YAKEEN NEET 2.0

2026

Units and Measurements

Physics

Lecture - 08

By- Manish Raj (MR Sir)

Topics to be covered

1. # K.B.D → Koi Baneya Dr. Dash → 10 Question → Notes में नहीं लिखना।
2.
3. * Error Analysis
4.

Question

If speed V, area A and force F are chosen as fundamental units, then the dimension of Young's modulus will be: **[JEE Main 2020]**

1. $FA^{-1}V^{0}$
2. $FA^{2}V^{-1}$
3. $FA^{2}V^{-2}$
4. $FA^{2}V^{-3}$

Young's modulus → Pressure $\left(\frac{F}{A}\right) = V^{x} A^{y} F^{z}$

$ML^{-1}T^{-2} = (LT^{-1})^{x} (L^{2})^{y} (MLT^{-2})^{z}$

मजदूरी

MR* $P = F/A = F^{1}A^{-2}V^{0}$

Question

If momentum (P), area (A) and time (T) are taken to be the fundamental quantities then the dimensional formula for energy is **[JEE Main 2020]**

1. $[P^{1/2} AT^{-1}]$
2. $[P^2 AT^{-2}]$
3. $[PA^{1/2} T^{-1}]$
4. $[P^{-1} AT^{-2}]$

Ans

$E = F \times l$

$= \frac{P}{t} l = \frac{P\sqrt{A}}{t}$

$= P^1 A^{1/2} T^{-1}$

$A = l^2$

$l = \sqrt{A}$

$E = P^x A^y T^z$

$ML^2T^{-2} = (MLT^{-1})$

Question

If force (F), velocity (V) and time (T) are considered as fundamental physical quantity, then dimensional formula of density will be: **[JEE Main 2023]**

1. $FV^4 T^{-6}$
2. $FV^{-4} T^{-2}$
3. $F^2 V^{-2} V^6$
4. $FV^{-2} T^2$

$$d = F^x V^y T^z$$

$$\frac{M}{L^3} = (MLT^{-2})(LT^{-1})T$$

The MP*

$$d = F^1 V^{-2}$$

$$\frac{M}{L^3} = \frac{(MLT^{-1})}{L^2 T^{-2}}$$

7. If momentum [P], area [A] and time [T] are taken as fundamental quantities, then the dimensional formula for coefficient of viscosity is:

[JEE Main 2022]

(1) $[P\,A^{-1}\,T^{0}]$

(2) $[P\,A\,T^{-1}]$

(3) $[P\,A^{-1}\,T]$

(4) $[P\,A^{-1}\,T^{-1}]$

$F = \eta \gamma v$

$\eta = \frac{F}{L \times v} = \frac{mLT^{-2}}{L(LT^{-1})}$

$\eta = mL^{-1}T^{-1}$

$\eta = P^{x} A^{y} T^{z}$

$mL^{-1}T^{-1} = P^{1}/AT^{0}$

$= \frac{(mLT^{-1})}{L^{2}} = mL^{-1}T^{-1}$

Question

लिख लेना Note में (मजदूरी mein bhi)

Time, velocity and angular momentum then find dimension of mass.

[JEE Main 2021]

$$\begin{cases} \text{Time} = T^1 \\ V = LT^{-1} \\ L = ML^2T^{-1} \end{cases}$$

$$M^1L^0T^0 = \frac{L^1}{V^2T} \quad (MR^2)$$

$$= \frac{ML^2T^{-1}}{L^2T^{-2}} \cdot T$$

$$= \frac{(mT)}{T}$$

$$= [m]$$

$$T^0L^0M = T^xV^yL^z$$

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

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

$z = 1$

$y + 2z = 0$

$y = -2$

$x - y - z = 0$

$x + 2 - 1 = 0$

$x + 1 = 0$

$x = -1$

$$M = T^{-1}V^{-2}L^1$$

$$M = T^{-1}V^{-2}L^1$$

Ans: $[t^{-1}\ V^{-2}\ l^1]$

Question

Planck's constant (h), Current (I) speed of light (c) → universal gravitation const (G) correct dimension of stopping potential

[JEE Main 2020]

1. $hI^{-1}G^{-1}c^{5}$
2. $h^{-1}I^{1}G^{-1}c^{6}$
3. $h^{0}I^{-1}G^{-1}c^{5}$
4. $h^{0}I^{1}G^{-1}c^{6}$

$h \rightarrow M^1L^2T^{-1}$

$I = A^1$

$C = LT^{-1}$

$G = M^{-1}L^3T^{-2}$

$\frac{I^1C^5}{G} = (M^1)$

$I = \frac{q}{t}$

$q = It$

$V = \frac{E}{q} = \frac{ML^2T^{-2}}{I \times t}$

→ Stopping Potential

Question

Same NEET-2014

A balloon is made of a material of surface tension S and its inflation outlet (from where gas is filled in it) has small area A. It is filled with a gas of density ρ and takes a spherical shape of radius R. When the gas is allowed to flow freely out of it, its radius r changes from R to 0 (zero) in time T. If the speed of gas coming out of the balloon depends on r as r^a and $T \propto S^\alpha, A^\beta \rho^\gamma R^\delta$ then

