

1. In a new system of units, the unit of mass is 'a' kg, length is 'b' m, and time is 'c' s. What will be the magnitude of a force of 1 N in this new system?
2. If Energy (E), Velocity (V), and Time (T) are chosen as fundamental quantities, what are the dimensions of the spring constant (k) in this new system? (Hint: $k = \text{Force}/\text{length}$)
3. The dimensions of impulse are the same as the dimensions of which of the following physical quantities?
4. Given that 1 calorie = 4.18 J, and $1 \text{ J} = 10^7 \text{ erg}$. If the value of G in CGS system is $6.67 \times 10^{-8} \text{ dyne cm}^2 \text{ g}^{-2}$, convert it to SI units.
5. When two quantities are multiplied, what is the rule for determining the number of significant figures in the result?
6. Add the following measurements and express the result with the correct number of significant figures: 2.3 cm, 1.25 cm, and 0.087 cm.
7. The radius of a solid sphere is measured to be $R = (6.0 \pm 0.2) \text{ cm}$. Calculate the maximum percentage error in the volume of the sphere.
8. How many picometers are there in 1 micrometer?
9. Which of the following physical quantities has the dimensions of $[M L^{-1} T^{-1}]$?
10. Why is the least count of an instrument crucial for accurate measurements?
11. The least count of a screw gauge is 0.01 mm, and there are 100 divisions on its circular scale. What is the pitch of the screw gauge?
12. The electric field (E) and magnetic field (B) are related by $c = E/B$, where c is the speed of light. If the dimensions of E are $[M L T^{-3} A^{-1}]$, what are the dimensions of B?
13. What are the dimensions of the gravitational constant G?
14. Why is it generally recommended to take multiple readings and calculate the mean when performing a scientific measurement?
15. What does it mean for a system of units to be 'coherent'?
16. The coefficient of viscosity (η) of a liquid is given by Poiseuille's formula: $F = \eta A (dv/dx)$, where F is force, A is area, dv/dx is velocity gradient. What are the dimensions of η ?
17. The distance to a star is measured to be 4.25 light-years. If 1 light-year = $9.46 \times 10^{15} \text{ m}$, what is this distance in kilometers?
18. Modified Question: A quantity Q is given by $Q = I^2 R$, where I is current, R is resistance. What are the dimensions of Q?

- 19.** A student performs an experiment to measure acceleration due to gravity (g) using a simple pendulum. They record a time period $T = (1.50 \pm 0.05)$ s and length $L = (0.55 \pm 0.02)$ m. Using the formula $g = 4\pi^2 L/T^2$, calculate the value of g and its absolute error. (Take $\pi^2 \approx 9.87$).
- 20.** How many significant figures are present in the number 500.0?