



# Physics - I

Complete Course on Physics

## Books & Resources



Class notes

▷ Physics I

:

with Annotation

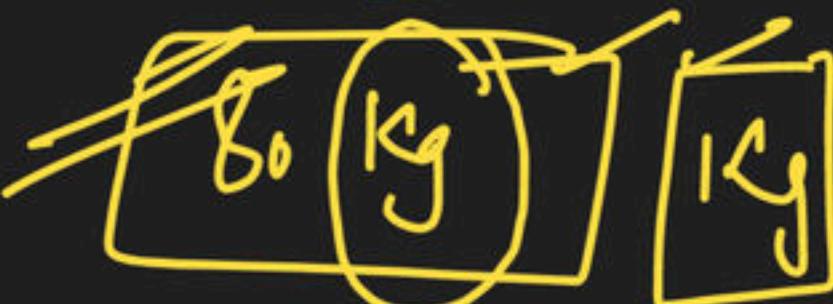
w/o Annotation

# Physics

UPI Complete Batch Discount code : **LAB**

# Units

Boys and



AMAN SIR

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# PHYSICAL QUANTITIES

: Anything that can be measured.

## Scalar Quantities

: magnitude only and no direction

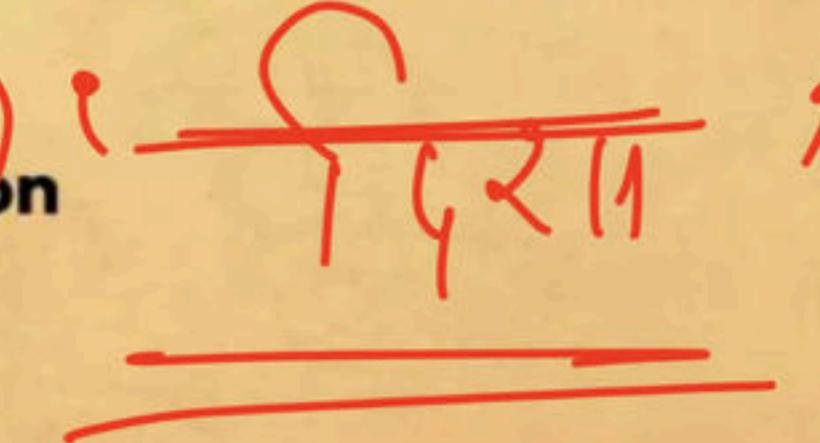
e.g. mass, speed, volume,

## Vector Quantities

: have magnitude, and direction both with direction

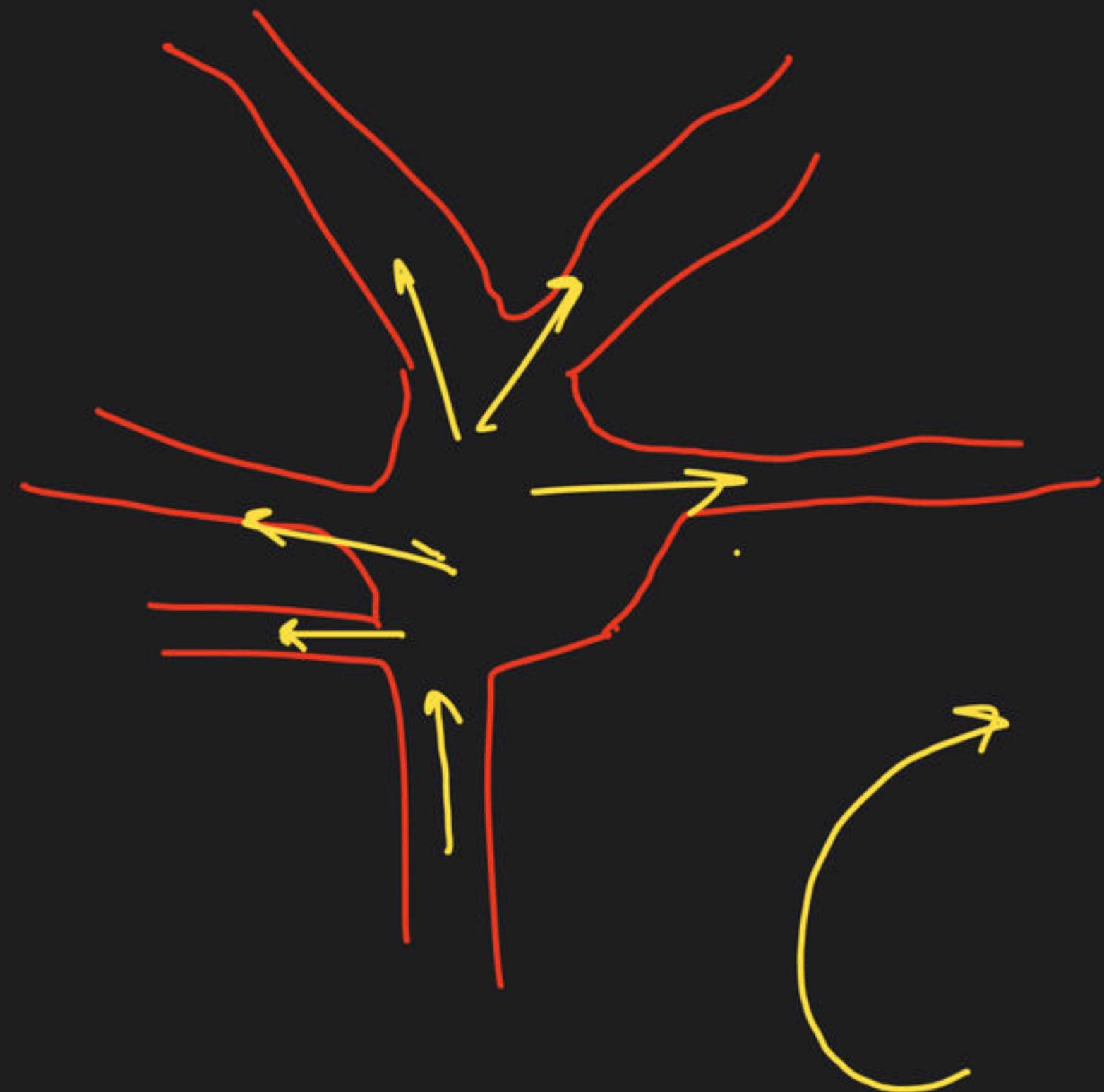
e.g. displacement, Velocity, acceleration

