YAKEEN NEET 2.0

2026

Units and Measurements

Physics | Lecture - 05

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Topics to be covered

1. #
2. Question on Principle of Homogenity.
3. Dimensional analysis :-
4.

H/W

Vector ka Maha-manthan

Join.

Sangha asm

Home work video solution separate, नहीं class के साथ.

Classes → Neet Top-100 (including H/W) (DPP)

assignment → JEE-main Top-100

JEE Advance में selection (50-60 JEE Advan के ques ही chapter)

(a) class के साथ.

(b) separate.

Physically correct	Must be physically wrong.	may be physically correct	A eqn is physically wrong.	A eqn is Physically correct.
Dimensionally correct	A eqn is dimensionally Not Correct (wrong)	A eqn is dimensionally correct.	may or may not be correct.	dimensionally Must be Correct

Angular velocity + frequency

↳ Dimensionally correct but not Physically Correct.

Torque = work + Energy

$v = u + at$ → Dim^n correct, physically correct

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

L^1 ; $LT^{-1}T = L$; $LT^{-2} \times T^2 = L^1$

$s = u + a$ ✗

→ Dim^n wrong

→ Physically → Wrong

$S_{nth} = u \times 1 t + \frac{a}{2}(2n-1)$

↳ dimⁿ correct. Physically correct ✓

↳ dispⁿ in n^{th} sec (duration of One sec)

$V = u + at$ ✓

$V = u + a \times 1\,sec$

$V = u + a$

↳ at $t = 1\,sec$ dimensionally correct.

$S = u + \frac{1}{2}a$

↳ at $t = 1\,sec$ पर dispⁿ

$S = ut + \frac{1}{2}at^2$ ✓

$S = u \times 1 + \frac{1}{2}a(1)^2$

$S = u + \frac{a}{2}$

dimⁿ correct at $t = 1\,sec$

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If any equation is given in chapter and we use to solve question, hence it is physically correct, hence dimⁿ must be correct

(A) all Physically correct must be dimensionally correct → True

(B) Dimensionally wrong may be Physicaly correct → false

(C) Physicaly wrong must be dimensionaly correct → false

(D) Physicaly wrong may be dimensionaly correct → True

(Torque + work).

Question

Assertion: Work = Torque is dimensionally correct but not physically.

Reason: Dimensional correctness of an equation ensures its physical correctness.

1. If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
2. If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
3. If Assertion is True but the Reason is False.
4. If both Assertion & Reason are false.

Question H/W → Unit Conversion

The density of a material in CGS system of units is 4 g cm^{-3}. In a system of units in which unit of length is 10 cm and unit of mass is 100 g, the value of density of material will be [Mains 2011]

$n_1u_1 = n_2u_2$

1. 0.04
2. 0.4
3. 40 ✓
4. 400 ✗

$\begin{cases} 1m' = 10cm \\ 1kg' = 100g \end{cases}$

$d = \frac{4g}{cm^3}$

$= 4\,\frac{1kg'}{100 \times \left(\frac{1m'}{10}\right)^3} = 4\,\frac{kg'}{\frac{100}{1000}\,m'^3} = 40\,\frac{kg'}{m'^3}$

Lecture 2nd me theory ✓

Question

The velocity v of a particle at time t is given by $v = at + \frac{b}{t+c}$ where a, b and c are constants. The dimensions of a, b and c are (2006)

1. $[L]$, $[LT]$ and $[LT^{-2}]$
2. $[LT^{-2}]$, $[L]$ and $[T]$
3. $[L^2]$, $[T]$ and $[LT^{-2}]$
4. $[LT^{-2}]$, $[LT]$ and $[L]$

$$V = at + \frac{b}{t+c}$$

MR*

$$V = at = \frac{b}{t=c}$$

$V = at$

$$a = \frac{V}{t} = \frac{LT^{-1}}{T} = LT^{-2}$$

$$V = \frac{b}{t}$$

$$b = Vt = L^1$$

Question

An equation is given here $\left(P+\frac{a}{v^2}\right)=b\frac{\theta}{V}$ where P = Pressure, V = Volume and θ = Absolute temperature. If a and b are constants, the dimensions of a will be

