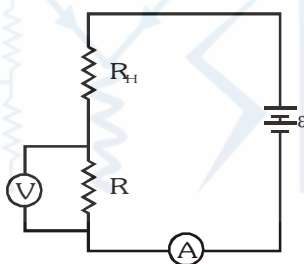


- If time (t), velocity (v), and angular momentum (ℓ) are taken as the fundamental units. Then the dimension of mass (m) in terms of t , v and ℓ is :
 (1) $[t^{-1}v^1\ell^{-2}]$ (2) $[t^1v^2\ell^{-1}]$ (3) $[t^{-2}v^{-1}\ell^1]$ (4) $[t^{-1}v^{-2}\ell^1]$
- A physical quantity 'y' is represented by the formula $y = m^2r^{-4}g^x l^3$. If the percentage errors found in y , m , r , l and g are 18, 1, 0.5, 4 and p respectively, then find the value of x and p .
 (1) 5 and ± 2 (2) 4 and ± 3 (3) $\frac{16}{3}$ and $\pm \frac{3}{2}$ (4) 8 and ± 2
- The vernier scale used for measurement has a positive zero error of 0.2 mm. If while taking a measurement it was noted that 'O' on the vernier scale lies between 8.5 cm and 8.6 cm, vernier coincidence is 6, Then the correct value of measurement is _____ cm.
 (least count = 0.01 cm)
 (1) 8.36 cm (2) 8.54 cm (3) 8.58 cm (4) 8.56 cm
- One main scale division of a vernier callipers is 'a' cm and n^{th} division of the vernier scale coincide with $(n - 1)^{\text{th}}$ division of the main scale. The least count of the callipers in mm is :
 (1) $\frac{10na}{(n-1)}$ (2) $\frac{10a}{(n-1)}$ (3) $\left(\frac{n-1}{10n}\right)a$ (4) $\frac{10a}{n}$
- The work done by a gas molecule in an isolated system is given by, $W = \alpha\beta^2 e^{-\frac{x^2}{\alpha kT}}$, where x is the displacement, k is the Boltzmann constant and T is the temperature, α and β are constants. Then the dimension of b will be :
 (1) $[M L^2 T^{-2}]$ (2) $[M L T^{-2}]$ (3) $[M^2 L T^2]$ (4) $[M^0 L T^0]$
- The force is given in terms of time t and displacement x by the equation $F = A \cos Bx + C \sin Dt$.
 The dimensional formula of $\frac{AD}{B}$ is :
 (1) $[M^0 L T^{-1}]$ (2) $[M L^2 T^{-3}]$ (3) $[M^1 L^1 T^{-2}]$ (4) $[M^2 L^2 T^{-3}]$

7. In a Screw Gauge, fifth division of the circular scale coincides with the reference line when the ratchet is closed. There are 50 divisions on the circular scale, and the main scale moves by 0.5 mm on a complete rotation. For a particular observation the reading on the main scale is 5 mm and the 20th division of the circular scale coincides with reference line. Calculate the true reading
 (1) 5.00mm (2) 5.25mm (3) 5.15mm (4) 5.20mm
8. The radius of a sphere is measured to be (7.50 ± 0.85) cm. Suppose the percentage error in its volume is x . The value of x , to the nearest x , is_____.
 (1) 14 (2) 24 (3) 34 (4) 44
9. The area of cross-section of a railway track is 0.01 m^2 . The temperature variation is 10°C . Coefficient of linear expansion of material of track is $10^{-5} / ^\circ\text{C}$. The energy stored per meter in the track is _____ J/m.
 (Young's modulus of material of track is 10^{11} Nm^{-2})
 (1) 5 (2) 10 (3) 15 (4) 20
10. In order to determine the Young's Modulus of a wire of radius 0.2 cm (measured using a scale of least count = 0.001 cm) and length 1m (measured using a scale of least count = 1 mm), a weight of mass 1kg (measured using a scale of least count = 1g) was hanged to get the elongation of 0.5 cm (measured using a scale of least count 0.001 cm). What will be the fractional error in the value of Young's Modulus determined by this experiment ?
 (1) 0.14% (2) 0.9% (3) 9% (4) 1.4%
11. While measuring acceleration due to gravity by a simple pendulum a student makes a positive error of 1% in the length of the pendulum and a negative error of 3% in the value of the time period. His percentage error in the measurement of the value of g will be -
 (A) 2% (B) 4% (C) 7% (D) 10%
12. The period of oscillation of a simple pendulum in the experiment is recorded as 2.63s, 2.56s, 2.42s, 2.71s and 2.80s respectively. The average absolute error is
 (A) 0.1s (B) 0.11s (C) 0.01s (D) 1.0s
13. The significant digits in 200.40 are
 (A) 4 (B) 5 (C) 2 (D) 3
14. A scientist performs an experiment in order to measure a certain physical quantity and takes 100 observations. He repeats the same experiment and takes 400 observations, by doing so
 (A) The possible error remains same
 (B) The possible error is doubled
 (C) The possible error is halved
 (D) The possible error is reduced to one fourth