NEET-2025 *

1. $a = \frac{1}{2}, \alpha = \frac{1}{2}, \beta = -1, \gamma = +1, \delta = \frac{3}{2}$
2. $a = -\frac{1}{2}, \alpha = -\frac{1}{2}, \beta = -1, \gamma = -\frac{1}{2}, \delta = \frac{5}{2}$
3. $a = -\frac{1}{2}, \alpha = -\frac{1}{2}, \beta = -1, \gamma = \frac{1}{2}, \delta = \frac{7}{2}$
4. $a = \frac{1}{2}, \alpha = \frac{1}{2}, \beta = -\frac{1}{2}, \gamma = \frac{1}{2}, \delta = \frac{7}{2}$

$M^0 L^0 T = S^\alpha A^\beta \rho^\gamma R^\delta$

$M^0 L^0 T = (M^1 T^{-2})^\alpha (L^2)^\beta \left(\frac{M^1}{L^3}\right)^\gamma (L)^\delta$

Question

Give the number of significant figures in each measurement.

1. 36.7 m → 3
2. 0.006606 s → 4
3. 2,002 kg → 4
4. 306,490,000 people → Infinite

Likho

❖ Addition or Subtraction with significant digit :—

→ **Final result is written in minimum decimal places.**

→ Isme significant digit count nahi karte, isme sirf minimum decimal place ke terms me Answer

$$\begin{array}{r} 1.71 \\ +\ 3.4 \\ \hline 5.11 \end{array} \longrightarrow \text{Final Answer} = 5.1$$

❖ Multiplication or Division

→ **Final result written in minimum significant figure.** → Jis 2 digit ko multiply kiya usme minimum significant digit dekho. Utne hi significant digit ke terms me Ans do.

$$\Rightarrow 3.2 \times 6 = 19.2$$

(a) 19.2
(b) 19 (wrong)
✓ (c) 20 Ans
(d) 15

Question

[NEET-2022]

The are of rectangle of length 55.3 m and breadth 25 m.

1. 1382
2. 1382.5
3. 14×10^2
4. 138×10^1

$l = 55.3 \longrightarrow$ sig^{n} $\rightarrow 3$

$b = 25 \longrightarrow$ sig $\rightarrow 2$

$3.2 \times 4 = 12.8$

$= 10$

Ans

Question

Taking into account of significant digit. What is the value of

9.99 m – 0.0099 m.

[NEET-2020]

Minimum decimal place.

1. 9.98 m — Ans
2. 9.890 m
3. 9.9 m
4. 9.9801 m

Question

Add these three length:

$l_1 = 0.307$ m, 0.52 m and 0.4 m

1. 1.22 m
2. 1.2 m
3. 1.3 m
4. 1.7 m

Ans

0.307
0.52
0.4
1.227

If last digit is greater than 5 then previous no increase by 1

1.23

1.2

If last digit is less than 5 then previous no remain same

ROUNDING OFF

लिख लेना

- If digit to be removed is less than 5 then there is no change in parimary number. (Previous)
- If digit to be removed is greater than 5 then there previous number increases by 1.
- If digit is 5, then previous number remains same if even and increase by 1 then if odd.

$\Rightarrow 4.675 \simeq 4.68$ ✓

$\Rightarrow 4.665 \simeq 4.66$ ✓

Question

Express the final answer to the proper number of significant figures.

(i) $101.2 + 18.702 = ?$

(ii) $202.88 - 1.013 = ?$

H/W

Question

Calculate the correct number of significant figures for the final solution:

(i) Round 4.7475 to 4 significant figures

(ii) Round 4.7465 to 4 significant figures

H/W

Question

If A = 2.413 and B = 1.2 then find A + B.

H/W

Question

If A = 25.5 and B = 5 then find $\frac{A}{B}$.

(a) 5.5

(b) 5.1 ✗

(c) 5 (761)

(d) 5.0

Likho

Accurancy = How close measured value To The True value is c/d accuracy.

→ High accuracy → minimum difference b/w True & measured value.

→ If True value is not given then more Precise will be considered as more accurate.

$l = 5\,cm$ (True)

$l_1 = 4.8\,cm$

$l_2 = 4.7\,cm$

$l_3 = 5.10\,cm$

$l_4 = 5.05\,cm$ ✓ Close.

Pression → Upto how many decimal placed Value is measured is called Precision.

((closness b/w True & measured nahi dekhna)

$l = 5\,cm$ True

$l_1 = 4.9\,cm$ → accurate already

$l_2 = 4.856\,cm$ → more Precise.

Question गिनती

If true value of length is 6.57 m then which of the following reading is most accurate and most precise.

1. 6.52 m
2. 6.61 m more accurate
3. 6.513 m more Precise
4. 6.68 m ✗

(3) 6.513 m

(2) more accurate.