## SCALAR AND VECTOR QUANTITIES



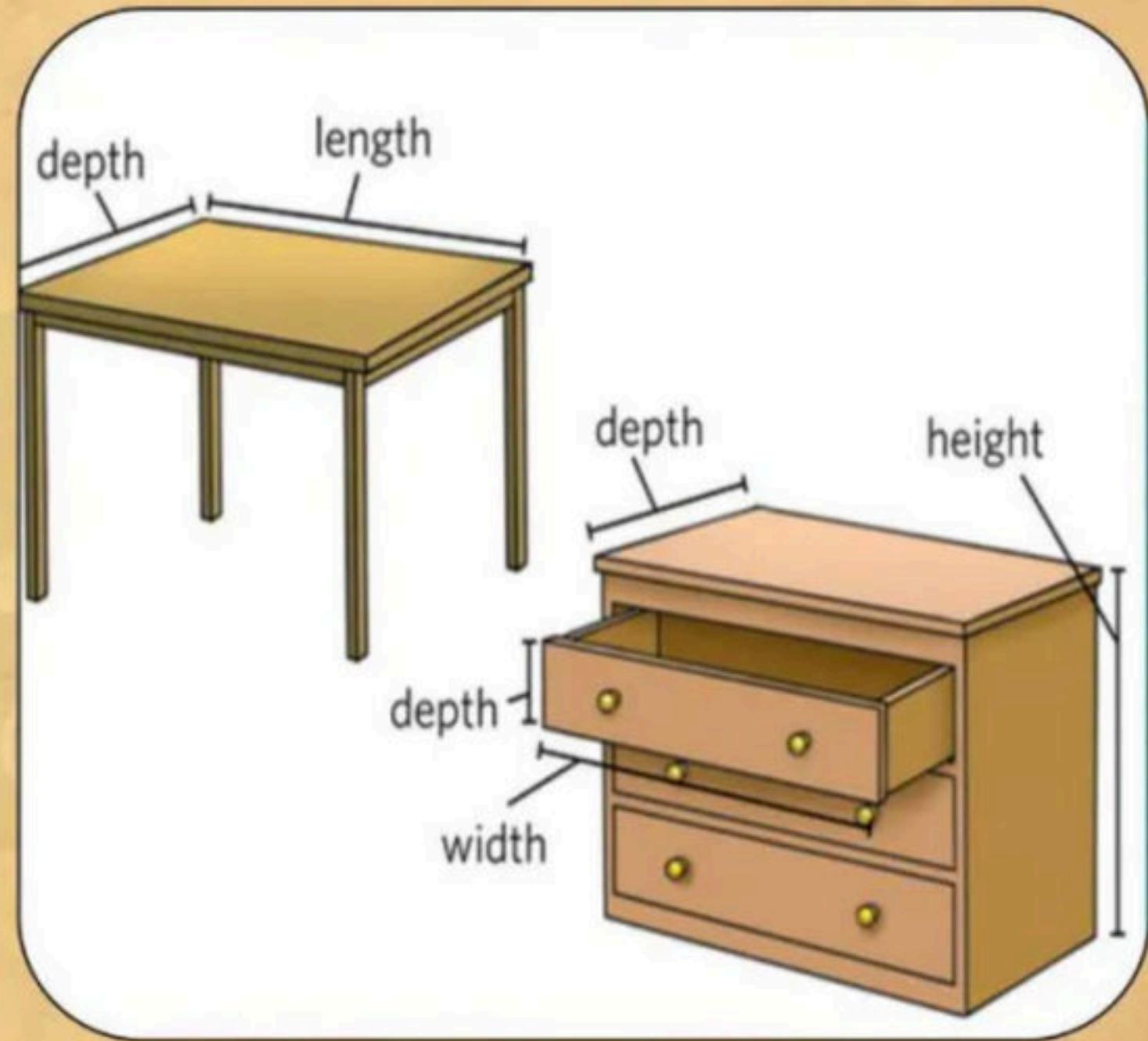


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# Dimensions

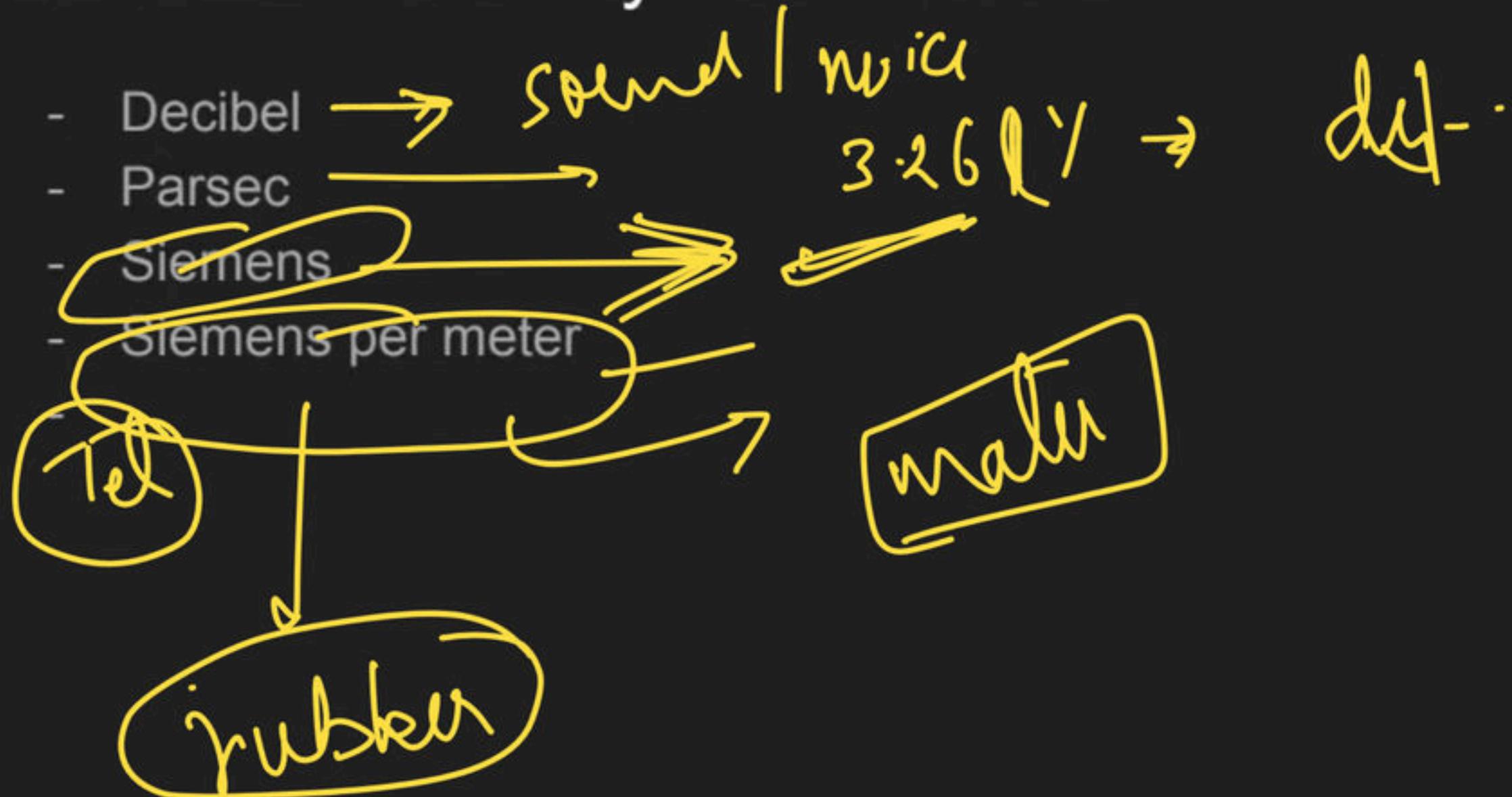
In terms of powers of seven fundamental units.



## File:Dimensional Formula of Some Physical Quantities.

1	Area	$[L^2]$	metre <sup>2</sup>
2	Volume	$[L^3]$	metre <sup>3</sup>
3	Velocity	$[LT^{-1}]$	$m s^{-1}$
4	Acceleration	$[LT^{-2}]$	$m s^{-2}$
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 <sup>-2</sup>
9	Linear momentum or Impulse	$[MLT^{-1}]$	$kg\ ms^{-1}$
10	Density	$[ML^{-3}]$	$kg\ m^{-3}$
11	Strain		Dimensionless
12	Modulus of elasticity	$[ML^{-1}T^{-2}]$	Nm <sup>-2</sup>
13	Surface tension	$[MT^{-2}]$	Nm <sup>-1</sup>
14	Velocity gradient	$T^{-1}$	second <sup>-1</sup>
15	Coefficient of velocity	$[ML^{-1}T^{-1}]$	$kg\ m^{-1}s^{-1}$
16	Gravitational constant	$[M^{-1}L^3T^{-2}]$	Nm <sup>2</sup> /kg <sup>2</sup>
17	Moment of inertia	$[ML^2]$	$kg\ m^2$
18	Angular velocity	$[T^{-1}]$	rad/s
19	Angular acceleration	$[T^{-2}]$	rad/s <sup>2</sup>
20	Angular momentum	$[ML^2T^{-1}]$	$kg\ m^2s^{-1}$
21	Specific heat	$L^2T^{-2}\theta^{-1}$	kcal kg <sup>-1</sup> K <sup>-1</sup>
22	Latent heat	$[L^2T^{-2}]$	kcal/kg
23	Planck's constant	$ML^2T^{-1}$	J <sup>s</sup>
24	Universal gas constant	$[ML^2T^{-2}\theta^{-1}]$	J/mol-K

## Some Commonly asked units



# 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	$\Phi$	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	$\mathfrak{R}$	Gilberts per Maxwell	Amp-turns per Weber	Amp-turns per Line
Permeability	$\mu$	Gauss per Oersted	Tesla-meters per Amp-turn	Lines per inch-Amp-turn

