

JEE MAIN UNITS AND MEASUREMENTS — COMBINATION OF ERRORS — PYQS

Max. Marks: 76

Questions: 19

Section A (MCQ) — 17 questions

- Q.1** The density ρ of a uniform cylinder is determined by measuring its mass m , length l and diameter d . The measured values of m , l and d are 97.42 ± 0.02 g, 8.35 ± 0.05 mm and 20.20 ± 0.02 mm, respectively. Calculated percentage fractional error in ρ is _____.

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) 0.63% (2) 0.82% (3) 0.72% (4) 0.25%

Scan or tap for the full solution



- Q.2** The percentage error in the calculated volume of a sphere, if there is 2% error in its diameter measurement, is _____.

[JEE Main 2026 (Online) 6th April Evening Shift]

- (1) 1 (2) 2 (3) 6 (4) 8

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- Q.3** In an experiment to determine the resistance of a given wire using Ohm's law, the voltmeter and ammeter readings are noted as 10 V and 5 A, respectively. The least counts of voltmeter and ammeter are 500 mV and 200 mA, respectively. The estimated error in the resistance measurement is _____ Ω .

[JEE Main 2026 (Online) 5th April Evening Shift]

- (1) 0.25 (2) 2 (3) 2.5 (4) 0.18

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- Q.4** The diameter of a wire measured by a screw gauge of least count 0.001 cm is 0.08 cm. The length measured by a scale of least count 0.1 cm is 150 cm. When a weight of 100 N is applied to the wire, the extension in length is 0.5 cm, measured by a micrometer of least count 0.001 cm. The error in the measured Young's modulus is $\alpha \times 10^9$ N/m². The value of α is _____.

(Ignore the contribution of the load to Young's modulus error calculation)

[JEE Main 2026 (Online) 2nd April Morning Shift]

- (1) 1.3 (2) 1.65 (3) 0.13 (4) 0.25

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- Q.5** The time period of a simple harmonic oscillator is $T = 2\pi\sqrt{\frac{m}{k}}$. Measured value of mass (m) of the object is 10 g with an accuracy of 10 mg and time for 50 oscillations of the spring is found to be 60 s using a watch of 2 s resolution. Percentage error in determination of spring constant (k) is _____%.

[JEE Main 2026 (Online) 28th January Evening Shift]

- (1) 3.43 (2) 7.60 (3) 3.35 (4) 6.76

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- Q.6** In an experiment the values of two spring constants were measured as $k_1 = (10 \pm 0.2)$ N/m and $k_2 = (20 \pm 0.3)$ N/m. If these springs are connected in parallel, then the percentage error in equivalent spring constant is :

[JEE Main 2026 (Online) 21st January Morning Shift]

- (1) 1.33% (2) 2.67% (3) 1.67% (4) 2.33%

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- Q.7** A spherical body of radius r and density σ falls freely through a viscous liquid having density ρ and viscosity η and attains a terminal velocity v_0 . Estimated maximum error in the quantity η is : (Ignore errors associated with σ , ρ and g , gravitational acceleration)

[JEE Main 2026 (Online) 21st January Evening Shift]

- (1) $2\left[\frac{\Delta r}{r} - \frac{\Delta v_0}{v_0}\right]$ (2) $2\left[\frac{\Delta r}{r} + \frac{\Delta v_0}{v_0}\right]$
(3) $\frac{2\Delta r}{r} + \frac{\Delta v_0}{v_0}$ (4) $2\frac{\Delta r}{r} - \frac{\Delta v_0}{v_0}$

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- Q.8** A quantity Q is formulated as $X^{-2}Y^{\frac{3}{2}}Z^{-\frac{2}{5}}$. X , Y , and Z are independent parameters which have fractional errors of 0.1, 0.2, and 0.5, respectively in measurement. The maximum fractional error of Q is

[JEE Main 2025 (Online) 8th April Evening Shift]

- (1) 0.6 (2) 0.8 (3) 0.7 (4) 0.1

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- Q.9** The energy of a system is given as $E(t) = \alpha^3 e^{-\beta t}$, where t is the time and $\beta = 0.3 \text{ s}^{-1}$. The errors in the measurement of α and t are 1.2% and 1.6%, respectively. At $t = 5 \text{ s}$, maximum percentage error in the energy is :

[JEE Main 2025 (Online) 23rd January Evening Shift]