6.57
6.52
0.05

6.61
6.57
0.04 ✓

Question

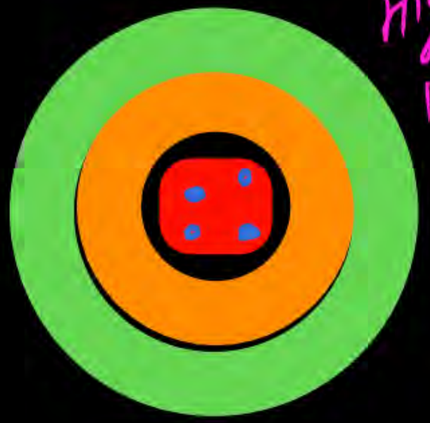
Which of the following reading is most accurate? [NEET 2024]

Closness b/w True & measured value.

1. 2.4 m
2. 2.41 m
3. 2 m
4. 2.413 m ✓

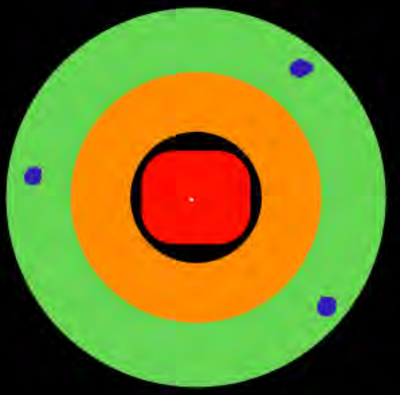
If True is not given then more precise is more accurate.

MR



High accuracy
High precision

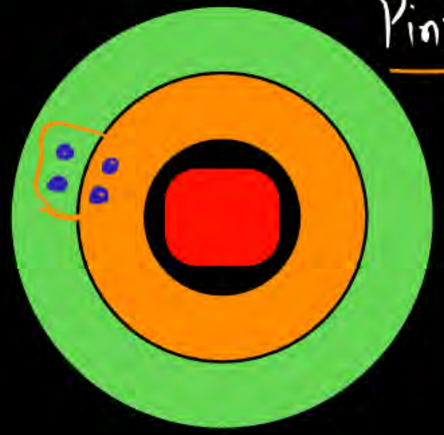
Ramlal



No accuracy
No Precise

	Clock-1	Clock-2
Monday 10:00 Am	10Am 15mint 10:15 Am	10:01 Am
Tuesday 10:00 A	10:16 Mi	10:10 Am
Wednesday 10:00 Am	10:14 Am	10:08 Am
Thursday 10:00 Am	10:13 Am	9:57 Am

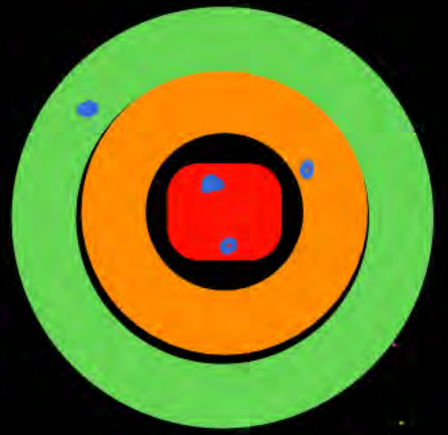
Piny



No accuracy
but high Precise.

More Precise
less accurate
(less deviation)

High accuracy
less Precise
(more deviation)



Accuracy high
but low precise

Error

1. Absolute error
2. Relative error
3. Percentage error

Absolute error = Magnitude of difference b/w True value & measured value is called absolute error.

x_T = True value

x_m = measure value

absolute error $\Delta x = |x_T - x_m|$

- Unit of absolute error same as unit of physical quantity.
- always Positive.
- It can't tells us about accuracy & pression.

$x_T = 5\,cm$
$x_m = 5\,cm$
absolute = zero

(a) Ramlal

$\Delta l = 1\,km$

$\frac{\Delta l}{l} = \frac{1\,km}{6400\,km} = \left(\frac{1}{6400}\right)$

$l_{radius\ of\ Earth} = 6400\,km$

$l_m = 6401\,km.$

(b) Pinky

$\Delta l = 1\,cm$ ✓

$l_{Rod} = 5\,cm$ ✓

$\left(\frac{\Delta l}{l}\right) = \frac{1\,cm}{5\,cm} = \frac{1}{5}$

Relative error = Ratio of absolute error to True value.
is called Relative error

Relative error $= \frac{\Delta x}{x_T}$

$= \frac{|x_T - x_m|}{x_{True}}$

→ unitless & dim^n less

% error $= \frac{\Delta x}{x_T} \times 100$

→ unit less & dim^n less

Question

If absolute error and actual value of a number are 5, 15 respectively then relative error is

True

$$\text{relative error} = \frac{\Delta x}{x_T}$$

$$= \frac{5}{15} = \frac{1}{3}$$

$$\% \text{ error} = \frac{1}{3} \times 100 = 33\%$$

(Q) If measured length of Rod is given as $l_1 = 4.1\ cm$, $l_2 = 4.2\ cm$, $l_3 = 3.9\ cm$, $l_4 = 3.8\ cm$ find percentage error in measurment.

