

UNIT I
PHYSICAL WORLD AND MEASUREMENT
ASSIGNMENT I

NOTE : All questions are of 3 marks each.

- Name the term which has unit but no dimensions.
- A new unit of length is chosen such that the speed of light in vacuum is unity. What is the distance between the sun and the earth in terms of new unit if light takes 8 min and 20 s to cover this distance?
- Which of the following is the most precise device for measurement :
 - a vernier callipers with 20 divisions on the sliding scale.
 - a screw gauge of pitch 1 mm and 100 divisions on the circular scale.
 - an optical instrument that can measure length to within a wavelength of light ?
- State the number of significant figures in the following :
 - 0.007 m²
 - 2.64×10^{24} kg
 - 0.2370 g cm⁻³
 - 6.320 J
 - 6.032 N m⁻²
 - 0.0006032 m²
- The length, breadth and thickness of a rectangular sheet of a metal are 4.234 m, 1.005 m 2.01 m respectively. Give the area and volume of the sheet to the correct significant figures.
- A physical quantity P is related to four observations a, b, c and d as follows $P = \frac{a^3 b^2}{\sqrt{cd}}$. The percentage error in measurement in a, b, c and d are 1%, 3%, 4% and 2% respectively. What is the percentage error in quantity P ? If the value calculated using the above relation turns out to be 3.763, to what value should you round off the result ?
- A book with many printing errors contains four different formulas for the displacement y of a particle undergoing a certain periodic motion :
 - $y = a \sin\left(\frac{2}{T}\right)$
 - $y = a \sin vt$
 - $y = \left(\frac{a}{T}\right) \sin \frac{t}{a}$
 - $y = (a\sqrt{2})\left(\sin \frac{2}{T} + \cos \frac{2}{T}\right)$(a = maximum displacement of particle, v = speed of the particle, T = time period of motion). Rule out the wrong formulas on dimensional ground.
- Define basic units and derived units.
- Define unified atomic mass unit. Find its value.
- Describe the parallax method to measure the distance of a planet from the earth.
- The density of a cylindrical rod was measured by using the formula $\rho = \frac{4m}{D^2 l}$. The percentage errors in m, D and l are 1%, 1.5% and 0.5%. Calculate the percentage error in the calculated value of density.
- An experiment measured quantities a, b, c and then x is calculated by using the relation $x = \frac{ab^2}{c^3}$. If the percentage errors in measurements of a, b and c are $\pm 1\%$, $\pm 2\%$ and $\pm 1.5\%$ respectively, then calculate the maximum percentage error in the value of x obtained.
- The resistance of a metallic wire is given by $R = V/I$, where V is the potential difference, I is the current. In a circuit the potential difference across the resistance is $V = (8 \pm 0.5)V$ and current in circuit $I = (4 \pm 0.2) A$. What is the value of resistance with its percentage error ?
- Briefly discuss error and its types.

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