- (1) 6% (2) 11.6% (3) 4% (4) 8.4%

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- Q.10** The maximum percentage error in the measurement of density of a wire is
[Given, mass of wire = $(0.60 \pm 0.003) \text{ g}$
radius of wire = $(0.50 \pm 0.01) \text{ cm}$
length of wire = $(10.00 \pm 0.05) \text{ cm}$]

[JEE Main 2025 (Online) 22nd January Evening Shift]

- (1) 7 (2) 8 (3) 5 (4) 4

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- Q.11** Young's modulus is determined by the equation given by $Y = 49000 \frac{M \text{ dyne}}{l \text{ cm}^2}$ 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 5 g and 0.02 cm along load axis and extension axis respectively. If the value of M and l are 500 g and 2 cm respectively then percentage error of Y is :

[JEE Main 2024 (Online) 8th April Morning Shift]

- (1) 2% (2) 0.02% (3) 0.5% (4) 0.2%

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- Q.12** To find the spring constant (k) of a spring experimentally, a student commits 2% positive error in the measurement of time and 1% negative error in measurement of mass. The percentage error in determining value of k is :

[JEE Main 2024 (Online) 6th April Morning Shift]

- (1) 5% (2) 3% (3) 1% (4) 4%

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- Q.13** The radius (r), length (l) and resistance (R) of a metal wire was measured in the laboratory as
 $r = (0.35 \pm 0.05) \text{ cm}$
 $R = (100 \pm 10) \text{ ohm}$
 $l = (15 \pm 0.2) \text{ cm}$
The percentage error in resistivity of the material of the wire is :

[JEE Main 2024 (Online) 1st February Morning Shift]

- (1) 37.3% (2) 25.6% (3) 35.6% (4) 39.9%

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- Q.14** If the percentage errors in measuring the length and the diameter of a wire are 0.1% each. The percentage error in measuring its resistance will be:

[JEE Main 2024 (Online) 31st January Morning Shift]

- (1) 0.144% (2) 0.2%
(3) 0.1% (4) 0.3%

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- Q.15** The measured value of the length of a simple pendulum is 20 cm with 2 mm accuracy. The time for 50 oscillations was measured to be 40 seconds with 1 second resolution. From these measurements, the accuracy in the measurement of acceleration due to gravity is $N\%$. The value of N is:

[JEE Main 2024 (Online) 31st January Evening Shift]

- (1) 6 (2) 5 (3) 4 (4) 8

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- Q.16** The resistance $R = \frac{V}{I}$ where $V = (200 \pm 5) \text{ V}$ and $I = (20 \pm 0.2) \text{ A}$, the percentage error in the measurement of R is :

[JEE Main 2024 (Online) 29th January Morning Shift]

- (1) 5.5% (2) 3% (3) 7% (4) 3.5%

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- Q.17** A physical quantity Q is found to depend on quantities a , b , c by the relation $Q = \frac{a^4 b^3}{c^2}$. The percentage error in a , b and c are 3%, 4% and 5% respectively. Then, the percentage error in Q is :

[JEE Main 2024 (Online) 29th January Evening Shift]

- (1) 43% (2) 34% (3) 66% (4) 14%

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Section B (Numerical) — 2 questions

- Q.18** A physical quantity C is related to four other quantities p , q , r and s as follows

$$C = \frac{pq^2}{r^3 \sqrt{s}}$$

The percentage errors in the measurement of p , q , r and s are 1%, 2%, 3% and 2%, respectively. The percentage error in the measurement of C will be _____ %

[JEE Main 2025 (Online) 3rd April Evening Shift]

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Q.19 A physical quantity Q is related to four observables a, b, c, d as follows :

$$Q = \frac{ab^4}{cd}$$

where, $a = (60 \pm 3) \text{ Pa}$; $b = (20 \pm 0.1) \text{ m}$;

$c = (40 \pm 0.2) \text{ N s m}^{-2}$ and $d = (50 \pm 0.1) \text{ m}$, then the

percentage error in Q is $\frac{x}{1000}$, where $x = \underline{\hspace{2cm}}$.

[JEE Main 2025 (Online) 29th January Evening Shift]

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full solution



ANSWER KEY

Section A (MCQ) — 17 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	2	3	4	2	4	3	3	3	1	3	1
Ques.	12	13	14	15	16	17					
Ans.	1	4	4	1	4	2					

Section B (Numerical) — 2 questions

Ques.	18	19					
Ans.	15	7700					