(1996)

1. $[MT^{-5}T^{-1}]$
2. $[ML^5T^1]$
3. $[ML^5T^{-2}]$
4. $[M^{-1}L^5T^2]$

$$\left(P+\frac{a}{V^2}\right)=b\frac{\theta}{V}$$

$$P=\frac{a}{V^2}=\frac{b\theta}{V}$$

$$a=PV^2$$
$$=ML^{-1}T^{-2}(L^3)^2$$
$$=ML^5T^{-2}$$

$$P=\frac{b\theta}{V}$$

$$b=\frac{PV}{\theta}=ML^2T^{-2}K^{-1}$$

(temp)

Question

The time dependence of a physical quantity p is given by $p = p_0 \exp(-at^2)$, where a is a constant and t is the time. The constant a (1993)

1. is dimensionless
2. has dimensions $[T^{-2}]$
3. has dimensions $[T^2]$
4. has dimensions of p

$P = P_0 \exp(-at^2)$

$P = P_0 e^{-at^2}$

$at^2 = 1$

$a = \frac{1}{t^2} = T^{-2}$

$-\text{length} = L^1$

$4m - 3m = 1m$

Question

Magnitude one have no dimⁿ

Assertion: The unit vectors $\hat{i}$, $\hat{j}$ and $\hat{k}$ have units of distance and dimensions $[M^0 L^1 T^0]$

Reason: The product of a scalar and a vector is a new scalar.

1. If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
2. If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
3. If Assertion is True but the Reason is False.
4. If both Assertion & Reason are false.

$F = 5N\hat{i}$

Question

Assertion: Force is not added with pressure.

Reason: Quantities having different dimension are not added or subtracted.

1. If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
2. If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
3. If Assertion is True but the Reason is False.
4. If both Assertion & Reason are false.

Question

$Y = A \sin(\omega t - kx + \phi)$, find dimension of A, ω, k and ϕ where y and x is position.

$$Y = A \sin(\omega t - kx + \phi)$$

$Y = A \times 1$

$\Leftarrow$ dim^n of $\sin\theta = m^0 L^0 T^0 = 1$

$A = Y = L^1$

Ans

Angle $\theta = \omega t - kx + \phi$

$\theta = \omega t = kx = \phi$

$m^0 L^0 T^0 = 1 = \omega t = kx = \phi$

$\hookrightarrow \phi =$ dim^{n}less

$\hookrightarrow \omega t = 1 \Rightarrow \omega = T^{-1}$ $(kx = 1 \Rightarrow k = L^{-1})$

Question

If velocity $v = \alpha t + \beta x - \gamma x t$, then find dimension of α, β and γ.

$$V = \alpha t = \beta x = \gamma x t$$

$V = \alpha t$

$\alpha = \frac{V}{t} = L T^{-2}$

$V = \beta x$

$\beta = \frac{V}{x} = \frac{L T^{-1}}{L} = T^{-1}$

$\gamma x t = V$

$\gamma = \frac{V}{x t} = \frac{L T^{-1}}{L T} = T^{-2}$

do all HOME WORK.

Question

Velocity $V = \frac{\alpha}{\beta} e^{-\alpha t}$ then find dimension of α and β.

$V = \frac{\alpha}{\beta} e^{-\alpha t}$

αt is dimensionless

$\alpha t = 1$

$[\alpha] = [T^{-1}]$ ✓

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$V = \frac{\alpha}{\beta}$

$\beta = \frac{\alpha}{V} = \frac{T^{-1}}{LT^{-1}} = \frac{1}{L} = L^{-1}$

Ans

Question

(Level up)

Momentum of object is given as $P = \alpha t\left[1-\beta e^{\gamma x}\right]$ then, find dimension of α, β and γ. Where t is time x is position.

