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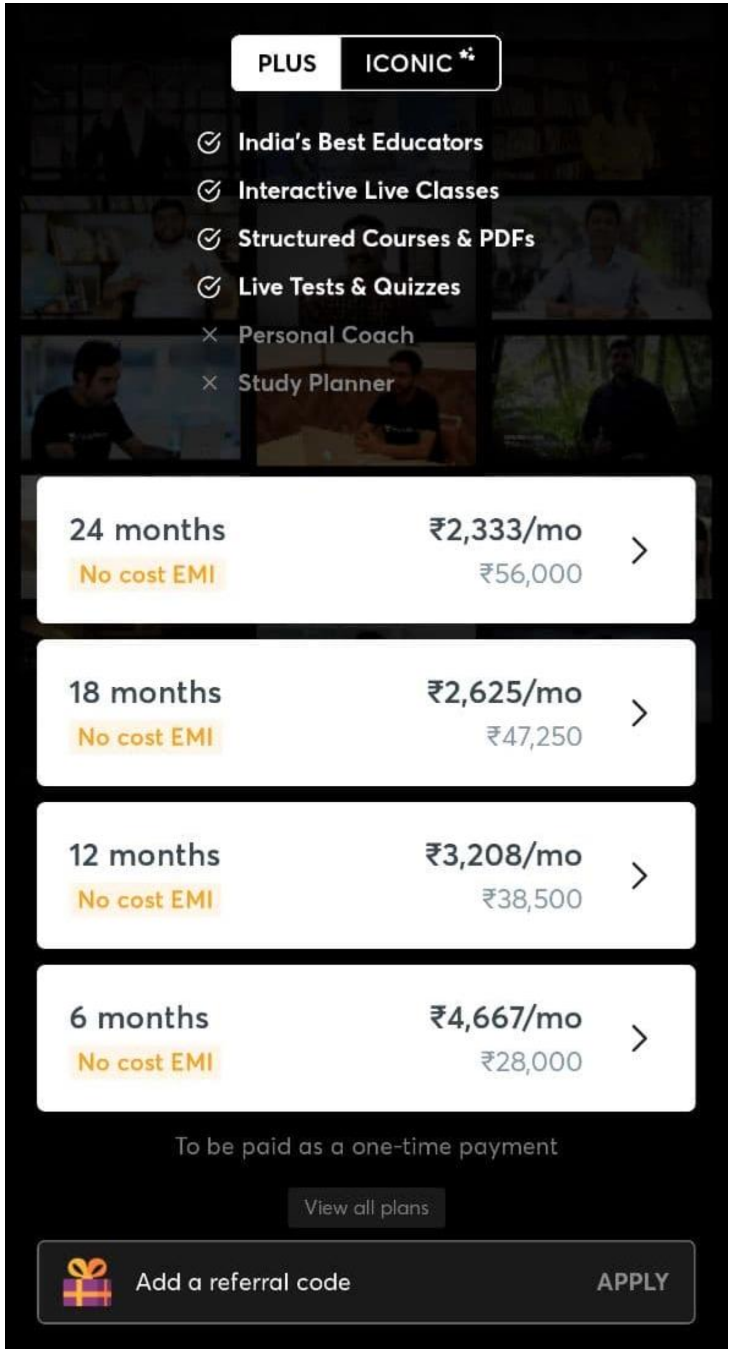

