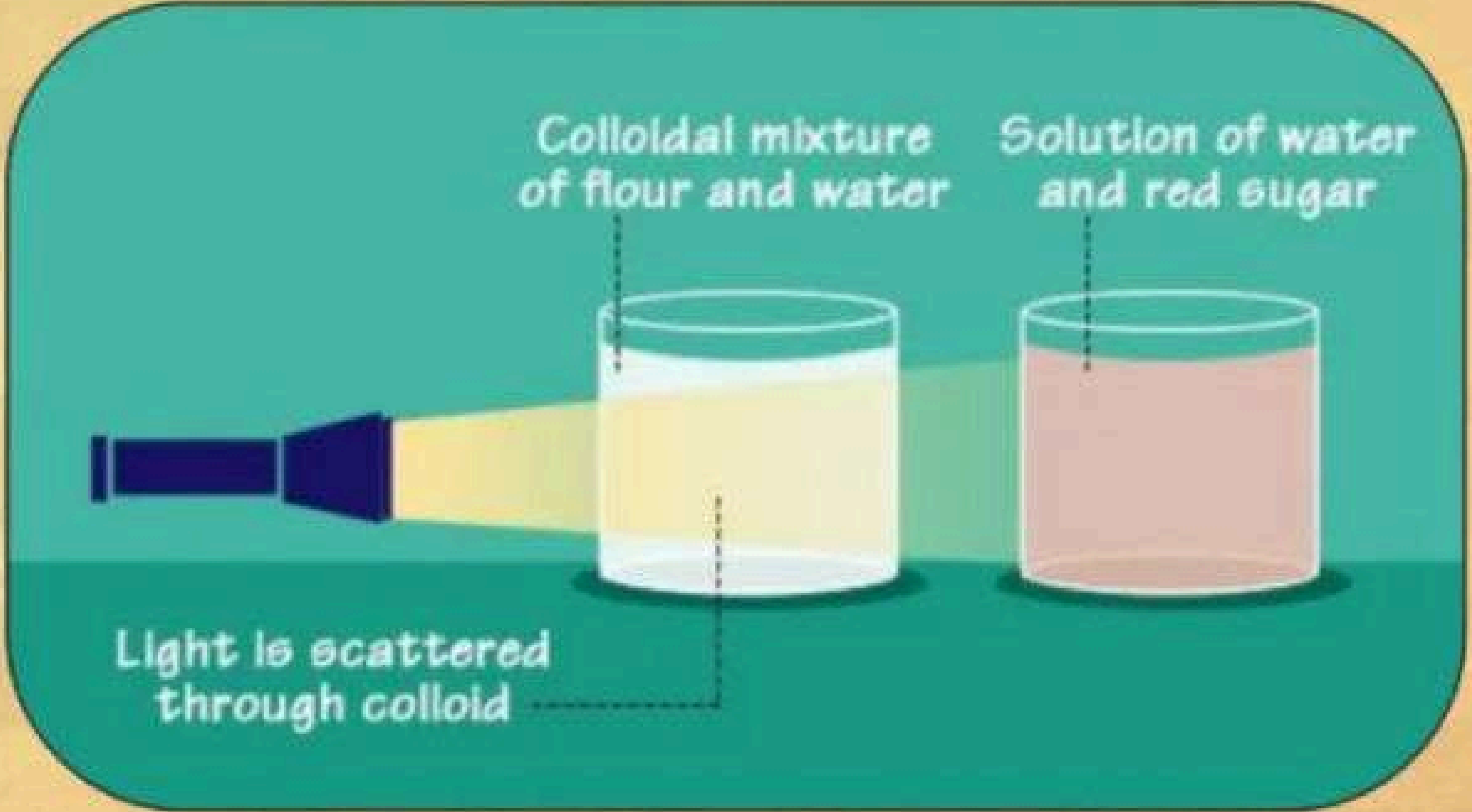
Scattering of light & Tyndall Effect





Scattering of light

Tyndall Effect