$P = mv = mLT^{-1}$

$$P = \alpha t\left[1-\beta e^{\gamma x}\right]$$

$$P = \alpha t\left[1-\beta\right]$$

$\gamma x = 1$

$\gamma = \frac{1}{x} = L^{-1}$

$P = \alpha t(1-\beta)$

$P = \alpha t$

$\alpha = \frac{P}{t} = \frac{mLT^{-1}}{T} = mLT^{-2}$

$\beta = 1 =$ dimensionless

dimension.

$\theta \rightarrow M^0L^0T^0 = 1$

$\sin\theta = 1$

$e^x = 1$

$x = 1$

$\log e^x = 1$

Question

If $Y = A \sin\left[\frac{2\pi}{\lambda}(ct - x)\right]$. Find dimension of c.

$$Y = A \sin\left[\frac{2\pi}{\lambda}(ct - x)\right]$$

$ct = x$

$$c = \frac{x}{t} = \frac{L}{T} = LT^{-1}$$

Ans

If force $F = \alpha e^{\beta(x-\gamma t)}$

find dimen of γ ??

Soln

$x = \gamma t$

$\gamma = \frac{x}{t} = LT^{-1}$

Ans

(a) If $\left(P+\frac{a}{V}\right)\cdot\left(\gamma-\frac{b}{p}\right)=\frac{\alpha t}{\theta}$

P = Pressure V = Volume, then find dim^n of a = ??

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

$a = PV = mL^2T^{-2}$

Question

Equation of force $F = \frac{a - x}{bt^2}$ then find dimension of a and b.

$a = x = L^1$

Sol^n

$$F = \frac{a-x}{bt^2}$$

$4m - 2m = 2m$ ✓ ✓ ✓

$$F = \frac{a=x}{bt^2}$$

$$F = \frac{x}{bt^2}$$

$$b = \frac{x}{FT^2} = \frac{L}{MLT^{-2}T^2} = M^{-1}$$ ✓

Dimension of diffrential Term

$$\Delta Y = Y_f - Y_i$$

↳ dimension of change in Y is same as Y

$$dY \overset{\text{dimension}}{=} \text{Same as } Y$$

$$\Rightarrow \frac{dY}{dx} = \frac{Y}{x} \text{ (dimensionally)}$$

$$\Rightarrow \frac{d^2Y}{dx^2} = \frac{Y}{x^2}$$

$$\Rightarrow \frac{d^3Y}{dx^3} = \frac{Y}{x^3}$$

Q) If Y is force and x is time then find dimension of $\frac{dY}{dx}$ and $\frac{d^2Y}{dx^2}$

Soln $\quad \frac{dY}{dx} = \frac{Y}{x} = \frac{\text{Force}}{\text{time}} = \frac{MLT^{-2}}{T} = MLT^{-3}$

$$\frac{d^2Y}{dx^2} = \frac{Y}{x^2} = \frac{\text{force}}{t^2} = MLT^{-4}$$

Dimension of integral term.

$$\int y\,dx = yx$$

$$\int \sin\theta\,d\theta = M^0L^0T^0$$

If y = velocity and x is time then find dimension of $\int y\,dx$ = ??

Soln $\int y\,dx = y\,x$

$= V \times t$

$= LT^{-1} \times T^{1}$

$= L^{1}$

Ans

Question

$\int \frac{dx}{\sqrt{2ax-x^2}} = b$; find dimension of a and b if x is distance.

$$\int \frac{dx}{\sqrt{2ax-x^2}} = b$$

dimn.

$$\int \frac{dx}{\sqrt{2ax-x^2}} = b$$

$$\frac{x}{\sqrt{x^2}} = b$$

$$\frac{x}{x} = b$$

$b = 1 =$ dimnless

MR*

Pure no

$2ax = x^2$

$ax = x^2$

$a = x^2 - x$

$a = x = L^1$

Question

Assertion: If x and y are the distances along x and y axes respectively then the dimensions of $\frac{d^3y}{dx^3}$ is $M^0 L^{-2} T^0$.