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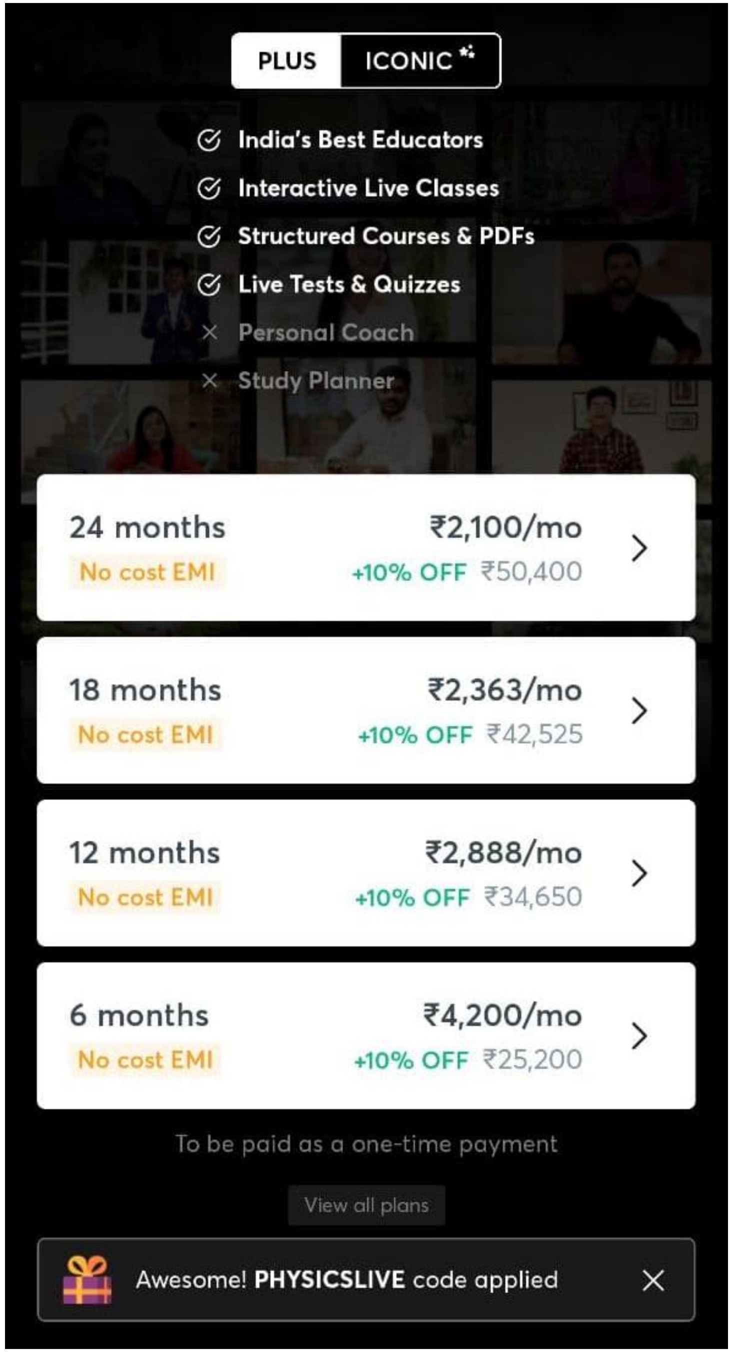

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JEE Main
Physics DPP

DPP-1 Units & Measurements: Units & Dimensional Formula

By Physicsaholics Team

Q) Which of the following physical quantities has neither dimensions nor unit?
(Hint:- $f = \mu N$; where, μ = coefficient of friction, f = friction force & N = Normal force)

(a) Angle

(b) Luminous intensity

(c) Coefficient of friction

(d) Current

Ans. c

Luminus intensity

↳ cd

Current

↳ Amp.

Angle

↳ rad

Coefficient of friction $\mu = \frac{f}{N} = \frac{\text{Force}}{\text{Force}}$

↳ No unit

No dimension.

Q) Dimensional formula for coefficient of viscosity (η)[use $F = 6\pi\eta rv$ (r=radius ; v=velocity; F=viscous force]:

(a) $ML^{-2}T^{-1}$

(b) $M^{-1}L^{1}T^{-1}$

(c) $M^{1}L^{1}T^{-2}$

(d) $ML^{-1}T^{-1}$

Ans. d

$$F = 6\pi\eta r v$$

$$[F] = MLT^{-2}$$

$$[r] = L$$

$$[v] = LT^{-1}$$

$$[\eta] = \frac{[F]}{[r][v]} = \frac{MLT^{-2}}{L \cdot LT^{-1}}$$

$$= \underline{ML^{-1}T^{-1}}$$

Q) The dimensions of radian per second are:

(a) $[M^0L^0T^0]$

(b) $[M^0L^0T^1]$

(c) $[M^0L^0T^{-1}]$

(d) $[M^0L^2T^{-1}]$

Ans. c

radian per sec = rad/sec

rad → Angle → dimensionless

$$[\text{Radian per sec}] = \frac{1}{[\text{sec}]} = \frac{1}{T} = \underline{T^{-1}}$$

Q) The dimensional formula of radius of gyration is:

(a) $[M^0 L^0 T^0]$

(b) $[M^0 L^0 T]$

(c) $[M^0 L T^0]$

(d) $[M L T^{-1}]$

Ans. c

Solution:

Radius of gyration is measure of distance.

(You will study this in the chapter “Rotational Motion.”

Q) From the following pairs of physical quantities, in which group dimensions are not same:
[Hint:- Linear momentum = mass × velocity, Torque = Force × perpendicular distance, Impulse = Change in momentum]

(a) Linear Momentum and impulse
(b) Torque and energy
(c) Energy and work
(d) Light year and minute

Ans. d

(a) Linear Momentum (P)

Impulse (I)

$P = mV$

$I = \Delta P$

so; $[I] = [P]$

(b) Torque & Energy
(τ) (E)

$\tau = F \times r_\perp$

$E = F \times x$

Energy or work.