15. A wire has a mass (0.3 ± 0.003) g, radius (0.5 ± 0.005) mm and length (6 ± 0.06) cm. The maximum percentage error in the measurement of its density is –
 (A) 1 (B) 2 (C) 3 (D) 4
16. The length of a cylinder is measured with a metre rod having least count 0.1 cm. Its diameter is measured with vernier callipers having least count 0.01 cm. Given the length is 5.0 cm and diameter is 2.00 cm. The percentage error in the calculated value of volume will be –
 (A) 2% (B) 1% (C) 3% (D) 4%
17. In a resonance column method, resonance occurs at two successive level of $\ell_1 = 30.7$ cm and $\ell_2 = 63.2$ cm using a tuning fork of $f = 512$ Hz. What is the maximum error in measuring speed of sound using relations $v = f \lambda$ & $\lambda = 2(\ell_2 - \ell_1)$.
 (A) 256 cm/sec (B) 92 cm/sec (C) 102.4 cm/sec (D) 204.8 cm/sec
18. A student performs an experiment for determination of $\left(g = \frac{4\pi^2 \ell}{T^2}\right)$, $\ell \approx 1$ m, and he commits an error of $\Delta \ell$. For T he takes the time of n oscillations with the stop watch of least count ΔT and he commits a human error of 0.1 s. For which of the following data, the measurement of g will be most accurate?
 (A) $\Delta L = 0.5$, $\Delta T = 0.1$, $n = 20$ (B) $\Delta L = 0.5$, $\Delta T = 0.1$, $n = 50$ [IIT-JEE 2006]
 (C) $\Delta L = 0.5$, $\Delta T = 0.01$, $n = 20$ (D) $\Delta L = 0.1$, $\Delta T = 0.05$, $n = 50$
19. A student performs an experiment to determine the Young's modulus of a wire, exactly 2m long, by Searle's method. In a particular reading, the student measures the extension in the length of the wire to be 0.8 mm with an uncertainty of ± 0.05 mm at a load of exactly 1.0 kg. The student also measures the diameter of the wire to be 0.4 mm with an uncertainty of ± 0.01 mm. Take $g = 9.8 \text{ m/s}^2$ (exact). The Young's modulus obtained from the reading is – [IIT-JEE 2007]
 (A) $(2.0 \pm 0.3) \times 10^{11} \text{ N/m}^2$ (B) $(2.0 \pm 0.2) \times 10^{11} \text{ N/m}^2$
 (C) $(2.0 \pm 0.1) \times 10^{11} \text{ N/m}^2$ (D) $(2.0 \pm 0.05) \times 10^{11} \text{ N/m}^2$
20. A student performed the experiment to measure the speed of sound in air using resonance air-column method. Two resonances in the air-column were obtained by resonance and that with the longer air-column is the second resonance. Then, [IIT-JEE 2009]
 (A) The intensity of the sound heard at the first resonance was more than that at the second resonance
 (B) the prongs of the tuning fork were kept in a horizontal plane above the resonance tube
 (C) the amplitude of vibration of the ends of the prongs is typically around 1 cm
 (D) the length of the air-column at the first resonance was somewhat shorter than $1/4$ th of the wavelength of the sound in air
21. The resistance is $R = \frac{V}{I}$ where $V = 100 \pm 5$ Volts and $I = 10 \pm 0.2$ amperes. What is the total error in R ?
 (A) 5% (B) 7% (C) 5.2% (D) $\left(\frac{5}{2}\right)\%$
22. The length, breadth and thickness of a strip are (10.0 ± 0.1) cm, (1.00 ± 0.01) cm and (0.100 ± 0.001) cm respectively. The most probable error in its volume will be
 (A) $\pm 0.03 \text{ cm}^3$ (B) $\pm 0.111 \text{ cm}^3$ (C) $\pm 0.012 \text{ cm}^3$ (D) none of these
23. The external and internal radius of a hollow cylinder are measured to be (4.23 ± 0.01) cm and (3.89 ± 0.01) cm. The thickness of the wall of the cylinder is :-
 (A) (0.34 ± 0.02) cm (B) (0.17 ± 0.02) cm (C) (0.17 ± 0.01) cm (D) (0.34 ± 0.01) cm