$\frac{d^3y}{dx^3} = \frac{y}{x^3} = \frac{L}{L^3} = \frac{1}{L^2} = L^{-2}$ Ans

Reason: Dimensions of $\int_a^b y\,dx$ is $M^0L^2T^0$.

$= yx = L^2$

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4. If both Assertion & Reason are false.

Question

Force acting on object is proportional to square of velocity then find dimension of proportional constant.

$$F \propto V^2$$

$$F = kV^2$$

$$k = \frac{F}{V^2} = \frac{MLT^{-2}}{L^2T^{-2}} = ML^{-1}$$

Proportional constant

(8) Force acting on object is given as $F = 5V$ then find dimension of '5'

(a) $5 = M^0L^0T^0$ (dimⁿ less)

(b) MT^{-1}

(c) None of these

Soln

$F = 5V$

$5 = \frac{F}{V} = \frac{MLT^{-2}}{LT^{-1}}$

$= MT^{-1}$ Ans

$S = ut + \left(\frac{1}{2}\right)at^2$

dimⁿ less

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

dimⁿ less

Soln

Application of dimensional analysis :—

① If Time Period of simple Pendulum depends on length of Pendulum l and acc^n due to gravity g then derive relation of Time in terms of l & g.

② If we consider length (l) and acc^n (g) is taken as fundamental P.Q. then find dimension Time interms of l & g.

③ If in new system of unit Unit of length is 1m & unit of acc^n is 5 m/s^2 then find unit of time.

→ all three are different question but all have same solution.

Application of dimensional analysis :—

① If Time Period of simple pendulum depends on length of Pendulum l and acc^n due to gravity g then derive relation of Time in terms of l & g.

Soln

$T \propto l^x$

$T \propto g^y$

$T = k\, l^x g^y$

↳ dim^{n}less

$T = l^x g^y$

$M^0 L^0 T^1 = L^x (LT^{-2})^y$

$M^0 L^0 T^1 = L^x L^y T^{-2y}$

$M^0 L^0 T^1 = L^{x+y} T^{-2y}$

dim^n Same

compair Power of L

$0 = x + y$

$x = -y$

Putn x & y → $T = l^{1/2} g^{-1/2} = \sqrt{\frac{l}{g}}$

Time ka Power Co.

$1 = -2y$

$y = -\frac{1}{2}$

$x = -y$

$x = \frac{1}{2}$

Question

If maximum acceleration of oscillating particle is α and maximum velocity is β, then find time period [NEET 2013]

1. $2\pi\frac{\alpha}{\beta}$
2. $2\pi\alpha\beta$
3. $2\pi\frac{\beta}{\alpha}$
4. $\frac{2\pi\alpha^2}{\beta^2}$

a/w (mugt)

Question

If force (F), acceleration (a) and time t is used as a fundamental P.Q. then find dimension of length in terms of them:

1. $F^0 a^1 T^2$
2. $F a^2 T^2$
3. $F a^2 T^0$
4. $F^0 a T$

H/W (Try Karo no jay to thik Nahi to Kal iska batti bna denge)

Question

If force, acceleration and time are basic fundamental P.Q. then find dimension of energy.

1. $F^2 A^{-1} T$
2. $F A T^2$
3. $F A T^{-2}$
4. $F A^{-1} T$

H/W

Kal Iska batti bna denge.

Question

If energy E, velocity V and time T are taken as fundamental units, the dimensional formula for surface tension is

1. $[E\ V^{-2}\ T^{-2}]$
2. $[E^{-2}\ V\ T^{-2}]$
3. $[E^{-2}\ V\ T^{-2}]$
4. $[E^{-2}\ V^{-2}\ T^{2}]$

n/a

THANK YOU