MRX If True value is Not given then mean value of measured is called True.

Sol^n $l_{True} = \dfrac{l_1 + l_2 + l_3 + l_4}{4}$

$= \dfrac{4.1 + 4.2 + 3.9 + 3.8\ cm}{4}$

$l_{True} = \dfrac{16}{4} = 4\ cm$ ✓

$\Delta l_1 = |l_T - l_{m_1}| = |4\ cm - 4.1\ cm| = 0.1\ cm$

$\Delta l_2 = |l_T - l_{m_2}| = |4 - 4.2| = 0.2\ cm$

$\Delta l_3 = 0.1\ cm$ $\quad \Delta l_4 = 0.2\ cm$

$|\Delta l|_{mean} = \left(\dfrac{0.1 + 0.2 + 0.2 + 0.1}{4}\right) = \dfrac{0.6}{4}$

$= 0.15$

% error $= \dfrac{\Delta l_{mean}}{l_m} \times 100$

$= \dfrac{0.15}{4} \times 100$

$= 3.75\%$

Propagation of error in Mathematical expression.

error → difference → differentiation
B/w True & mean

Valid for around 10-12 %

$$Z = A + B$$

differentiation wrt x

$$\frac{dZ}{dx} = \frac{dA}{dx} + \frac{dB}{dx}$$

$$\Delta Z = \Delta A + \Delta B$$

ΔZ: Absolute error in 'Z' & (A+B)

ΔA: Absolute error in A

ΔB: Absolute error in B

ΔZ divided by Z

$$\frac{\Delta Z}{Z} = \frac{\Delta A + \Delta B}{A + B}$$

Relative error in Z $= \left(\frac{\Delta A + \Delta B}{A + B}\right)$

$$Y = A - B$$

$$\Delta Y = \Delta A + \Delta B$$

ΔY: absolute error

$$\left[\frac{\Delta Y}{Y}\right] = \frac{\Delta A + \Delta B}{A - B}$$

Question

If $l_1 = (10 \pm 2)$ cm and $l_2 = (20 \pm 1)$ cm. Find $l = l_1 + l_2$ with error.

H/W

Question

In a series of successive measurements in an experiment, the readings of the period of oscillation of a simple pendulum were round to be 2.63s, 2.56s, 2.42s, 2.71s and 2.80s. Calculate

(i) The mean value of the period of oscillation

(ii) The absolute error in each measurement

(iii) The mean absolute error

(iv) The relative error

(v) The percentage error.

H/W

SANGHARSH ASSIGNMENT

Units and Dimensions

Assignment-01
By: M.R. Sir

1. Amount of solar energy received on the earth's surface per unit area per unit time is defined a solar constant. Dimension of solar constant is **[JEE Main 2020]**

(1) ML^2T^{-2} (2) MLT^{-2}

(3) $M^2L^0T^{-1}$ (4) ML^0T^{-3}

2. Dimensional formula for thermal conductivity is (here K denotes the temperature) **[JEE Main 2020]**

(1) $MLT^{-2}K^{-2}$

(2) $MLT^{-3}K^{-1}$

(3) $MLT^{-3}K$

(4) $MLT^{-2}K$

3. A quantity x is given by (IFv^2/WL^4) in terms of moment of inertia I, force F, velocity v, work W and length L. The dimensional formula for x is same as that of **[JEE Main 2020]**

(1) Coefficient of viscosity

(2) Force constant

(3) Energy density

(4) Planck's constant

4. The quantities $x = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$, $y = \frac{E}{B}$ and $z = \frac{1}{CR}$ are defined where C – capacitance, R – resistance, l – length, E – electric field, B – magnetic field and ε_0, μ_0, – free space permittivity and permeability respectively. Then **[JEE Main 2020]**

(1) Only x and y have the same dimension

(2) Only x and z have the same dimension

(3) x, y and z have the same dimension

(4) Only y and z have the same dimension

5. A quantity f is given by $f = \sqrt{\frac{hc^5}{G}}$ where c is speed of light G universal gravitational constant and h is the Planck's constant. Dimension of f is that of: **[JEE Main 2020]**

(1) Momentum (2) Energy

(3) Force (4) Pressure

6. The work done by a gas molecule in an isolated system is given by, $W = \alpha^2\beta e^{\frac{-\beta x^2}{kT}}$, where x is the displacement, k is the Boltzmann constant and T is the temperature, α and β are constants. Then the dimensions of β will be: **[JEE Main 2021]**

(1) $[M^0LT^0]$ (2) $[M^2LT^2]$

(3) $[MLT^{-2}]$ (4) $[ML^2T^{-2}]$

7. Match List-I with List-II:

List-I		List-II	
(A)	h (Planck's constant)	I	$[M\,L\,T^{-1}]$
(B)	E (Kinetic energy)	II	$[M\,L^2\,T^{-1}]$
(C)	V (electric potential)	III	$[M\,L^2\,T^{-2}]$
(D)	P (linear momentum)	IV	$[ML^2I^{-1}T^{-1}]$