$[\tau] = [E]$

(c) Energy & work

$[E] = [W]$

(d) Light year is length

Minute is time

$[L] \neq [T]$

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Q) The dimensional formula for Planck's constant (h) is
(Hint:- Unit of planks constant = J-sec)

(a) $[ML^{-2}T^{-3}]$

(b) $[M^0L^2T^{-2}]$

(c) $[ML^2T^{-1}]$

(d) $[ML^{-2}T^{-2}]$

Ans. c

$[h] = ?$

Unit of h = Joule - Sec

Joule $\rightarrow$ Energy

$[E] = ML^2T^{-2}$

$[h] = [E][t]$

$= ML^2T^{-2} \cdot T$

$= ML^2T^{-1}$

Q) An atmosphere:

(a) is a unit of pressure

(b) is a unit of force

(c) gives an idea of the composition of air

(d) is the height above which there is no atmosphere

Ans. a

atmosphere (atm) is the unit of pressure.

$$\boxed{1\,atm = 10^5\ pascal}$$

Q) The dimensions of wavelength (λ) is:
(Wavelength = Distance travelled by wave in one time period)

(a) $[M^0 L^0 T^0]$

(b) $[M^0 L T^0]$

(c) $[M^0 L^{-1} T^0]$

(d) none of these

Ans. b

wavelength = measure of length

$[\lambda] = L$ or $M^0L^1T^0$

Q) State which of the following is correct?
(Hint:- When a charge q is accelerated by a Voltage V then its energy = qV)

(a) joule = coulomb × volt

(b) joule = coulomb/volt

(c) joule = volt + coulomb

(d) joule = volt/coulomb

Ans. a

Energy = $q \Delta V$

Joule = Coulomb × Volt

Q) Of the following quantities, which one has dimensions different from the remaining three?
(Hint:- Angular Momentum = mass × velocity × perpendicular distance,
& When a charge q is accelerated by a voltage V then its energy = qV)

(a) Energy per unit volume

(b) Force per unit area

(c) Product of voltage and charge per unit volume

(d) Angular momentum

Ans. d

(a) $\left[\frac{E}{V}\right] = \frac{ML^2T^{-2}}{L^3} = ML^{-1}T^{-2}$

(b) $\left[\frac{F}{A}\right] = \frac{MLT^{-2}}{L^2} = ML^{-1}T^{-2}$

(c) $\left[\frac{\text{Volt} \times \text{Coulamb}}{V}\right] = \frac{\text{Joule}}{\text{Volume}} = \frac{ML^2T^{-2}}{L^3} = ML^{-1}T^{-2}$

$= \text{Energy}/\text{Volume}$

(d) $[L] = [mvr] = MLT^{-1}L = ML^2T^{-1}$

(angular momentum is denoted by = L)

Q) The dimensions of frequency is:
(Hint:- frequency (f) = $\frac{1}{T}$; T = Time period)

(a) $[T^{-1}]$

(b) $[M^0L^0T^0]$

(c) $[M^0L^0T^{-2}]$

(d) None of these

Ans. a

Frequency, $f = \frac{1}{T}$

T = Time period

$[T] = T$

$[f] = \frac{1}{T} = T^{-1}$

$[f] = T^{-1}$ or $M^0 L^0 T^{-1}$

Q) Young's modulus (Y) of a material has the same unit as

(Y = $\frac{Stress}{Strain}$; where, Stress = $\frac{Force}{Area}$ & Strain = $\frac{Change\ in\ length}{original\ length}$)

(a) Pressure

(b) Strain

(c) Density

(d) Force

Ans. a

$$Y = \frac{F/A}{\frac{\Delta l}{l}} = \text{Youngs Modulus}$$

$$[Y] = \frac{\left[\frac{F}{A}\right]}{\left[\frac{\Delta l}{l}\right]} \quad \left[\because \frac{\Delta l}{l} \rightarrow \text{Dimensionless}\right]$$

$$\therefore [Y] = \left[\frac{F}{A}\right]$$

$$\text{Pressure} = P = \frac{F}{A}$$

$$[P] = \left[\frac{F}{A}\right]$$

$$\therefore [Y] = [P]$$

Q) The unit of impulse is the same as that of
(Hint:- Impulse = Force × time, Momentum = mass × velocity, Power = Energy per unit time)

(a) Energy
(b) Power
(c) Momentum
(d) Velocity

Ans. c

Impulse = Force $\times$ time

$= MLT^{-2} \times T = MLT^{-1}$

Momentum = mass $\times$ velocity

$= M \times LT^{-1} = MLT^{-1}$

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Chalo Niklo