24. The radius of a disc is 1.2 cm. Its area according to idea of significant figures, will be given by:-
 (A) 4.5216 cm² (B) 4.521 cm² (C) 4.52 cm² (D) 4.5 cm²
25. The length ℓ , breadth b and thickness t of a block of wood were measured with the help of a measuring scale. The results with permissible errors are $\ell = 15.12 \pm 0.01$ cm, $b = 10.15 \pm 0.01$ cm, $t = 5.28 \pm 0.01$ cm. The percentage error in volume upto proper significant figures is -
 (A) 0.28% (B) 0.36% (C) 0.48 % (D) 0.64%
26. The following observations were taken for determining surface tension of water by capillary tube method: Diameter of capillary $D = 1.25 \times 10^{-2}$ m Rise of water in capillary, $h = 1.45 \times 10^{-2}$ m. Taking $g = 9.80$ m/s² and using the relation $T = (rhg/2) \times 10^3$ N/m, what is the possible error in surface tension. T-
 (A) 0.16% (B) 1.6% (C) 16% (D) 2.4%
27. The least count of a stop watch is 1/5 sec. The time of 20 oscillations of a pendulum is measured to be 25 s. What is the maximum percentage error in this measurement
 (A) 8% (B) 1% (C) 0.8% (D) 16%
28. The area of a rectangle of size 1.23 2.345 cm is
 (A) 2.88 cm² (B) 2.884 cm² (C) 2.9 cm² (D) 2.88435 cm²
29. The diameter of a cylinder is measured using a Vernier callipers with no zero error. It is found that the zero of the Vernier scale lies between 5.10 cm and 5.15 cm of the main scale. The Vernier scale has 50 divisions equivalent to 2.45 cm. The 24th division of the Vernier scale exactly coincides with one of the main scale divisions. The diameter of the cylinder is :-
 (1) 5.112 cm (2) 5.124 cm (3) 5.136 cm (4) 5.148 cm
30. When the gap is closed without placing any object in the screw gauge whose least count is 0.005 mm, the 5th division on its circular scale coincides with the reference line on main scale, and when a small sphere is placed reading on main scale advances by 4 divisions, whereas circular scale reading advances by five times to the corresponding reading when no object was placed. There are 200 divisions on the circular scale. The radius of the sphere is
 (1) 4.10 mm (2) 4.05 mm (3) 2.10 mm (4) 2.05 mm
31. In the circuit shown, voltmeter is ideal and its least count is 0.1 V. The least count of ammeter 1 mA. Let reading of the voltmeter be 30.0 V and the reading of ammeter is 0.020 A. We shall calculate the value of resistance R within error limits.



32. Students I_1 , J_1, J_3 and I_2 perform an experiment for measuring the acceleration due to gravity (g) using a simple pendulum. they use different lengths of the pendulum and record time for different number of oscillations. The observations are shown in the table. Least count for length = 0.1 cm, Least count for time = 1s

Students	Length of the pendulum(cm)	No. of oscillations (n)	Time period of pendulum(s)
I_1	100.0	20	20
J_1	400.0	10	40
J_3	100.0	10	20
I_2	400.0	20	40

If P_1, P_2, P_3 and P_4 are the % error in g for students I_1, J_1, J_3 and I_2 respectively then-

- (A) $P_1 = P_3$ (B) P_3 is maximum (C) P_4 is minimum (D) $P_2 = P_4$