Choose the correct answer from the options given below: **[JEE Main 2021]**

(1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(2) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

(3) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

(4) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

8. If e is the electronic charged, c is the speed of light in free space and h is Planck's constant, the quantity $\frac{1}{4\pi\varepsilon_0}\frac{|e|^2}{hc}$ has dimensions of: **[JEE Main 2021]**

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

(3) $[MLT^0]$ (4) $[MLT^{-1}]$

9. If a typical combustion engine the work done by a gas molecule is given by $W = \alpha^2\beta e^{\frac{-\beta x^2}{kT}}$, where x is the displacement, k is the Boltzmann constant and T is the temperature. If α and β are constants, dimensions of α will be: **[JEE Main 2021]**

(1) $[M^0 LT^0]$ (2) $[M^2 LT^{-2}]$

(3) $[MLT^{-2}]$ (4) $[MLT^{-1}]$

10. The dimension of mutual inductance is: **[JEE Main 2022]**

(1) $[ML^2 T^{-2} A^{-1}]$ (2) $[ML^2 T^{-3} A^{-2}]$

(3) $[ML^2 T^{-2} A^{-2}]$ (4) $[ML^2 T^{-3} A^{-2}]$

11. The SI unit of a physical quantity is pascal-second. The dimensional formula of this quantity will be **[JEE Main 2022]**

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

(3) $[ML^2 T^{-1}]$ (4) $[M^{-1} L^3 T^0]$

12. If L, C and R are the self inductance, capacitance and resistance respectively, which of the following does not have the dimension of time? **[JEE Main 2022]**

(1) RC (2) $\frac{L}{R}$

(3) $\sqrt{LC}$ (4) $\frac{L}{C}$

13. In Vander Waals equation $\left[P + \frac{a}{V^2}\right](V - b) = RT$; P is pressure, V is volume, R is universal gas constant and T is temperature. The ratio of constants $\frac{a}{b}$ is dimensionally equal to: **[JEE Main 2022]**

(1) $\frac{P}{V}$ (2) $\frac{V}{P}$

(3) PV (4) PV^3

14. Dimension of $\frac{1}{\mu_0 \varepsilon_0}$ should be equal to **[JEE Main 2023]**

(1) LT^{-1} (2) $T^2 L^{-2}$

(3) $L^2 T^{-2}$ (4) TL^{-1}

15. Match List I with List II **[JEE Main 2023]**

List-I		List-II	
(A)	Torque	I	$ML^{-2} T^{-2}$
(B)	Stress	II	$ML^2 T^{-2}$
(C)	Pressure gradient	III	$ML^{-1} T^{-1}$
(D)	Coefficient of viscosity	IV	$ML^{-1} T^{-2}$

Choose the correct answer from the options given below:

(1) A-I, B-III, C-II, D-IV

(2) A-IV, B-I, C-III, D-II

(3) A-II, B-I, C-IV, D-III

(4) A-II, B-III, C-I, D-IV

16. Match List I with List II **[JEE Main 2023]**

List-I		List-II	
(A)	Spring constant	I	$[T^{-1}]$
(B)	Angular speed	II	$[MT^{-2}]$
(C)	Angular momentum	III	$[ML^2]$
(D)	Moment of inertia	IV	$[ML^2T^{-1}]$

Choose the correct answer from the options given below:

(1) A-I, B-III, C-II, D-IV

(2) A-IV, B-I, C-III, D-II

(3) A-II, B-I, C-IV, D-III

(4) A-II, B-III, C-I, D-IV

17. In the equation $\left[X + \frac{a}{Y^2}\right](Y - b) = RT$, X is pressure, Y is volume, R is universal gas constant and T is temperature. The physical quantity equivalent to the ratio $\frac{a}{b}$ is: **[JEE Main 2023]**

(1) Pressure gradient

(2) Energy

(3) Impulse

(4) Coefficient of viscosity

18. Match List I with List II **[JEE Main 2023]**

List-I		List-II	
(A)	Young's Modulus (Y)	I	$[M L^{-1} T^{-1}]$
(B)	Co-efficient of Viscosity (η)	II	$[M L T^{-1}]$
(C)	Planck's constant (h)	III	$[M L^{-1} T^{-2}]$
(D)	Work function (ϕ)	IV	$[M L^2 T^{-2}]$

Choose the correct answer from the options given below:

(1) A-II, B-III, C-V, D-I
(2) A-III, B-I, C-II, D-IV
(3) A-I, B-III, C-IV, D-II
(4) A-I, B-II, C-III, D-IV

19. The equation of stationary wave is:

$$y = 2a\sin\left(\frac{2\pi nt}{\lambda}\right)\cos\left(\frac{2\pi x}{\lambda}\right)$$