Henry →

Weber →

Tesla →

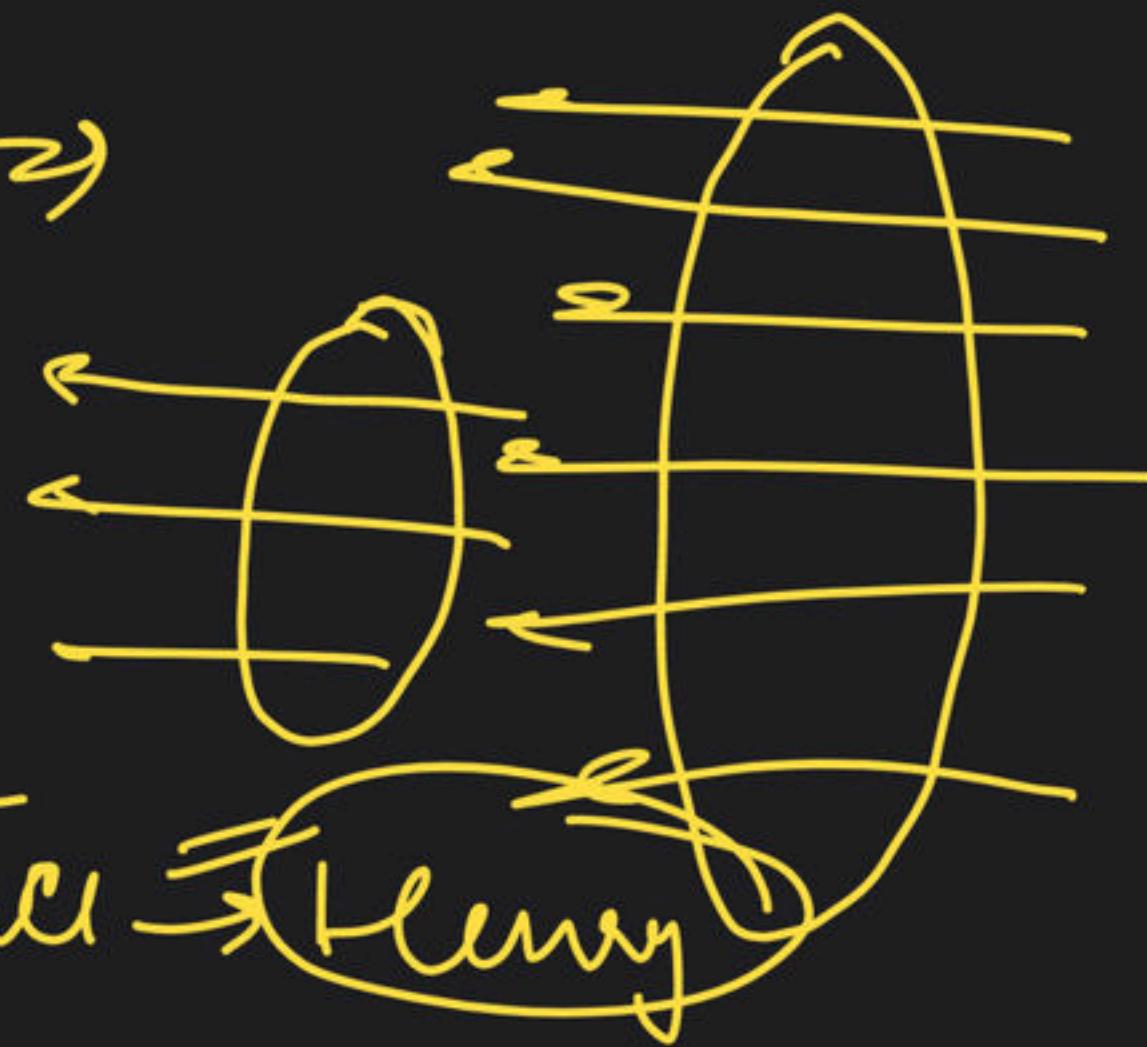
Weber

Mgg web

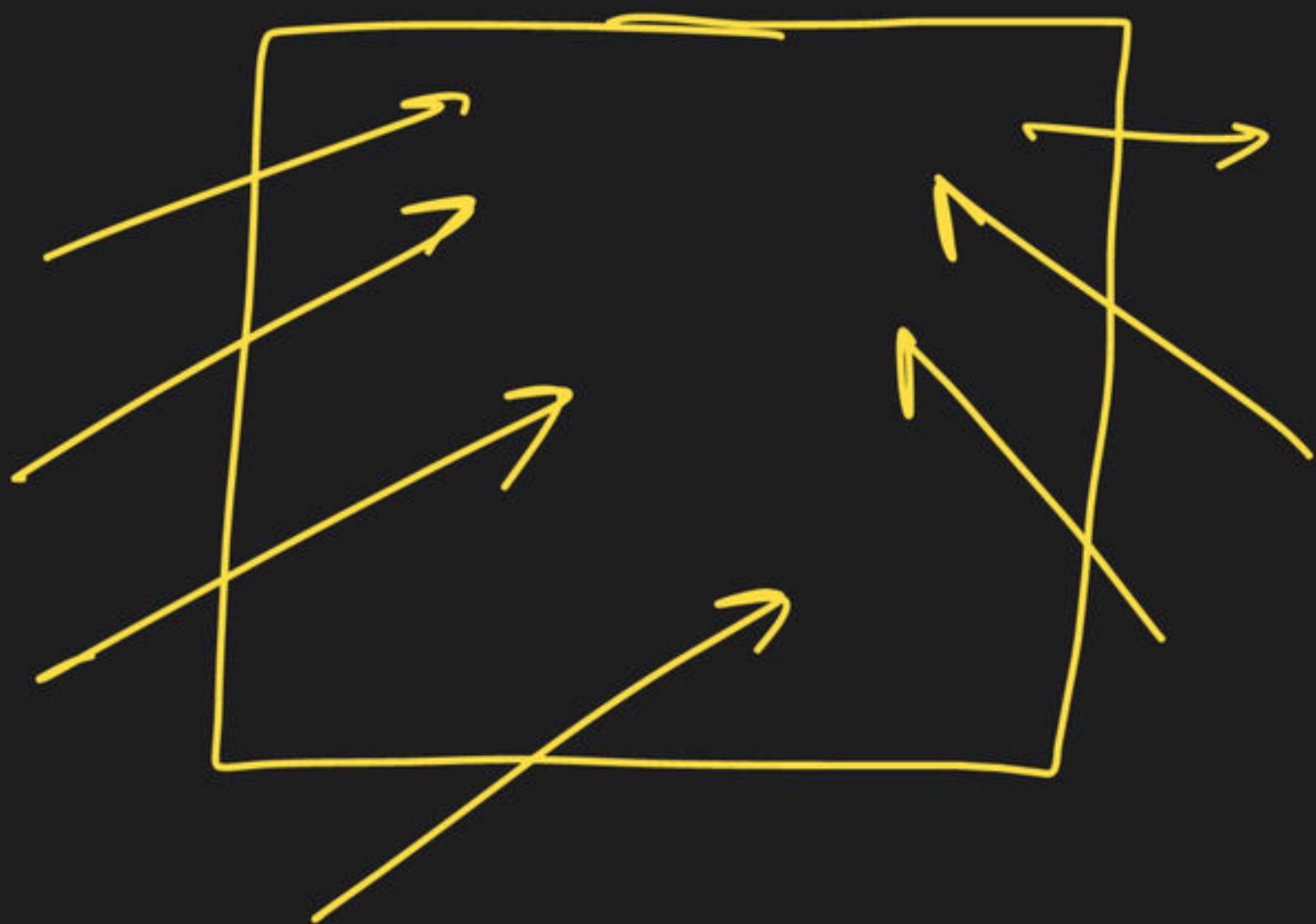


Tesla

$$= \text{wb} / \text{m}^2$$



Inductancia Henry



MR

3T.

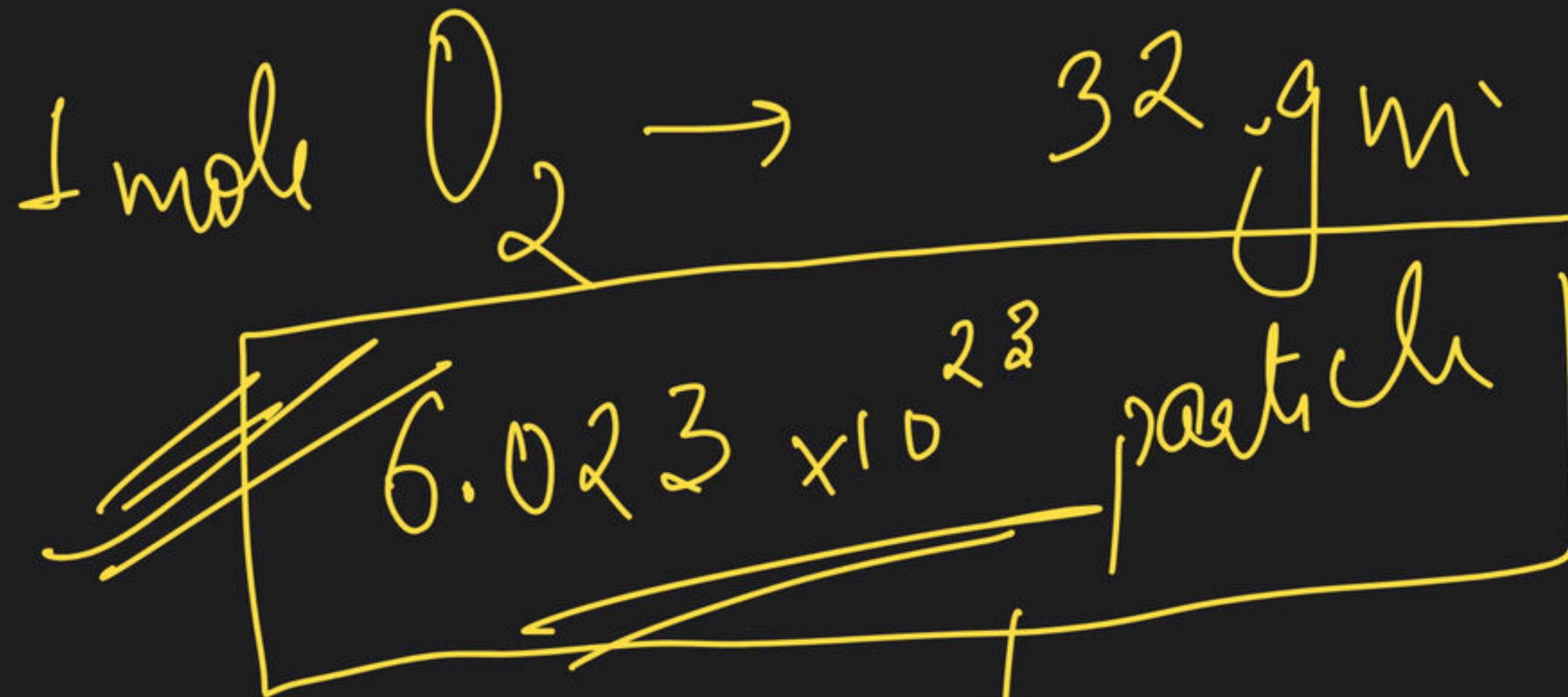
GT.

# Difference between Joule & Calorie?

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

7CSK 7APL 7KMH

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



Avogadro No.

~~SD student~~

~~600 Kg~~

~~5 sugar~~

~~40 students~~

~~325 Kg~~



+  
311 एप्रिल

"सप्टेंबर"

~~Luminous~~ (soft)

Flux



Luminous (fall)

intensity

Candela



# Some important derived units.

Physical Quantity	cgs units	SI unit	Relation
Force	$m \times a.$	dyne	$1 \text{ newton} = 10^5 \text{ dyne}$
work	$F \times d.$	erg	$1 \text{ joule} = 10^7 \text{ erg}$

$$F = m \times a = \frac{m \times d}{t^2} = \frac{kg \times m}{s^2}$$

 \$ 38000

 € 100

MKS  $\rightarrow$  m kilo sec.

~~CGS~~  $\rightarrow$  cm gm sec

FPS  $\rightarrow$  foot pound sec

~~S I P~~ ✓ ✓ ✓

$$\text{Work} = \underline{F \times d.}$$

$$= \underline{\underline{Kgms^{-2} \times m}}$$

$$\rightarrow \underline{\underline{Kgm^2 s^{-2}}} \rightarrow \underline{\underline{\text{Joule}}}$$



length  $\rightarrow$   $m$

= Speed

$$\frac{D}{T}$$

$L$

$$\frac{L}{S}$$

$m$   
CS

$m s^{-1}$

Acceleration =  $\frac{\Delta V}{\Delta t}$ ,  $\frac{m}{s \times s} = m s^{-2}$

Mass =  $\frac{F}{g}$ ,  $m \times g \rightarrow \frac{kg \times m s^{-2}}{N} = kg m s^{-2}$

$m$   
 $s \times s$   
 $kg \times m s^{-2}$   
 $N$   
 $kg m s^{-2}$



Work - Joule  
Energy → Calorie } dimension



$$1 \text{ Cal} = 4.2 \text{ Joule}$$

$$100 \times 10^3 \text{ Cal} =$$

# Some practical units of length, mass and time

## Length

Light year = distance travelled by light in one year in vacuum.

$$1 \text{ LY} = 9.46 \times 10^{15} \text{ m}$$

$$1 \text{ Astronomical Unit (A.U)} = 1.5 \times 10^{11} \text{ m}$$

$$1 \text{ Parsec} = 3.26 \text{ ly} = 3.08 \times 10^{16} \text{ m}$$

$$1 \text{ Nautical mile or Seamile} = 6076 \text{ ft} = 1852 \text{ m} = 1.85 \text{ KM}$$

$$1 \text{ Micron} = 1 \mu\text{m} = 10^{-6} \text{ m}$$

$$1 \text{ Angstrom (\AA)} = 10^{-10} \text{ m}$$

$$3 \times 10^8 \frac{\text{m}}{\text{s}}$$

## Mass

$$1 \text{ Quintal} = 10^2 \text{ kg}$$

$$1 \text{ Metric ton} = 10^3 \text{ kg}$$

$$1 \text{ Atomic Mass Unit (amu) or Dalton} = 1.66 \times 10^{-27} \text{ kg}$$

$$3.26 \text{ ly}$$

## Weight

$$1 \text{ Slug} = 14.59 \text{ kg}$$

$$1 \text{ Pound} = 0.4537$$

$$1 \text{ Chandrashekhar limit} = 1.4 \text{ times the mass of sun} = 2.8 \times 10^{30} \text{ kg}$$

$$1 \text{ Solar day} = 86400 \text{ sec.}$$

$$1 \text{ Year} = 365\frac{1}{2} \text{ solar days}$$

$$1 \text{ Lunar month} = 27.3 \text{ solar days.}$$

$$1 \text{ Parsec}$$

## 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.

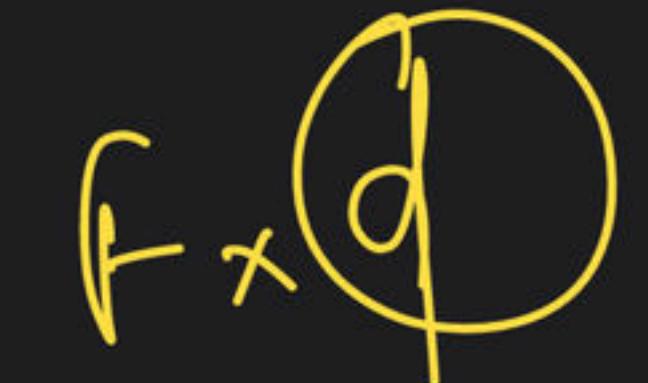
# Prefixes used in metric system

Prefix	Symbol	Multiplier
deci	d	$10^{-1}$
centi	c	$10^{-2}$
milli	m	$10^{-3}$
micro	$\mu$	$10^{-6}$
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	$[M^0 L^3 T^0]$	
2.	Density	$[ML^{-3} T^0]$	
3.	Velocity	$[M^0 L^1 T^{-1}]$	
4.	Acceleration	$\sqrt{L/T}$	$[M^0 L^1 T^{-2}]$
5.	Angular Velocity, Frequency	$[M^0 L^0 T^{-1}]$	
6.	Momentum, Impulse	$[MLT^{-1}]$	
7.	Force	$[MLT^{-2}]$	
8.	Work, Energy	$\int F \cdot d$	$[ML^2 T^{-2}]$
9.	Power	$\cancel{W/T}$	$[ML^2 T^{-3}]$
10.	Pressure, Stress, Modulus of Elasticity		$[ML^{-1} T^{-2}]$
11.	Moment of Inertia		$[ML^2 T^0]$
12.	Torque/Moment of Force	$F \times L \cancel{\text{dis}}$	$[ML^2 T^{-2}]$
13.	Angular Momentum, Planck's Constant		$[ML^2 T^{-1}]$
14.	Coefficient of Viscosity		$[ML^{-1} T^{-1}]$
15.	Surface Tension		$[M^1 L^0 T^{-2}]$
16.	Universal Gravitational Constant		$[M^{-1} L^3 T^{-2}]$
17.	Latent Heat		$[M^0 L^2 T^{-2}]$
18.	Specific Heat		$[M^0 L^2 T^{-2} AK^{-1}]$

