

Units and Measurements — CBSE Pattern Test 2

Class 11 Physics · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

Test 2 — CBSE Pattern (90 minutes, 40 marks)

Class 11 Physics · Units and Measurements · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.

(2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.

(3) For MCQ questions choose the single correct option; for VSA answers write a single line.

(4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

- 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 SI unit of luminous intensity is the
 - candela
 - lumen
 - lux
 - kelvin
- Which of the following is a derived unit?
 - newton
 - metre
 - kilogram
 - second
- Dimensional analysis cannot determine
 - dimensionless constants
 - the powers of quantities
 - unit conversions
 - the homogeneity of an equation
- In multiplication and division, the errors to be added are the
 - relative errors
 - absolute errors
 - mean errors
 - systematic errors
- If $Z = A^2$, the relative error in Z equals
 - twice the relative error in A
 - half the relative error in A
 - the relative error in A
 - four times the relative error in A
- The number 3.400 has
 - four significant figures

- (B) two significant figures
 - (C) three significant figures
 - (D) five significant figures
8. The least count of an ordinary metre scale is
- (A) 1 mm
 - (B) 1 cm
 - (C) 0.1 mm
 - (D) 1 m
9. Define absolute error.
10. State the rule for combining the relative errors in a product.

Section B — Short Answer I ($4 \times 2 = 8$ marks)

11. Convert $1 \text{ kg m}^2 \text{ s}^{-2}$ into $\text{g cm}^2 \text{ s}^{-2}$.
12. State the number of significant figures in (a) 0.007 m^2 (b) $2.64 \times 10^{24} \text{ kg}$.
13. Add 2.15 m and 1.3 m, giving the result to the correct number of significant figures.
14. A body moves at 90 km h^{-1} . Express this speed in m s^{-1} .

Section C — Short Answer II ($4 \times 3 = 12$ marks)

15. Derive the expression for the relative error in $Z = A^n B^m / C^p$.
16. 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 .
17. 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.
18. Explain, with sources, the difference between systematic and random errors and how each is reduced.

Section D — Long Answers ($2 \times 5 = 10$ marks)

19. State the rules governing the number of significant figures in a result, with one example each of addition and of multiplication.
20. Explain base and derived units and the advantages of the SI system. Convert 1 N into dyne and 1 J into erg, showing the working.

Answer Key (Marking Scheme)

- Q1 — (A) $[\text{M L}^2 \text{T}^{-2}]$. Q2 — (A) candela. Q3 — (A) newton. Q4 — (A) dimensionless constants.
- Q5 — (A) relative errors. Q6 — (A) twice the relative error in A. Q7 — (A) four significant figures. Q8 — (A) 1 mm.
- Q9 — The magnitude of the difference between the measured value and the true value.
- Q10 — Add the relative errors of the factors (each multiplied by its power).
- Q11 — $10^7 \text{ g cm}^2 \text{ s}^{-2}$.
- Q12 — (a) 1 (b) 3.
- Q13 — 3.5 m.
- Q14 — 25 m s^{-1} .
- Q15 — $\Delta Z/Z = n \Delta A/A + m \Delta B/B + p \Delta C/C$.

Q16 — $\Delta T/T = \frac{1}{2}(\Delta l/l + \Delta g/g) = \frac{1}{2}(e_l + e_g)$.

Q17 — Area = 4.255 m²; volume = 8.55×10^{-2} m³.

Q18 — Systematic errors are repeatable and arise from instrument/method defects (reduced by calibration); random errors fluctuate and reduce by averaging many readings.

Q19 — Multiplication/division: keep the least number of significant figures of the factors (e.g. $2.5 \times 3.25 = 8.1$); addition/subtraction: keep the least number of decimal places (e.g. $2.15 + 1.3 = 3.5$).

Q20 — Base units are independent (seven of them); derived units combine base units. SI is coherent and decimal. 1 N = 10^5 dyne; 1 J = 10^7 erg.