

PHYSICS · JEE MAIN

Units, Dimensions & Errors

Chapter-wise previous year questions, with answer key

22

PYQS

2020–2025

PAPERS

2

TOPICS

Dimensional Analysis

Error Analysis

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

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Dimensional Analysis · 15 PYQs

Q1 JEE Main 2025 · 2 Apr · Shift 2

Match List - I with List - II.

List - I	List - II
(A) Heat capacity of body	(I) Jkg^{-1}
(B) Specific heat capacity of body	(II) JK^{-1}
(C) Latent heat	(III) $\text{Jkg}^{-1}\text{K}^{-1}$
(D) Thermal conductivity	(IV) $\text{Jm}^{-1}\text{K}^{-1}\text{s}^{-1}$

Choose the correct answer from the options given below :

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

[Step-by-step solution ► prepwiser.in/questions/LXYMQm1II1](#)

Q2 JEE Main 2025 · 2 Apr · Shift 1

The equation for real gas is given by $(P + \frac{a}{V^2})(V - b) = RT$, where P , V , T and R are the pressure, volume, temperature and gas constant, respectively. The dimension of ab^{-2} is equivalent to that of :

- (A) Compressibility (B) Planck's constant
(C) Energy density (D) Strain

[Step-by-step solution ► prepwiser.in/questions/ACiNPnSqg5](#)

Q3 JEE Main 2025 · 28 Jan · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/4z3Qsj2piS](#)

Q4 JEE Main 2025 · 22 Jan · Shift 2

Which one of the following is the correct dimensional formula for the capacitance in F? M , L , T and C stand for unit of mass, length, time and charge,

- (A) $[F] = [CM^{-1}L^{-2}T^2]$
(B) $[F] = [C^2M^{-2}L^2T^2]$
(C) $[F] = [C^2M^{-1}L^{-2}T^2]$
(D) $[F] = [CM^{-2}L^{-2}T^{-2}]$

[Step-by-step solution ► prepwiser.in/questions/4yqR7sbRmU](#)

Q5 JEE Main 2024 · 6 Apr · Shift 2

Given below are two statements:

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

Statement (II) : Dimensions of gas constant is $[ML^2T^{-1}K^{-1}]$.

In the light of the above statements, choose the most appropriate answer from the options given below.

- (A) Statement (I) is incorrect but statement (II) is correct
- (B) Both statement (I) and statement (II) are incorrect
- (C) Both statement (I) and statement (II) are correct
- (D) Statement (I) is correct but statement (II) is incorrect

[Step-by-step solution ► prepwisser.in/questions/_IRzNWJDnJ](https://www.prepwisser.in/questions/_IRzNWJDnJ)

Q6 JEE Main 2024 · 5 Apr · Shift 1

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 $\sqrt{uG}$:

- (A) Gravitational potential
- (B) pressure gradient per unit mass
- (C) Energy per unit mass
- (D) Force per unit mass

[Step-by-step solution ► prepwisser.in/questions/jjz9pnGVq8](https://www.prepwisser.in/questions/jjz9pnGVq8)

Q7 JEE Main 2024 · 27 Jan · Shift 2

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 :

- (A) P
- (B) RT
- (C) PV
- (D) R

[Step-by-step solution ► prepwisser.in/questions/eyzel7HJhD](https://www.prepwisser.in/questions/eyzel7HJhD)

Q8 JEE Main 2023 · 1 Feb · Shift 1

$\left(P + \frac{a}{V^2}\right)(V - b) = RT$ represents the equation of state of some gases. Where P is the pressure, V is the volume, T is the temperature and a, b, R are the constants. The physical quantity, which has dimensional formula as that of $\frac{b^2}{a}$, will be:

- (A) Energy density
- (B) Bulk modulus
- (C) Modulus of rigidity
- (D) Compressibility

[Step-by-step solution ► prepwisser.in/questions/vTvo6Xgcyl](https://www.prepwisser.in/questions/vTvo6Xgcyl)

Q9 JEE Main 2023 · 24 Jan · Shift 2

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

- (A) $(\frac{3}{2}, \frac{1}{2}, -\frac{1}{2})$
- (B) $(-\frac{3}{2}, -\frac{1}{2}, \frac{1}{2})$
- (C) $(\frac{3}{2}, -\frac{1}{2}, \frac{1}{2})$
- (D) $(-\frac{3}{2}, \frac{1}{2}, \frac{1}{2})$

[Step-by-step solution ► prepwiser.in/questions/T0twPYoJP1](https://www.prepwiser.in/questions/T0twPYoJP1)

Q10 JEE Main 2022 · 25 Jul · Shift 1

Which of the following physical quantities have the same dimensions?