Which of the following is not correct: **[JEE Main 2024]**

(1) The dimensions of n/λ is [T]
(2) The dimensions of n is $[LT^{-1}]$
(3) The dimensions of x is [L]
(4) The dimensions of nt is [L]

20. What is the dimensional formula of ab^{-1} in the equation $\left(P + \frac{a}{V^2}\right)(V - b) = RT$, where letters have their usual meaning. **[JEE Main 2024]**

(1) $[M^{-1} L^5 T^3]$ (2) $[M^0 L^3 T^4]$
(3) $[ML^2 T^{-2}]$ (4) $[M^0 L^3 T^{-2}]$

21. If ε_0 is the permittivity of free space and E is the electric field, then $\varepsilon_0 E^2$ has the dimensions: **[JEE Main 2024]**

(1) $[M^{-1} L^{-3} T^4 A^2]$
(2) $[ML^2 T^{-2}]$
(3) $[M^0 L^{-2} TA]$
(4) $[ML^{-1} T^{-2}]$

22. The dimensional formula of latent heat is: **[JEE Main 2024]**

(1) $[ML^2 T^{-2}]$ (2) $[M^0 L^2 T^{-2}]$
(3) $[MLT^{-2}]$ (4) $[ML^2 T^{-2}]$

23. The equation of state of a real gas is given by $\left(P + \frac{a}{V^2}\right)(V - b) = RT$, where P, V and T are pressure. Volume and temperature respectively and R is the universal gas constant. The dimensions of $\frac{a}{b^2}$ is similar to that of: **[JEE Main 2024]**

(1) PV (2) P
(3) RT (4) R

24. A force is represented by $F = \alpha x^2 + \beta t^{1/2}$. Where x = distance and t = time. The dimensions of b^2/a are: **[JEE Main 2024]**

(1) $[ML^3T^{-3}]$ (2) $[MLT^{-2}]$
(3) $[ML^{-1}T^{-3}]$ (4) $[ML^2T^{-3}]$

25. The position of a particle moving on x-axis is given by $x(t) = A\sin t + B\cos^2 t + Ct^2 + D$, where t is time. The dimension of $\frac{ABC}{D}$ is **[JEE Main 2025]**

(1) $L^2 T^{-2}$ (2) L^2
(3) L (4) $L^3 T^{-2}$

26. The electric flux is $\phi = \alpha\sigma + \beta\lambda$ where λ and σ are linear and surface charge density, respectively. $\left(\frac{\alpha}{\beta}\right)$ represents **[JEE Main 2025]**

(1) electric field
(2) area
(3) charge
(4) displacement

27. The expression given below shows the variation of velocity (v) with time (t), $v = At^2 + \frac{Bt}{C + t}$. The dimension of ABC is: **[JEE Main 2025]**

(1) $[M^0 L^2 T^{-2}]$
(2) $[M^0 L^1 T^{-3}]$
(3) $[M^0 L^1 T^{-2}]$
(4) $[M^0 L^2 T^{-3}]$

28. Match List-I with List-II **[JEE Main 2025]**

List-I		List-II	
(A)	Boltzmann constant	I	ML^2T^{-1}
(B)	Coefficient of viscosity	II	$MLT^{-3}K^{-1}$
(C)	Planck's constant	III	$ML^2T^{-2}K^{-1}$
(D)	Thermal conductivity	IV	$ML^{-1}T^{-1}$

Choose the correct answer from the options given below:

(1) A-III, B-IV, C-I, D-II

(2) A-II, B-III, C-IV, D-I

(3) A-III, B-II, C-I, D-IV

(4) A-III, B-IV, C-II, D-I

29. The dimension of $\sqrt{\frac{\mu_0}{\epsilon_0}}$ is equal to that of:

(μ_0 = Vacuum permeability and ϵ_0 = Vacuum permittivity) **[JEE Main 2025]**

(1) Voltage (2) Capacitance

(3) Inductance (4) Resistance

30. Match List-I with List-II **[JEE Main 2025]**

List-I		List-II	
(A)	Mass density	I	$[ML^2T^{-3}]$
(B)	Impulse	II	$[MLT^{-1}]$
(C)	Power	III	$[ML^2T^0]$
(D)	Moment of inertia	IV	$[ML^{-3}T^0]$

Choose the correct answer from the options given below:

(1) A-IV, B-II, C-III, D-I

(2) A-I, B-III, C-IV, D-II

(3) A-IV, B-II, C-I, D-III

(4) A-II, B-III, C-IV, D-I

ANSWER KEY

1.	(4)	11.	(1)	21.	(4)
2.	(2)	12.	(4)	22.	(2)
3.	(3)	13.	(3)	23.	(2)
4.	(3)	14.	(3)	24.	(1)
5.	(2)	15.	(3)	25.	(1)
6.	(3)	16.	(3)	26.	(4)
7.	(1)	17.	(2)	27.	(4)
8.	(2)	18.	(2)	28.	(1)
9.	(1)	19.	(1)	29.	(4)
10.	(3)	20.	(3)	30.	(3)