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Energy =   $\times \omega$

$$= M L T^{-2} \times L$$
$$M L^2 T^{-2}$$

MALT

MLT

$$F = \frac{kg m s^{-2}}{LT^{-2}}$$

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 // एंप्लीफायर
- 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 // तारकों की सघनता
- ~~2) Astronomical distance // खगोलीय दूरी~~
- 3) Brightness of heavenly bodies //  
खगोलीय पिंडों 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

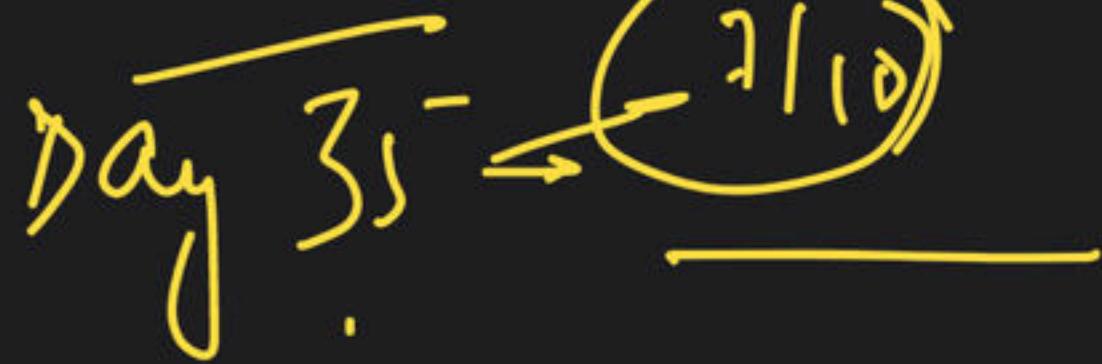
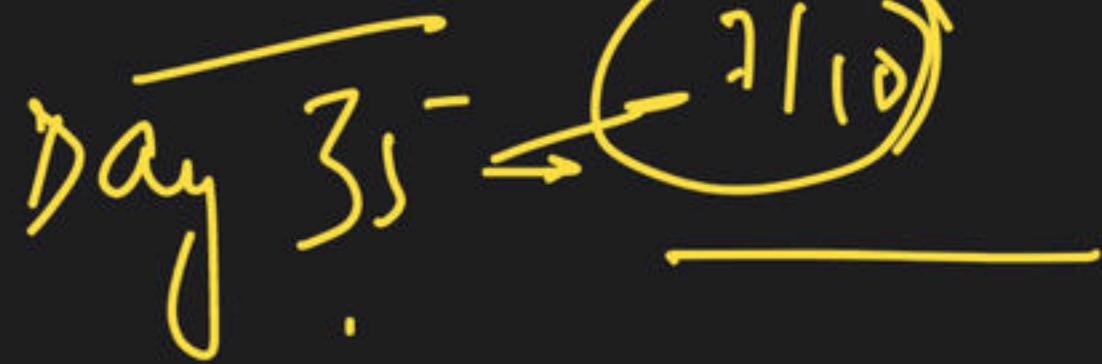
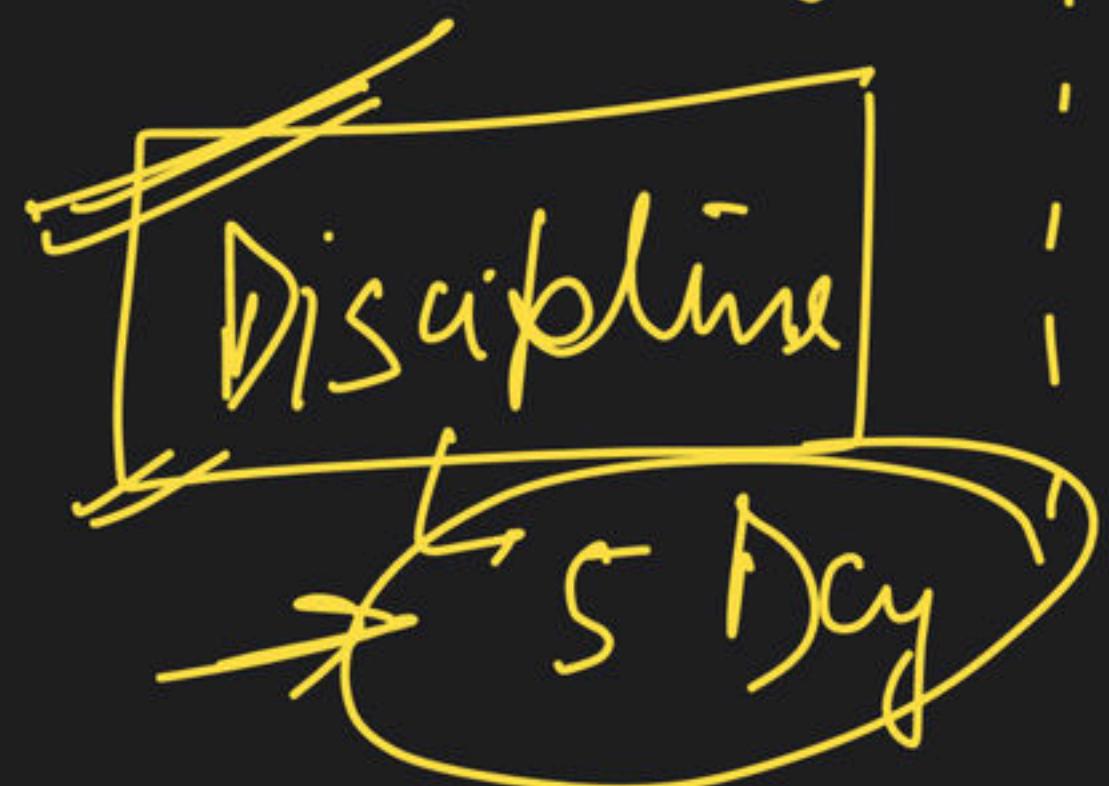
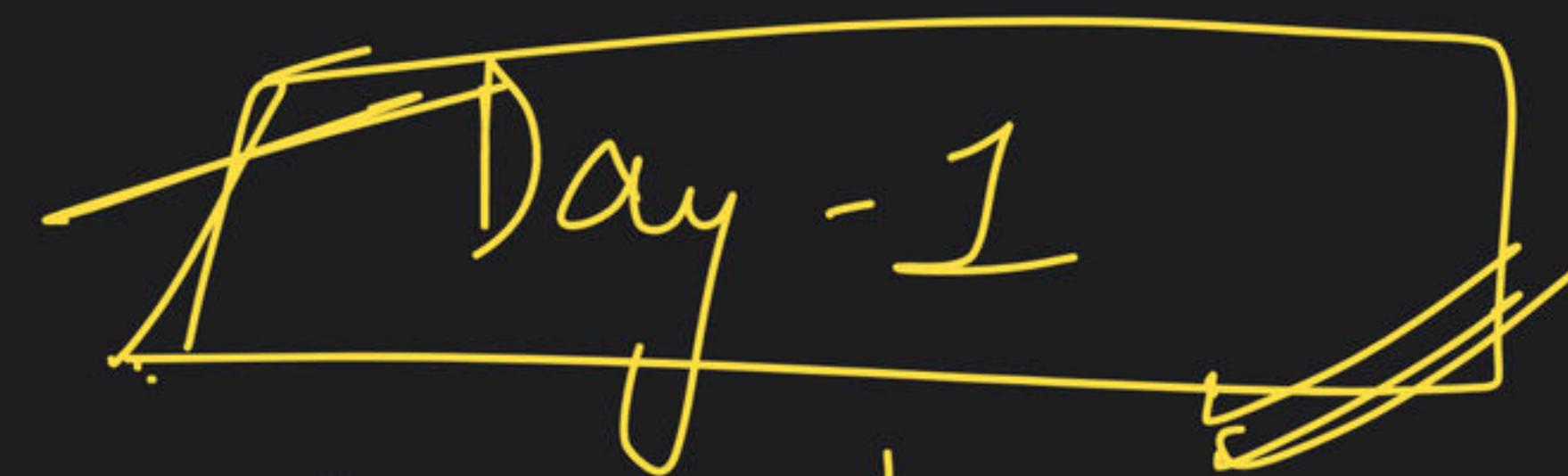
Q.4) What is the SI unit of pressure?

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~~

0.39.''



### 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 ओह्म
- 2. farad फैरड
- 3. henry हेनरी
- 4. weber वेबर



mho

siemens

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 फेरड~~ → Capacitance
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

$$\frac{C}{5} = \frac{F - 32}{9}$$

$$T_K = 273.15 + T^{\circ}C$$

## 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. Hertz 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<sup>-1</sup> L<sup>3</sup> T<sup>-2</sup>

# 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)

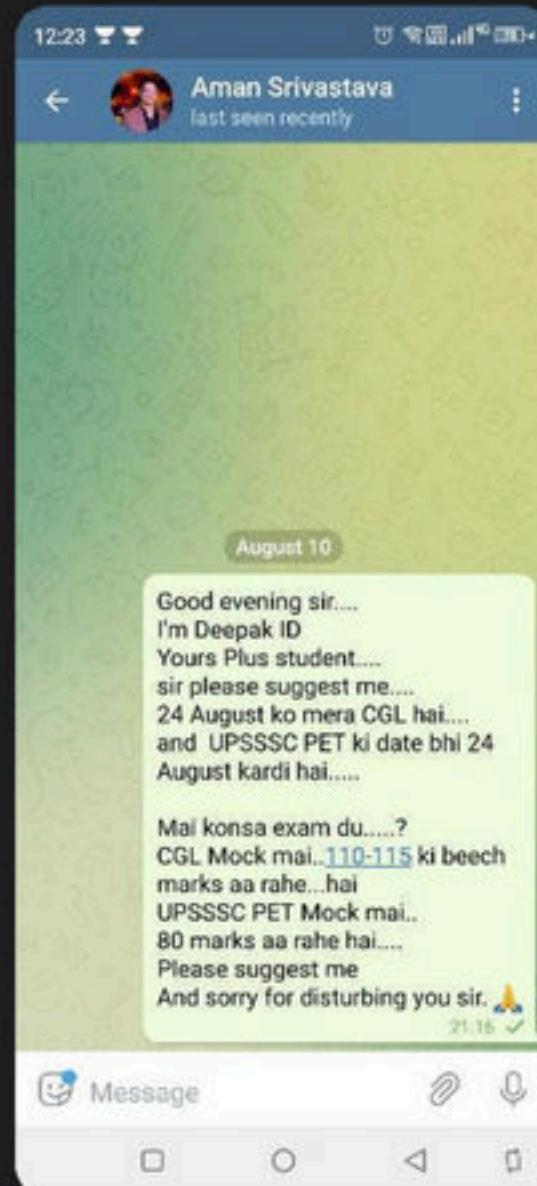
Amount of Substance

Mole (mol)



Question  
from Deepak

Sir please suggest me.....





