

Units and Measurements — Assignment 1

Class 11 Physics · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.
(2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.
(3) Universal values: $g = 10 \text{ m/s}^2$ unless stated. Give answers with correct SI units.

SI Base Units and Standards

MCQ Questions (choose the correct option)

- Which of the following is a fundamental (base) quantity in the SI?
(A) mass
(B) force
(C) area
(D) velocity
- The SI unit of luminous intensity is the
(A) candela
(B) lumen
(C) lux
(D) kelvin
- The SI unit of the plane angle is the
(A) radian
(B) steradian
(C) degree
(D) watt
- Which of the following is a derived unit?
(A) newton
(B) metre
(C) kilogram
(D) second

1 Mark Questions

- Name the seven SI base units.
- Write the SI unit of time and of luminous intensity.
- What is a derived unit? Give one example.

2 Mark Questions

- Distinguish between base units and derived units, with one example of each.
- A body moves at 90 km h^{-1} . Express this speed in m s^{-1} . (Ans: 25 m s^{-1})

3 Mark Questions

- Convert $1 \text{ kg m}^2 \text{ s}^{-2}$ into $\text{g cm}^2 \text{ s}^{-2}$. (Ans: $10^7 \text{ g cm}^2 \text{ s}^{-2}$)

Dimensions and Dimensional Analysis

MCQ Questions (choose the correct option)

- The dimensions of force are
 - $[M L T^{-2}]$
 - $[M L^2 T^{-2}]$
 - $[M L T^{-1}]$
 - $[M L^{-1} T^{-2}]$
- The dimensional formula of work is
 - $[M L^2 T^{-2}]$
 - $[M L T^{-2}]$
 - $[M L T^{-1}]$
 - $[M L^2 T^{-1}]$
- The principle of homogeneity of dimensions states that
 - every term in a correct equation has the same dimensions
 - dimensions depend on the system of units
 - all quantities are dimensionless
 - dimensions change with temperature
- Dimensional analysis cannot determine
 - dimensionless constants
 - the powers of quantities
 - unit conversions
 - the homogeneity of an equation

1 Mark Questions

- What is the dimensional formula of work?
- State the principle of homogeneity of dimensions.
- Write the dimensions of force.

2 Mark Questions

- Check the dimensional consistency of the equation $v = u + at$. (Ans: $[L T^{-1}]$ on both sides — dimensionally correct)
- Check whether $s = ut + \frac{1}{2}at^2$ is dimensionally correct. (Ans: both sides have the dimension of length $[L]$ — correct)

3 Mark Questions

- Using dimensional analysis, derive the relation for the period of a simple pendulum, $T \propto \sqrt{l/g}$. (Ans: $T = k\sqrt{l/g}$)
- The viscous force on a sphere of radius r moving with speed v in a fluid is $F = 6\pi\eta rv$. Find the dimensions of η . (Ans: $[M L^{-1} T^{-1}]$)

Accuracy, Precision and Errors**MCQ Questions (choose the correct option)**

- Errors that repeat consistently because of an instrument defect are
 - systematic errors
 - random errors
 - least-count errors
 - parallax errors
- Random errors are reduced by

- (A) taking many readings and averaging
 - (B) using a single careful reading
 - (C) zero-error correction
 - (D) changing the unit
3. Relative error is
- (A) absolute error divided by the true value
 - (B) true value divided by the absolute error
 - (C) the least count
 - (D) the mean of the readings
4. The least count of an ordinary metre scale is
- (A) 1 mm
 - (B) 1 cm
 - (C) 0.1 mm
 - (D) 1 m

1 Mark Questions

1. Define absolute error.
2. Distinguish between systematic and random errors.
3. Define the least count of a measuring instrument.

2 Mark Questions

1. Explain why the mean of a large number of readings is a better estimate than a single reading.
2. Two readings of a length are 3.24 m and 3.28 m. Find the mean and the absolute errors. (Ans: mean = 3.26 m; absolute errors 0.02 m and 0.02 m)

3 Mark Questions

1. Six readings of a time interval (in s) are 1.23, 1.24, 1.23, 1.25, 1.24 and 1.23. Find the mean, the mean absolute error and the percentage error. (Ans: mean = 1.237 s; mean absolute error $\approx$ 0.007 s; percentage error $\approx$ 0.5%)

Propagation of Errors

MCQ Questions (choose the correct option)

1. In addition and subtraction, the errors to be added are the
 - (A) absolute errors
 - (B) relative errors
 - (C) percentage errors
 - (D) least counts
2. In multiplication and division, the errors to be added are the
 - (A) relative errors
 - (B) absolute errors
 - (C) mean errors
 - (D) systematic errors
3. If $Z = A^2$, the relative error in Z equals
 - (A) twice the relative error in A
 - (B) half the relative error in A

- (C) the relative error in A
 - (D) four times the relative error in A
4. The error in the quotient A/B is
- (A) the sum of the relative errors in A and B
 - (B) the difference of the relative errors
 - (C) the product of the relative errors
 - (D) the larger relative error

1 Mark Questions

1. How are absolute errors combined in the sum of two quantities?
2. State the rule for the relative error of a product or a quotient.
3. If $Z = A^n$, how is the relative error in Z related to that in A?

2 Mark Questions

1. A quantity $X = a^2b^3/c$. If the percentage errors in a, b and c are 1%, 2% and 3%, find the percentage error in X. (Ans: $2 \times 1 + 3 \times 2 + 3 = 11\%$)
2. $A = 5.00 \pm 0.02$ m and $B = 3.00 \pm 0.03$ m. Find $A + B$ with its error. (Ans: 8.00 ± 0.05 m)

3 Mark Questions

1. Derive the expression for the relative error in $Z = A^n B^m / C^p$.
2. The period of a simple pendulum is $T = 2\pi\sqrt{l/g}$. If the relative errors in l and g are e_l and e_g , find the relative error in T. (Ans: $\frac{1}{2}(e_l + e_g)$)

Significant Figures

MCQ Questions (choose the correct option)

1. The number of significant figures in 0.0006032 m^2 is
 - (A) 4
 - (B) 5
 - (C) 7
 - (D) 3
2. The number 3.400 has
 - (A) four significant figures
 - (B) two significant figures
 - (C) three significant figures
 - (D) five significant figures
3. The trailing zeros in 0.2500 are
 - (A) significant
 - (B) not significant
 - (C) place holders only
 - (D) exact zeros
4. In multiplication, the result is rounded off to
 - (A) the least number of significant figures in the factors
 - (B) the greatest number of significant figures
 - (C) the number of decimal places

(D) two significant figures always

1 Mark Questions

1. How many significant figures are there in 6.320 J?
2. State the rule for zeros between two non-zero digits.
3. Why is scientific notation preferred when writing very large or very small numbers?

2 Mark Questions

1. State the number of significant figures in (a) 0.007 m^2 (b) $2.64 \times 10^{24} \text{ kg}$. (Ans: (a) 1 (b) 3)
2. Add 2.15 m and 1.3 m, giving the result to the correct number of significant figures. (Ans: 3.5 m)

3 Mark Questions

1. The length, breadth and thickness of a metal sheet are 4.234 m, 1.005 m and 2.01 cm. Give the area and volume to the correct number of significant figures. (Ans: area = 4.255 m^2 ; volume = $8.55 \times 10^{-2} \text{ m}^3$)
2. State the rules governing significant figures in multiplication and in addition, with one example each.