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SANGHARSH ASSIGNMENT

Units and Dimensions

Assignment-02
By: M.R. Sir

1. If speed V, area A and force F are chosen as fundamental units, then the dimension of Young's modulus will be: **[JEE Main 2020]**

(1) $FA^{-1}V^{0}$ (2) $FA^{2}V^{-1}$

(3) $FA^{2}V^{-2}$ (4) $FA^{2}V^{-3}$

2. If momentum (P), area (A) and time (T) are taken to be the fundamental quantities then the dimensional formula for energy is **[JEE Main 2020]**

(1) $[P^{1/2}\,AT^{-1}]$

(2) $[P^{2}\,AT^{-2}]$

(3) $[PA^{1/2}\,T^{-1}]$

(4) $[P^{-1}\,AT^{-2}]$

3. The dimensions of $\frac{B^2}{2\mu_0}$, where B is magnetic field and μ_0 is the magnetic permeability of vacuum, is **[JEE Main 2020]**

(1) $ML^{-1}L^{-2}$ (2) $ML^{2}L^{-2}$

(3) $ML^{-1}L^{2}$ (4) $ML^{-2}L^{-1}$

4. Stopping potential depends on Planck's constant (h), current (I), Universal gravitational constant (G) and speed of light (C). Choose the correct option for the dimension of stopping potential (V) **[JEE Main 2020]**

(1) $hI^{-1}G^{-1}C^{5}$ (2) $h^{-1}I^{1}G^{-1}C^{6}$

(3) $h^{0}I^{-1}G^{-1}C^{6}$ (4) $h^{0}I^{-1}G^{-1}C^{5}$

5. If 'C' and 'V' represent capacity and voltage respectively then what are the dimensions of λ where $C/V = \lambda$? **[JEE Main 2021]**

(1) $[M^{-2}L^{-4}I^{3}T^{7}]$

(2) $[M^{-2}L^{-3}I^{2}T^{6}]$

(3) $[M^{-1}L^{-3}I^{-2}T^{7}]$

(4) $[M^{-3}L^{-4}I^{3}T^{7}]$

6. Identify the pair of physical quantities which have different dimensions: **[JEE Main 2022]**

(1) Wave number and Rydberg's constant

(2) Stress and Coefficient of elasticity

(3) Coercivity and Magnetization

(4) Specific heat capacity and Latent heat

7. If momentum [P], area [A] and time [T] are taken as fundamental quantities, then the dimensional formula for coefficient of viscosity is: **[JEE Main 2022]**

(1) $[P\,A^{-1}\,T^{0}]$

(2) $[P\,A\,T^{-1}]$

(3) $[P\,A^{-1}\,T]$

(4) $[P\,A^{-1}\,T^{-1}]$

8. Given below are two statements:

Statements-I: Astronomical unit (Au), Parsec (Pc) and Light year (ly) are units for measuring astronomical distances.

Statements-II: Au < Parsec (pc) < ly

In the light of the above statements, choose the most appropriate answer from the options given below: **[JEE Main 2023]**

(1) Both Statement I and Statement II are incorrect

(2) Statement I is correct but Statement II is incorrect

(3) Both Statement I and Statement II are correct

(4) Statement I is incorrect but Statement II is correct

9. If force (F), velocity (V) and time (T) are considered as fundamental physical quantity, then dimensional formula of density will be: **[JEE Main 2023]**

(1) $FV^{4}T^{-6}$ (2) $FV^{-4}T^{-2}$

(3) $F^{2}V^{-2}T^{8}$ (4) $FV^{-2}T^{2}$

10. The speed of a wave produced in water is given by $v = \lambda^a g^b \rho^c$. Where λ, g and ρ are wavelength of wave, acceleration due to gravity and density of water respectively. The values of a, b and c respectively, are **[JEE Main 2023]**

(1) $1, -1, 0$ (2) $\frac{1}{2}, 0, \frac{1}{2}$

(3) $1, 1, 0$ (4) $\frac{1}{2}, \frac{1}{2}, 0$

11. The frequency (ν) of an oscillating liquid drop may depend upon radius (r) of the drop, density (ρ) of liquid and the surface tension (s) of the liquid as: $\nu = r^a \rho^b s^c$. The values of a, b and c respectively are **[JEE Main 2023]**

(1) $\left(-\frac{3}{2}, -\frac{1}{2}, \frac{1}{2}\right)$ (2) $\left(\frac{3}{2}, -\frac{1}{2}, \frac{1}{2}\right)$

(3) $\left(\frac{3}{2}, \frac{1}{2}, -\frac{1}{2}\right)$ (4) $\left(-\frac{3}{2}, \frac{1}{2}, \frac{1}{2}\right)$

12. The equation of a circle is given by $x^2 + y^2 = a^2$, where a is the radius. If the equation is modified to change the origin other than (0, 0), then find out the correct dimensions of A and B in a new equation: $(x - At)^2 + \left(y - \frac{t}{B}\right)^2 = a^2$. The dimensions of t is given as $[T^{-1}]$. **[JEE Main 2023]**