## Question

from Utkarsh

Sir score 110-140 vwry krta rehta h

CHSL [14<sup>th</sup> March, 2020 - Shift-2]

Subject	Attempts	Correct	Wrong	Average	Total Time	Total Marks
Quant	24/25	21	03	23 min	40.5/50	
Reasoning	24/25	21	03	20 min	48.5/50	
English	23/25	17	06	11 min	31.5/32	
CGL	08/25	06	02	03 min	11.5/20	
Total	79/100	65	19	57 min	123/200	

**Quant**

- Right & wrong
- Approximation in calculation
- $\frac{1}{3} \times 3/4 \times 7 = 5.25 \times 2$
- Calculation tip

**Reasoning**

- Series (Number)
- odd-even-a-bab-ab
- Word Banker
- Math speed (Time)

**English**

- Active Passive
- Antonyms for Middle
- Usage test 2 minutes
- Antonyms - Ruffful  
Synonyms - Colle

110  
—  
140

**TRICK TO REMEMBER**

**CSK AM**

**KM**

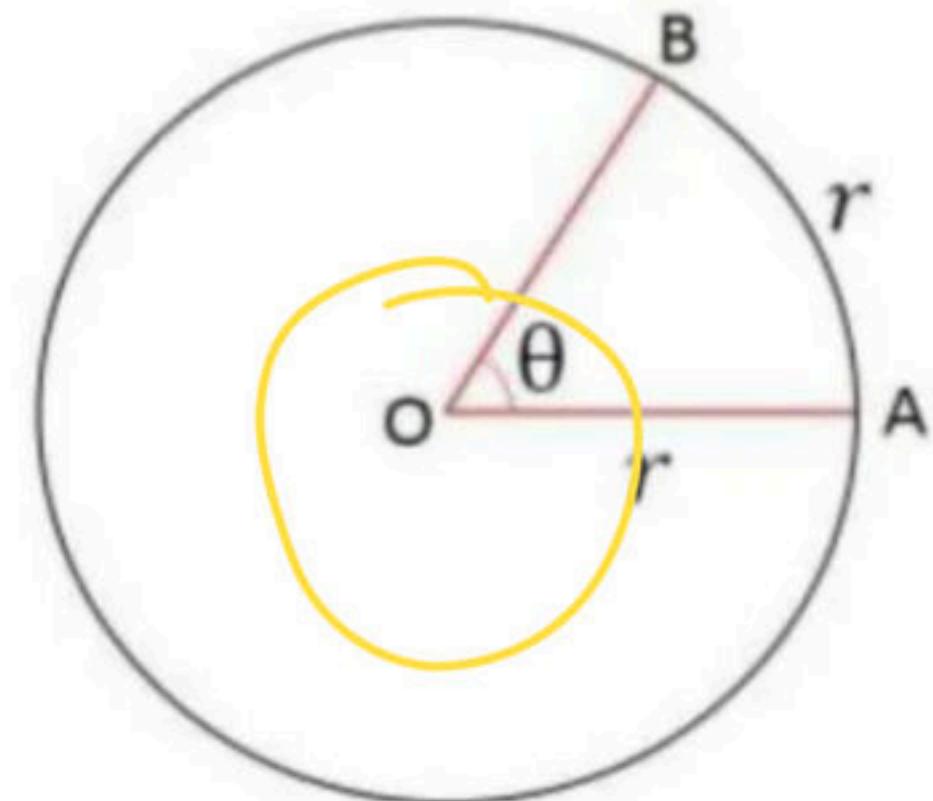
# Why do we call Fundamental unit ?



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

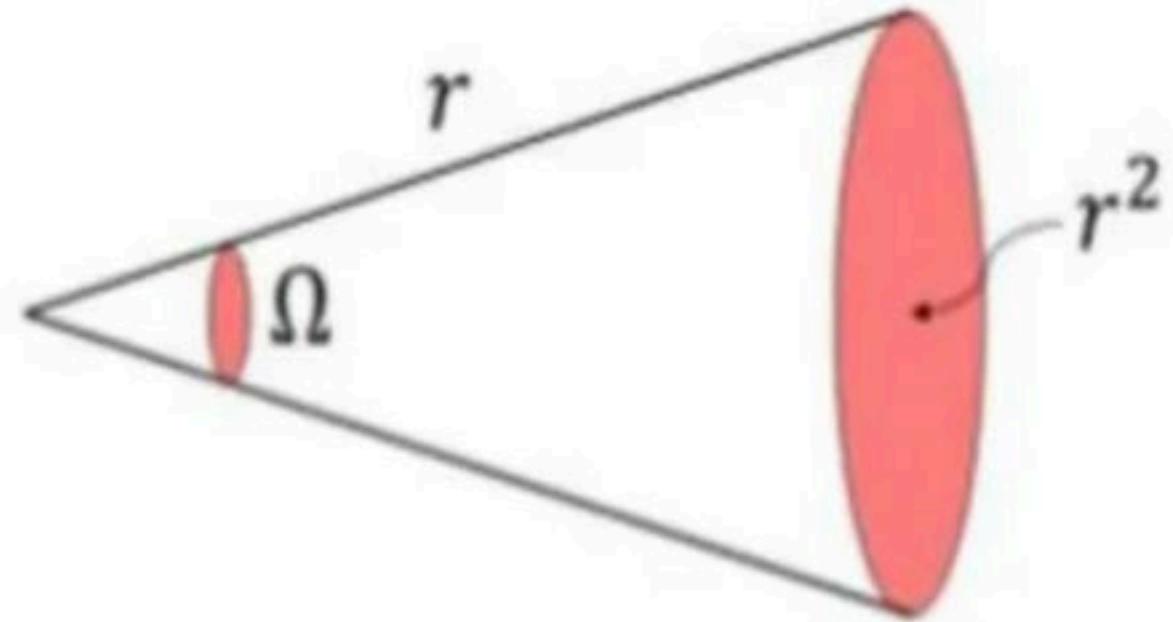
## Two supplementary units

1. Radian: It is used to measure plane angle



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

2. Steradian: It is used to measure solid angle



$$\Omega = 1 \text{ steradian}$$

# Motion

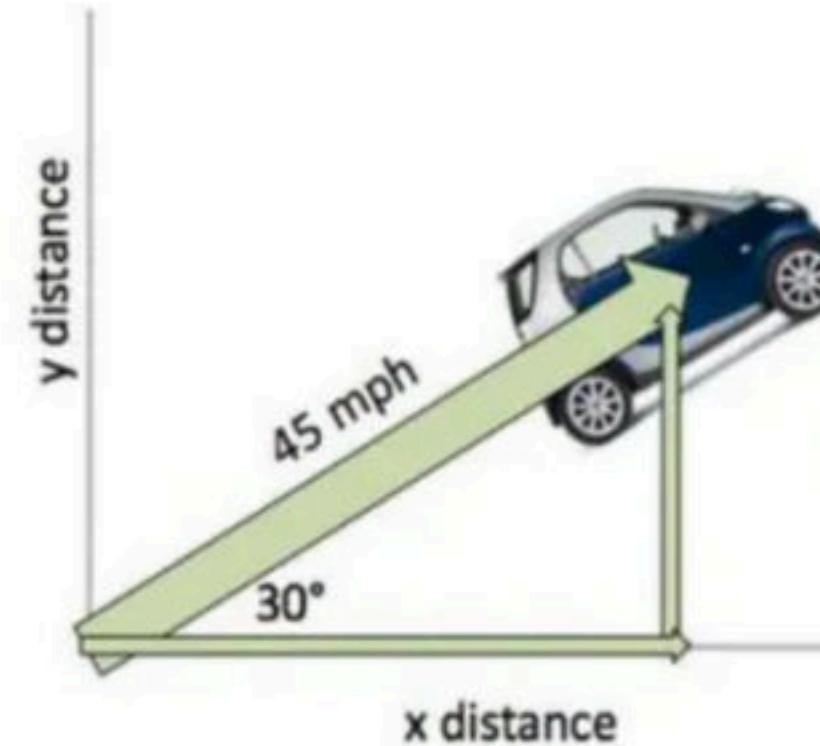
**Speed** distance covered by a moving body in unit time interval.

**Velocity** The rate of change of displacement

## Scalar and Vector Quantities



"speed" is scalar  
45 mph  
(or 20.1 m/s)



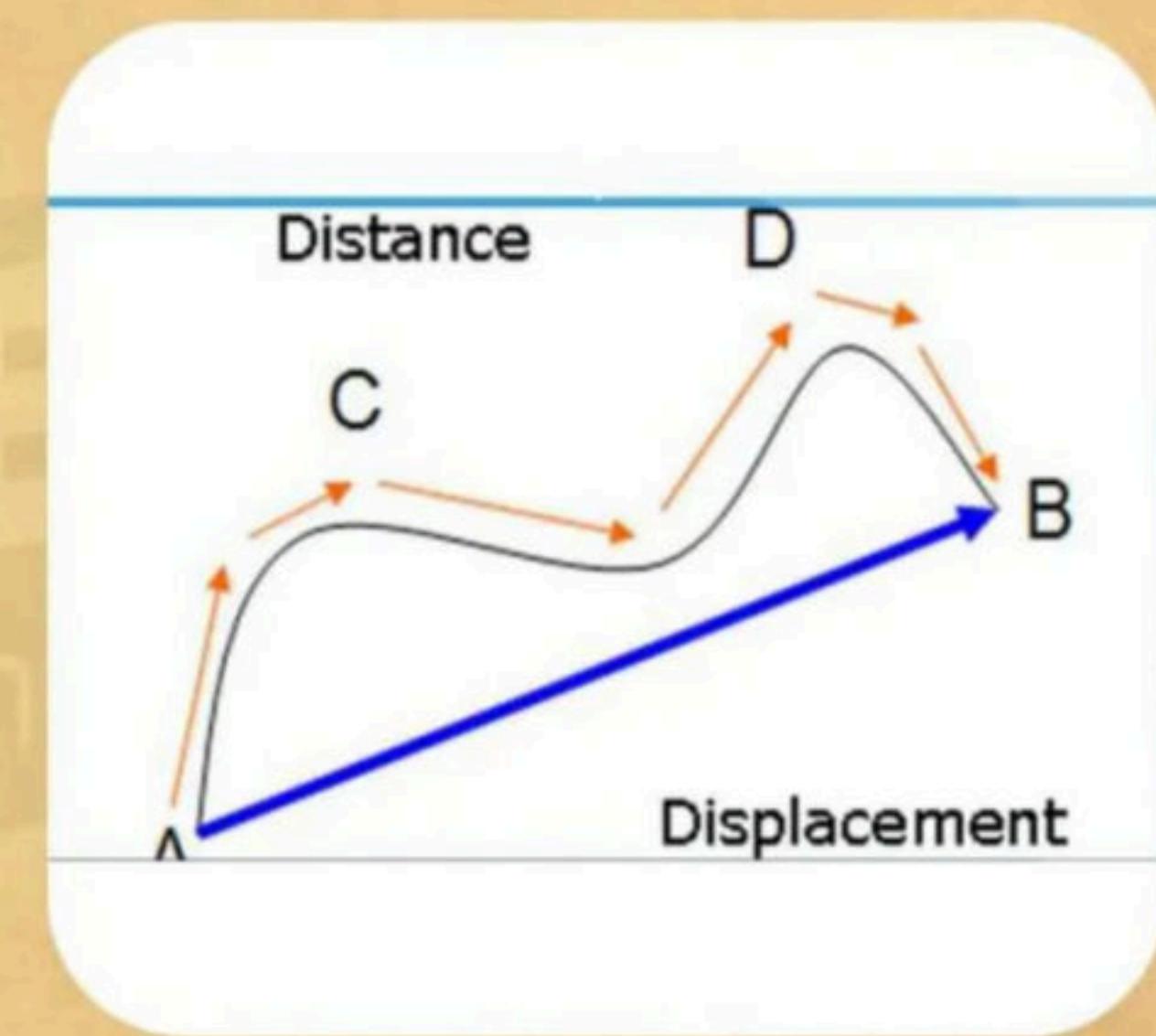
"velocity" is vector  
which means direction  
is also included