- (A) Electric displacement ($\vec{D}$) and surface charge density
- (B) Displacement current and electric field
- (C) Current density and surface charge density
- (D) Electric potential and energy

[Step-by-step solution ► prepwiser.in/questions/0c5jxCqss7](https://www.prepwiser.in/questions/0c5jxCqss7)

Q11 JEE Main 2022 · 29 Jun · Shift 1

In van der Waal equation $[P + \frac{a}{V^2}] [V - b] = RT$; 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 :

- (A) $\frac{P}{V}$
- (B) $\frac{V}{P}$
- (C) PV
- (D) PV^3

[Step-by-step solution ► prepwiser.in/questions/yMmWjBDfHF](https://www.prepwiser.in/questions/yMmWjBDfHF)

Q12 JEE Main 2022 · 28 Jun · Shift 1

Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R.
Assertion A : Product of Pressure (P) and time (t) has the same dimension as that of coefficient of viscosity.

Reason R : Coefficient of viscosity = $\frac{\text{Force}}{\text{Velocity gradient}}$

Choose the correct answer from the options given below :

- (A) Both A and R are true, and R is the correct explanation of A.
- (B) Both A and R are true but R is NOT the correct explanation of A.
- (C) A is true but R is false.
- (D) A is false but R is true.

[Step-by-step solution ► prepwiser.in/questions/-0rCleFNXn](https://www.prepwiser.in/questions/-0rCleFNXn)

Q13 JEE Main 2022 · 27 Jun · Shift 2

If L , C and R are the self inductance, capacitance and resistance respectively, which of the following does not have the dimension of time?

- (A) RC (B) $\frac{L}{R}$
(C) $\sqrt{LC}$ (D) $\frac{L}{C}$

Step-by-step solution ► [prepwisar.in/questions/iwzvuy3Hok](https://www.prepwisar.in/questions/iwzvuy3Hok)

Q14 JEE Main 2021 · 27 Jul · Shift 2

Match List I with List II.

List - I

(a) Capacitance, C

(b) Permittivity of free space, ϵ_0

(c) Permeability of free space, μ_0

(d) Electric field, E

List - II

(i) $M^1 L^1 T^{-3} A^{-1}$

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

(iii) $M^{-1} L^{-2} T^4 A^2$

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

Choose the correct answer from the options given below

- (A) (a) $\rightarrow$ (iii), (b) $\rightarrow$ (ii), (c) $\rightarrow$ (iv), (d) $\rightarrow$ (i)
(B) (a) $\rightarrow$ (iii), (b) $\rightarrow$ (iv), (c) $\rightarrow$ (ii), (d) $\rightarrow$ (i)
(C) (a) $\rightarrow$ (iv), (b) $\rightarrow$ (ii), (c) $\rightarrow$ (iii), (d) $\rightarrow$ (i)
(D) (a) $\rightarrow$ (iv), (b) $\rightarrow$ (iii), (c) $\rightarrow$ (ii), (d) $\rightarrow$ (i)

Step-by-step solution ► [prepwisar.in/questions/gnCQdOQAdN](https://www.prepwisar.in/questions/gnCQdOQAdN)

Q15 JEE Main 2020 · 5 Sep · Shift 1

Assume that the displacement(s) of air is proportional to the pressure difference (Δp) created by a sound wave. Displacement (s) further depends on the speed of sound (v), density of air (ρ) and the frequency (f). If $\Delta p \sim 10$ Pa, $v \sim 300$ m/s, $\rho \sim 1$ kg/m³ and $f \sim 1000$ Hz, then s will be of the order of (take the multiplicative constant to be 1) :

- (A) 1 mm (B) $\frac{3}{100}$ mm
(C) 10 mm (D) $\frac{1}{10}$ mm

Step-by-step solution ► [prepwisar.in/questions/2nN7ULFbV4](https://www.prepwisar.in/questions/2nN7ULFbV4)

Q16 JEE Main 2024 · 8 Apr · Shift 1

Young's modulus is determined by the equation given by

$$Y = 49000 \frac{M}{l} \frac{\text{dyne}}{\text{cm}^2}$$

where M is the mass and l is the extension of wire used in the experiment. Now error in Young modulus (Y) is estimated by taking data from $M - l$ plot in graph paper. The smallest scale divisions are 5g and 0.02cm along load axis and extension axis respectively. If the value of M and l are 500g and 2cm respectively then percentage error of Y is :

- (A) 2% (B) 0.02%
(C) 0.5% (D) 0.2%

Step-by-step solution ► [prepwisar.in/questions/Z1KTCL44y4](https://www.prepwisar.in/questions/Z1KTCL44y4)

Q17 JEE Main 2023 · 13 Apr · Shift 2

Given below are two statements: one is labelled as Assertion **A** and the other is labelled as Reason **R**
Assertion A : A spherical body of radius $(5 \pm 0.1)\text{mm}$ having a particular density is falling through a liquid of constant density. The percentage error in the calculation of its terminal velocity is 4%.