(1) $A = [L^{-1} T]$, $B = [LT^{-1}]$

(2) $A = [LT]$, $B = [L^{-1}T^{-1}]$

(3) $A = [L^{-1} T^{-1}]$, $B = [LT^{-1}]$

(4) $A = [L^{-1} T^{-1}]$, $B = [LT]$

13. If the velocity of light c, universal gravitational constant G and Planck's constant h are chosen as fundamental quantities. The dimensions of mass in the new system is: **[JEE Main 2023]**

(1) $\left[h^{\frac{1}{2}} c^{-\frac{1}{2}} G^{1}\right]$ (2) $\left[h^{1} c^{1} G^{-1}\right]$

(3) $\left[h^{-\frac{1}{2}} c^{\frac{1}{2}} G^{\frac{1}{2}}\right]$ (4) $\left[h^{\frac{1}{2}} c^{\frac{1}{2}} G^{-\frac{1}{2}}\right]$

14. Applying the principle of homogeneity of dimensions, determine which one is correct, where T is time period G is gravitational constant, M is mass, r is radius of orbit. **[JEE Main 2024]**

(1) $T^2 = \frac{4\pi^2 r^2}{GM}$ (2) $T^2 = \frac{4\pi^2 r}{GM^2}$

(3) $T^2 = \frac{4\pi^2 r^3}{GM}$ (4) $T^2 = 4\pi^2 r^3$

15. If G be the gravitational constant and u be the energy density then which of the following quantity have the dimensions as that of the $\sqrt{uG}$: **[JEE Main 2024]**

(1) Pressure gradient per unit mass

(2) Gravitational potential

(3) Energy per unit mass

(4) Force per unit mass

16. **Statement (I):** Dimension of specific heat is $[L^2T^{-2}K^{-1}]$

Statement (II): Dimension of gas constant is $[ML^2T^{-1}K^{-1}]$ **[JEE Main 2024]**

(1) Both Statement (I) and Statement (II) are correct

(2) Statement (I) is correct but Statement (II) is incorrect

(3) Both Statement (I) and Statement (II) are incorrect Statement (I) is incorrect but statement (II) is correct

(4) Statement (I) is incorrect but Statement (II) is correct

17. The de-Broglie wavelength associated with a particle of mass m and energy E is $h/\sqrt{2mE}$. The dimensional formula for Planck's constant is: **[JEE Main 2024]**

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

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

(3) $[MLT^{-2}]$

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

18. Statement-I: Planck's constant and angular momentum have same dimensions.

Statement-II: Linear momentum and moment of force have same dimensions.

Choose the correct answer from the options given below: **[JEE Main 2024]**

(1) Statement I is true but Statement II is false

(2) Both Statement I and Statement II are false

(3) Both Statement I and Statement II are true

(4) Statement I is false but Statement II is true

19. If mass is written as $m = k\,c^P\,G^{-1/2}\,h^{1/2}$ then the value of P will be: (Constants have their usual meaning with k a dimensionless constant) **[JEE Main 2024]**

(1) 1/2 (2) 1/3

(3) 2 (4) −1/3

20. Consider two physical quantities A and B related to each other as $E = \frac{B - x^2}{At}$ where E, x and t have dimensions of energy, length and time respectively. The dimension of AB is **[JEE Main 2024]**

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

(3) $L^{-2}M^{-1}T^1$ (4) $L^0M^{-1}T^1$

21. In a measurement, it is asked to find modulus of elasticity per unit torque applied on the system. The measured quantity has dimension of $[M^aL^bT^c]$. If $b = 3$, the value of c is _____. **[JEE Main 2025]**

22. Match List-I with List-II **[JEE Main 2025]**

List-I		List-II	
(A)	Gravitational constant	I	$[LT^{-2}]$
(B)	Gravitational potential energy	II	$[L^2T^{-2}]$
(C)	Gravitational potential	III	$[ML^2T^{-2}]$
(D)	Acceleration due to gravity	IV	$[M^{-1}L^3T^{-2}]$

Choose the correct answer from the options given below:

(1) A-IV, B-III, C-II, D-I

(2) A-III, B-II, C-I, D-IV

(3) A-II, B-IV, C-III, D-I

(4) A-I, B-III, C-IV, D-II

23. In an electromagnetic system, a quantity defined as the ratio of electric dipole moment and magnetic dipole moment has dimension of $[M^PL^QT^RA^S]$. The value of P and Q are: **[JEE Main 2025]**

(1) −1, 0 (2) −1, 1

(3) 1, −1 (4) 0, −1

ANSWER KEY

1.	(1)	9.	(2)	17.	(1)
2.	(3)	10.	(4)	18.	(1)
3.	(1)	11.	(1)	19.	(1)
4.	(4)	12.	(2)	20.	(2)
5.	(1)	13.	(4)	21.	(4)
6.	(4)	14.	(3)	22.	(1)
7.	(1)	15.	(4)	23.	(4)
8.	(2)	16.	(2)		

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THANK YOU