# Motion

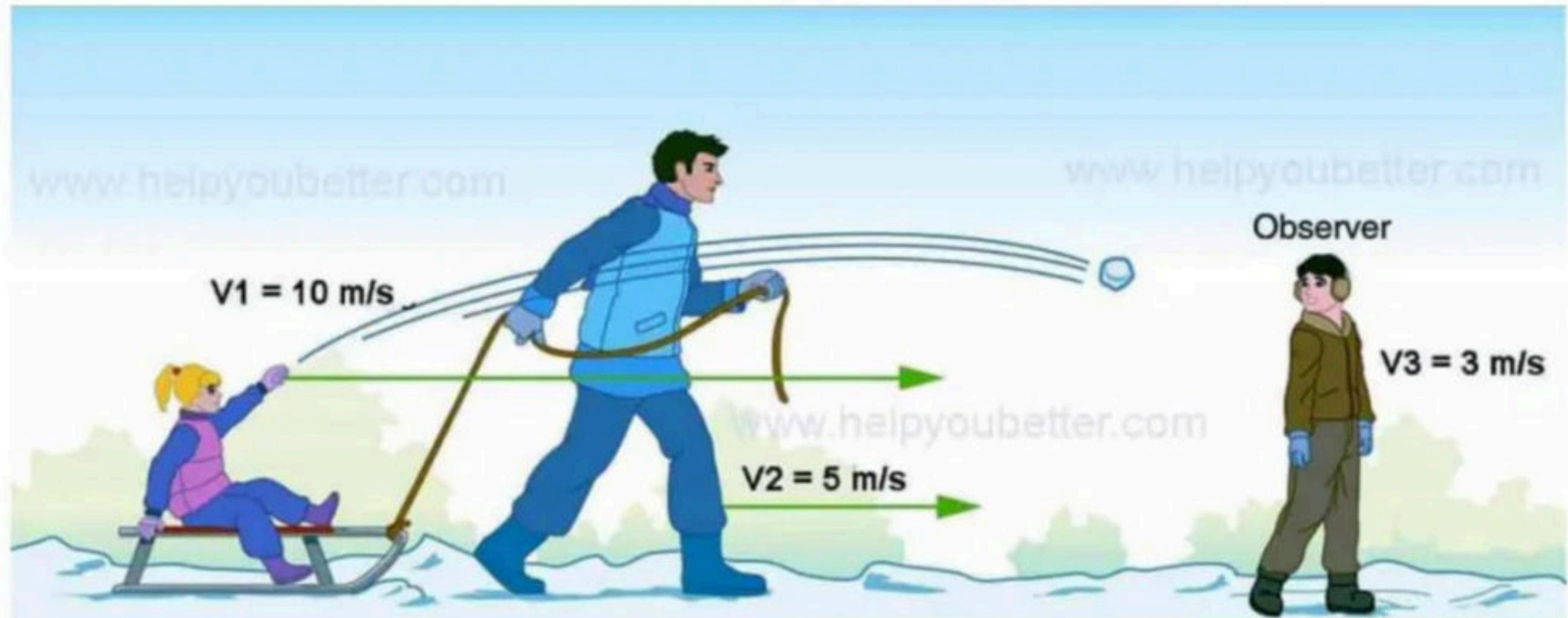
Distance length of the actual path.

It is always (+)ve

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

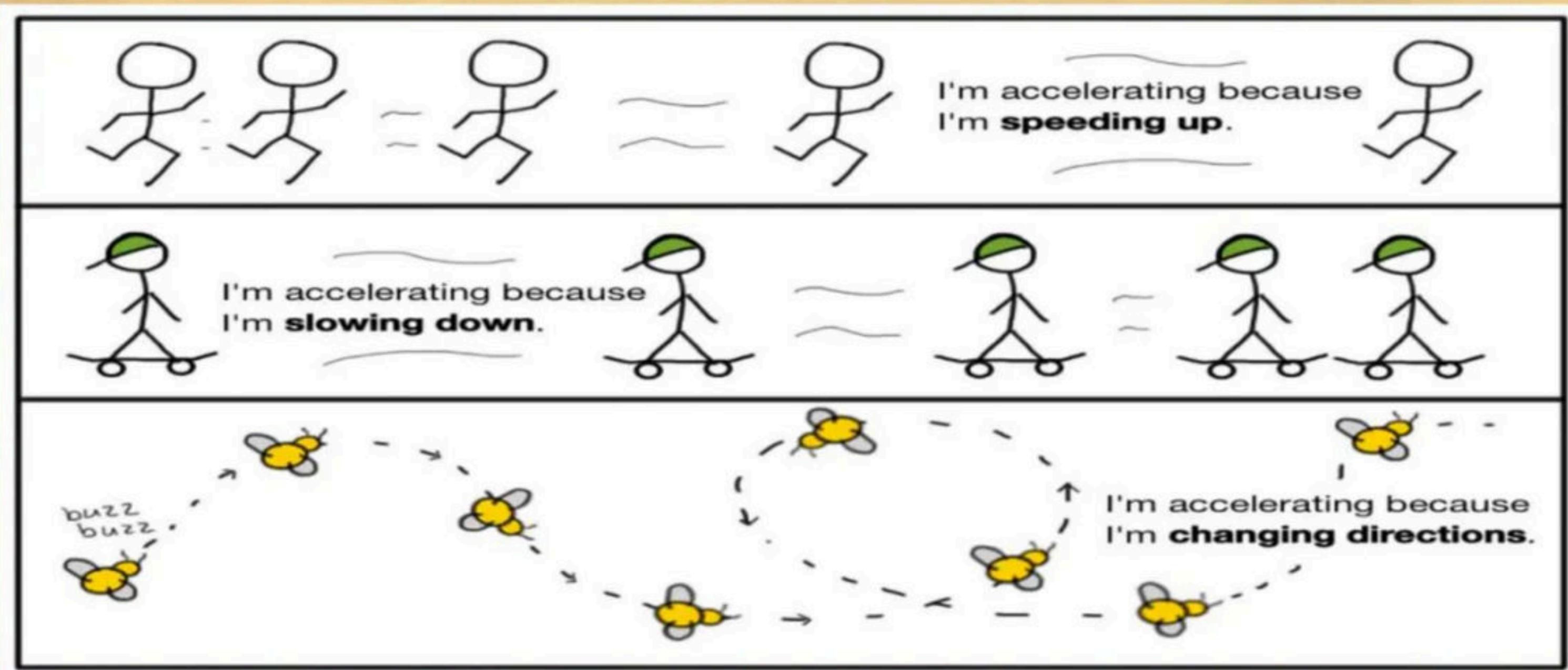


## RELATIVE VELOCITY



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

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



# Equations of Motion in one Dimension

Three equations are:

$$1. \quad v = u + at$$

$$2. \quad s = ut + \frac{1}{2}at^2$$

$$3. \quad v^2 - u^2 = 2as$$

Where,

$v$  = final velocity

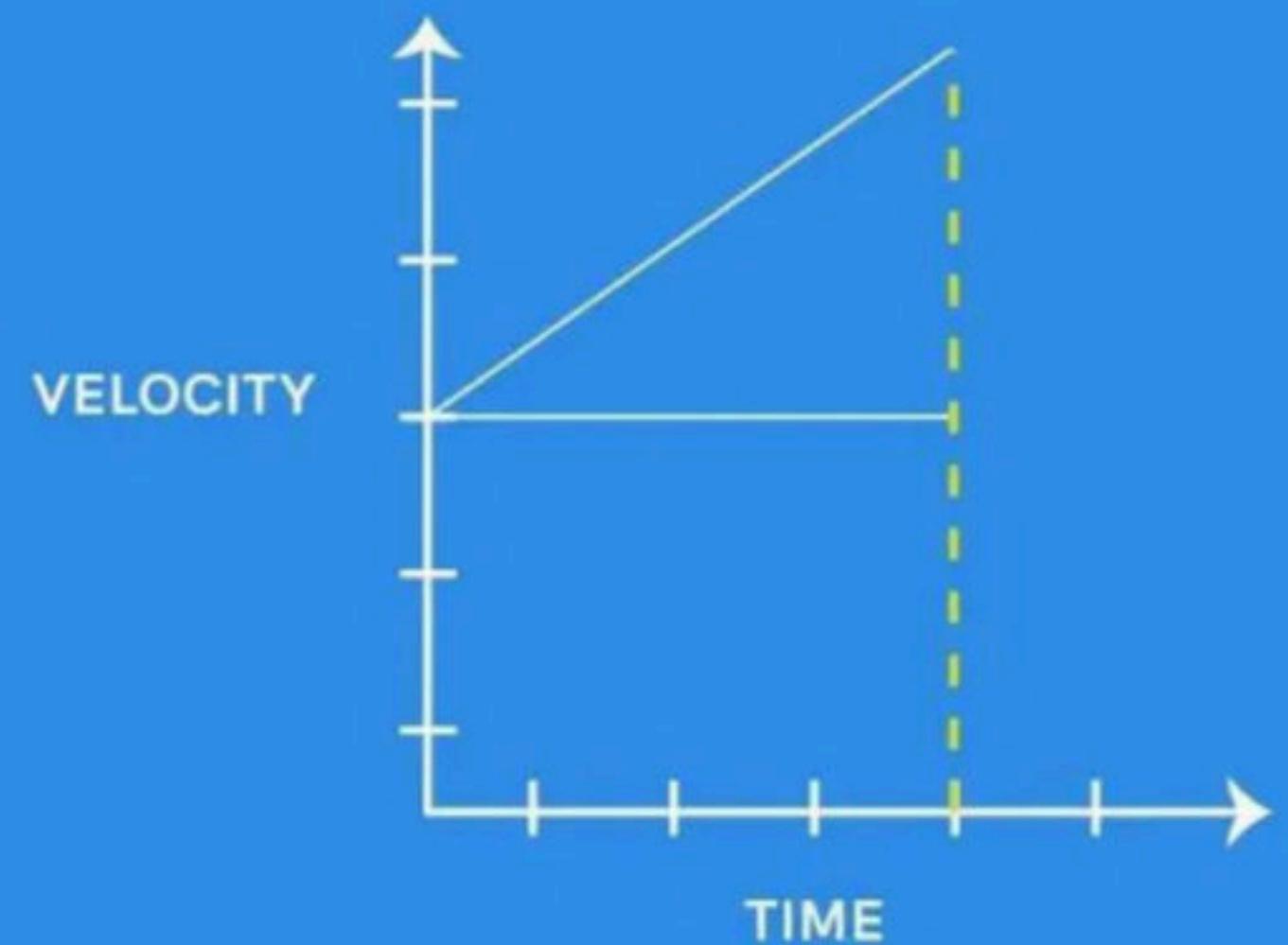
$u$  = initial velocity

$a$  = acceleration

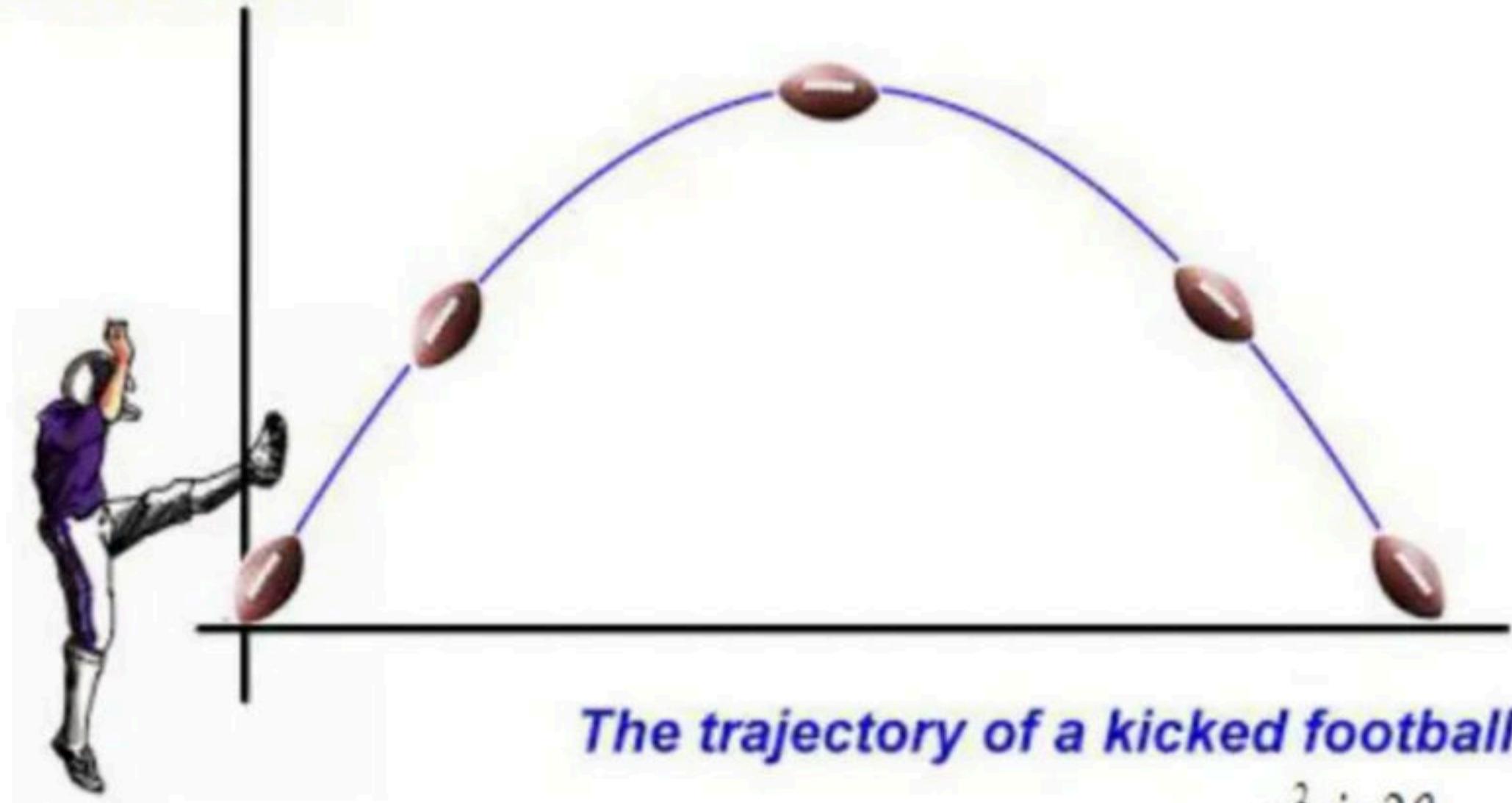
$t$  = time



# EQUATIONS OF MOTION



## Projectile Motion



*The trajectory of a kicked football*

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

Path of Projectile is a Parabo

$$\text{Time (T)} = \frac{2a \sin \theta}{g}$$

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

(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.  $g = 9.8 \text{ m/s}^2$

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 एक समान 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

(C) Parabolic

Q.24) The motion of the wheel of a  
bullock 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:

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

[a] More force

# Newton's Law

# Newton's First Law Of Motion



An object at rest  
will remain at rest....



Unless acted on by  
an unbalanced force.



An object in motion  
will continue with  
constant speed and  
direction,....

... Unless acted on by  
an unbalanced force.

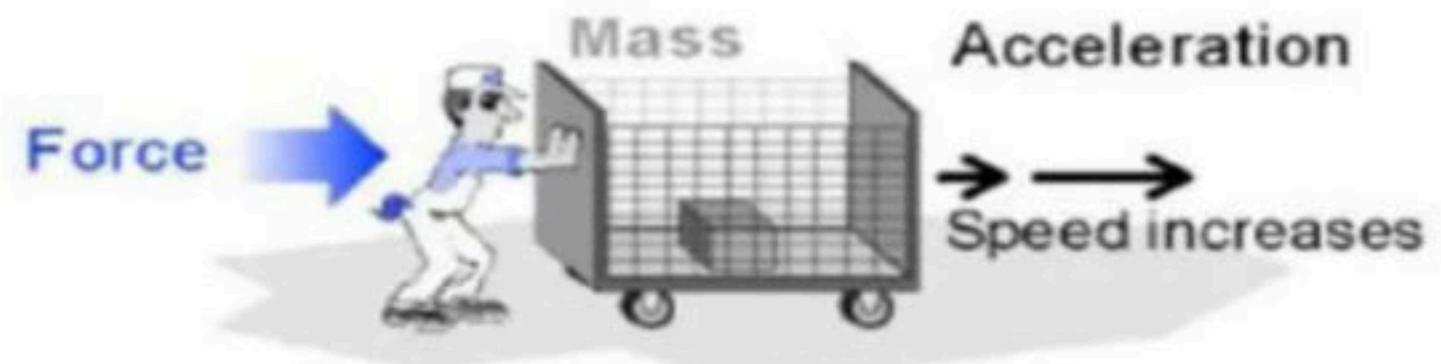


Also known as law of inertia or law of Galileo.

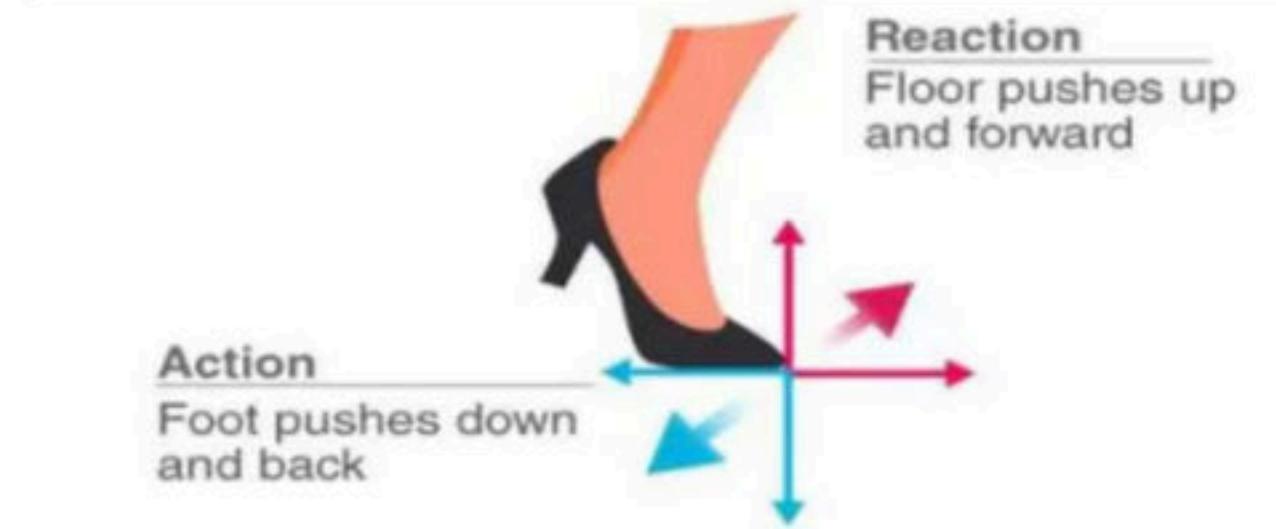
# Newton's Second Law Of Motion

## Law Of acceleration

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

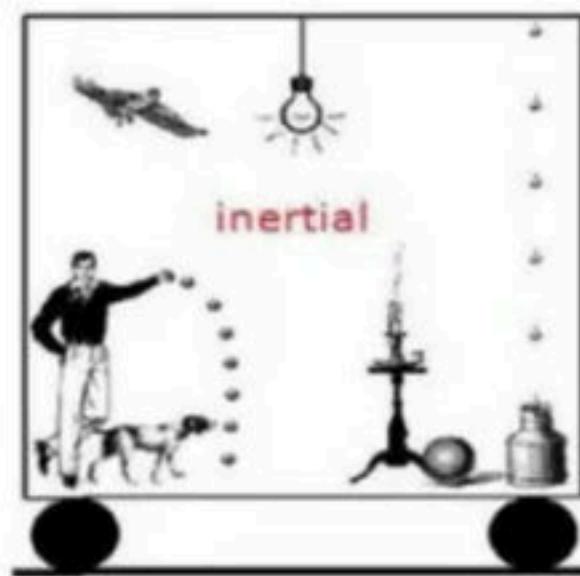


# Newton's 3rd Law Of Motion

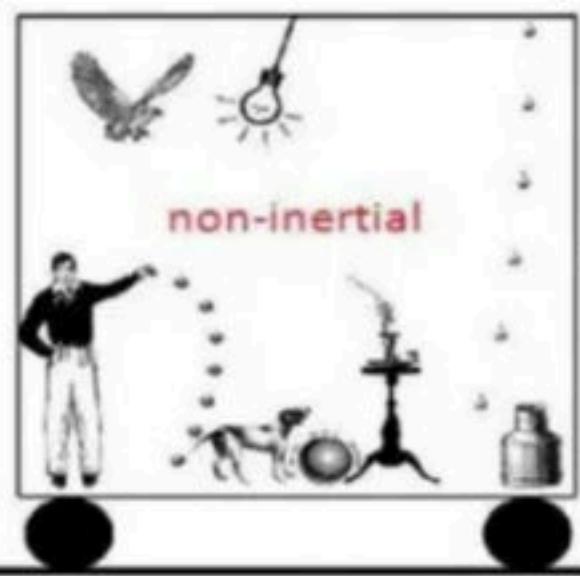


# Inertial Reference Frames

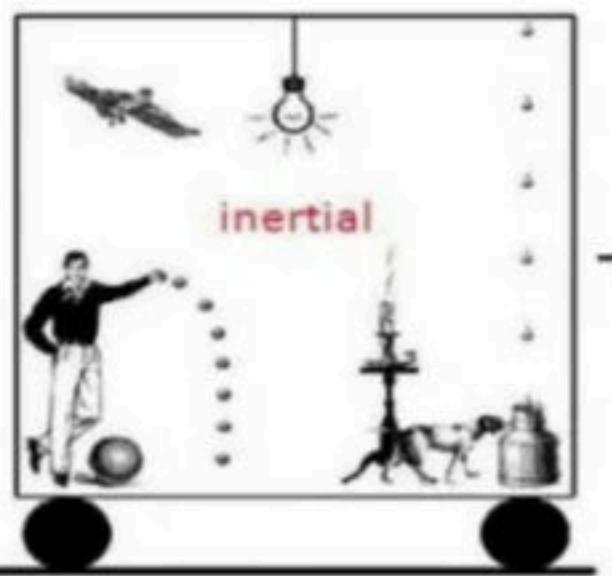
These reference frames are said to be **inertial**.