Reason R : The terminal velocity of the spherical body falling through the liquid is inversely proportional to its radius.

In the light of the above statements, choose the correct answer from the options given below

- (A) A is false but **R** is true
(B) A is true but **R** is false
(C) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**
(D) Both **A** and **R** are true and **R** is the correct explanation of **A**

Step-by-step solution ► [prepwisar.in/questions/SVU8-ftZX](https://www.prepwisar.in/questions/SVU8-ftZX)

Q18 JEE Main 2022 · 26 Jul · Shift 1

In an experiment to determine the Young's modulus of wire of a length exactly 1m, the extension in the length of the wire is measured as 0.4mm with an uncertainty of $\pm 0.02\text{mm}$ when a load of 1kg is applied. The diameter of the wire is measured as 0.4mm with an uncertainty of $\pm 0.01\text{mm}$. The error in the measurement of Young's modulus (ΔY) is found to be $x \times 10^{10} \text{Nm}^{-2}$. The value of x is _____.
(take $g = 10\text{ms}^{-2}$)

Numerical answer — enter the value.

Step-by-step solution ► [prepwisar.in/questions/0zQ4bKhptu](https://www.prepwisar.in/questions/0zQ4bKhptu)

Q19 JEE Main 2021 · 1 Sep · Shift 2

Two resistors $R_1 = (4 \pm 0.8) \Omega$ and $R_2 = (4 \pm 0.4) \Omega$ are connected in parallel. The equivalent resistance of their parallel combination will be :

- (A) $(4 \pm 0.4) \Omega$ (B) $(2 \pm 0.4) \Omega$
(C) $(2 \pm 0.3) \Omega$ (D) $(4 \pm 0.3) \Omega$

Step-by-step solution ► [prepwisar.in/questions/FFoqcE7-6Y](https://www.prepwisar.in/questions/FFoqcE7-6Y)

Q20 JEE Main 2021 · 18 Mar · Shift 1

The time period of a simple pendulum is given by $T = 2\pi\sqrt{\frac{L}{g}}$. The measured value of the length of pendulum is 10 cm known to a 1 mm accuracy. The time for 200 oscillations of the pendulum is found to be 100 second using a clock of 1s resolution. The percentage accuracy in the determination of 'g' using this pendulum is 'x'. The value of 'x' to be nearest integer is :-

- (A) 2% (B) 3%
(C) 5% (D) 4%

[Step-by-step solution ► prepwiser.in/questions/VeSC1DKdc8](https://www.prepwiser.in/questions/VeSC1DKdc8)

Q21 JEE Main 2021 · 18 Mar · Shift 1

In the experiment of Ohm's law, a potential difference of 5.0 V is applied across the end of a conductor of length 10.0 cm and diameter of 5.00 mm. The measured current in the conductor is 2.00 A. The maximum permissible percentage error in the resistivity of the conductor is :

- (A) 3.9 (B) 8.4
(C) 7.5 (D) 3.0

[Step-by-step solution ► prepwiser.in/questions/wFx5kCWmbE](https://www.prepwiser.in/questions/wFx5kCWmbE)

Q22 JEE Main 2021 · 24 Feb · Shift 2

The period of oscillation of a simple pendulum is $T = 2\pi\sqrt{\frac{L}{g}}$. Measured value of 'L' is 1.0 m from meter scale having a minimum division of 1 mm and time of one complete oscillation is 1.95 s measured from stopwatch of 0.01 s resolution. The percentage error in the determination of 'g' will be :

- (A) 1.30% (B) 1.33%
(C) 1.13% (D) 1.03%

[Step-by-step solution ► prepwiser.in/questions/E8E9-xM8Ky](https://www.prepwiser.in/questions/E8E9-xM8Ky)

Answer key — Units, Dimensions & Errors

Numbers match the question numbers above. For full working, open the solution link under each question.

1	D	2	C	3	0	4	C	5	D	6	D	7	A	8	D
9	B	10	A	11	C	12	C	13	D	14	A	15	B	16	A
17	B	18	2	19	C	20	B	21	A	22	C				

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