A. Carriage standing still



B. carriage accelerating

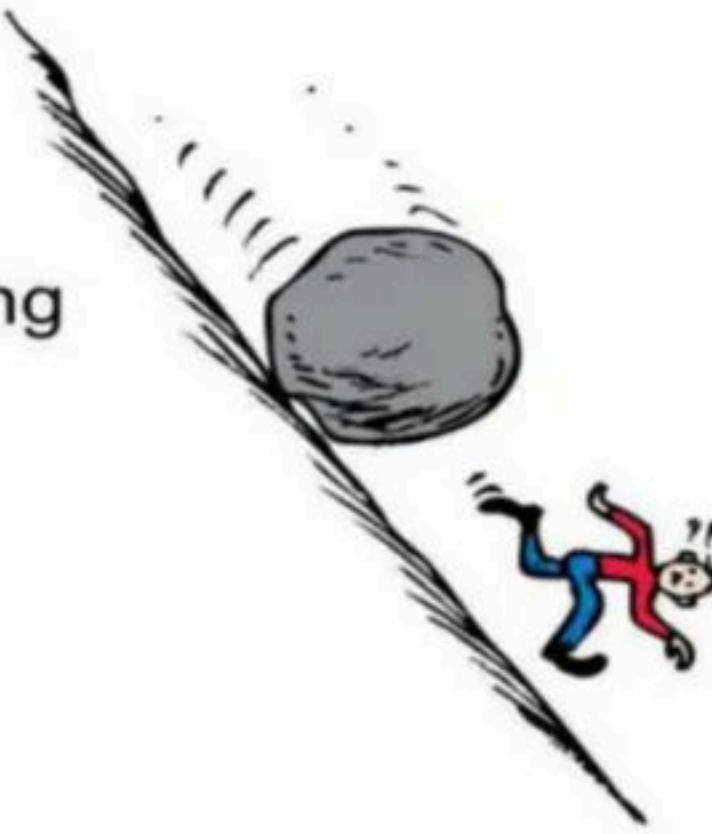


C. carriage moving uniformly

# 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**



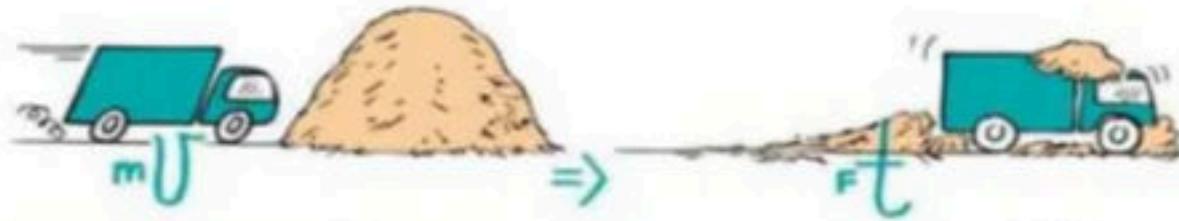
# Conservation of momentum

# Impulse Changes Momentum

Examples:

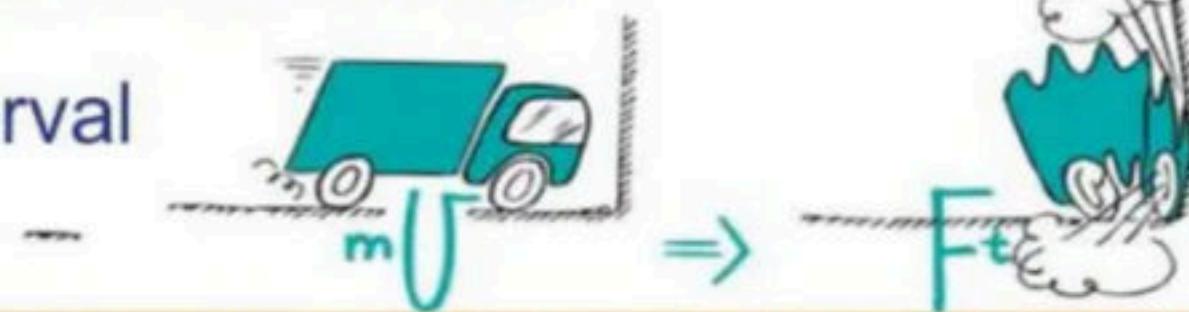
When a car is out of control, it is better to hit a haystack than a concrete wall.

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



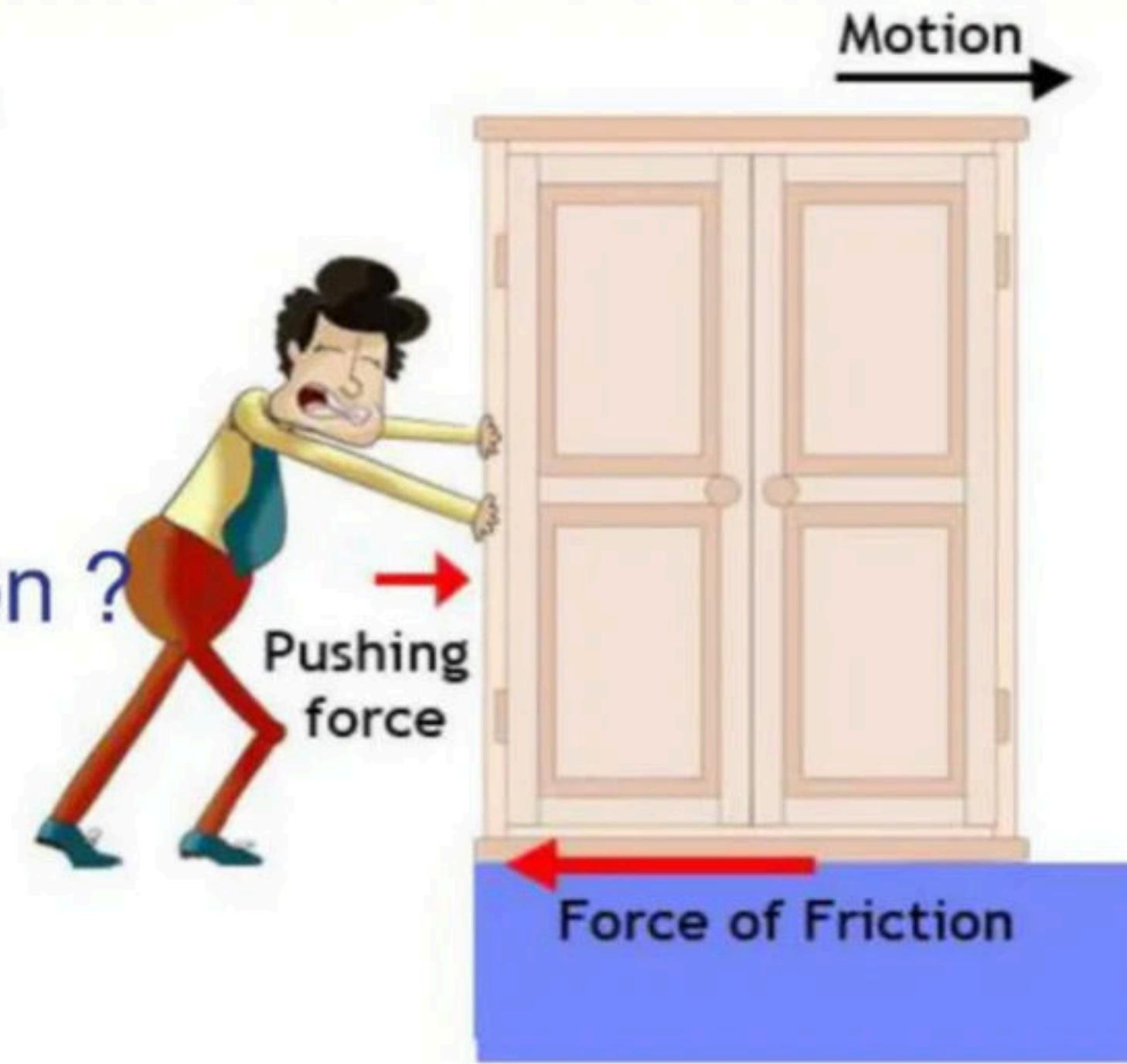
Impulse = Change in momentum

= Force  $\times$  Time interval



# What is Friction ?

Can we feel friction ?

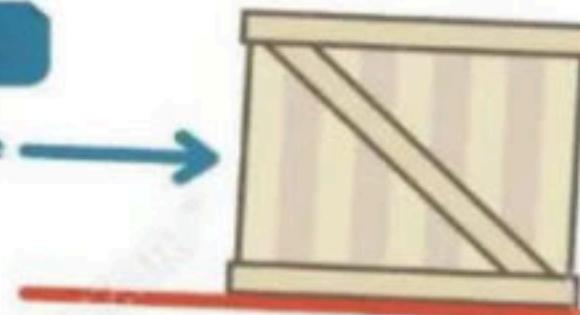


# FRICTION

- Types Of Friction
- Advantage and disadvantage of friction

Static Friction

Force →



No Motion

Sliding Friction

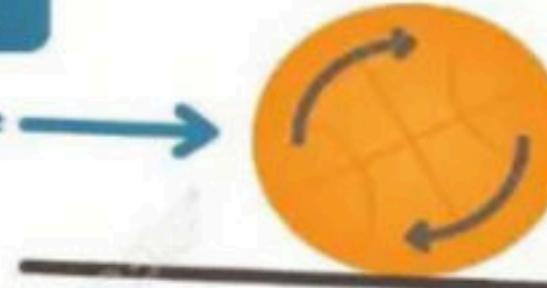
Force →



Sliding Motion

Rolling Friction

Force →



Rolling Motion

## 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 ओर 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]

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

## 4.mass द्रव्यमान

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

बल की प्रबलता प्रायः 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

3.100N