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CLASS 11 PHYSICS · NCERT CHAPTER 1 · IMU CET PRACTICE

Units and Measurements

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Questions: 46 MCQs

Each question has exactly one correct option. Attempt all questions first, then check the Answer Key and Solutions at the end.

- 1 Which of the following is NOT a fundamental SI unit?
(A) Candela (B) Kelvin
(C) Mole (D) Newton
- 2 The dimensional formula of Planck's constant is the same as that of
(A) angular momentum (B) linear momentum
(C) energy (D) power
- 3 The dimensional formula of the universal gravitational constant G is
(A) $[M^{-1}L^2T^{-2}]$ (B) $[M^{-1}L^3T^{-2}]$
(C) $[M^{-2}L^3T^{-2}]$ (D) $[ML^3T^{-2}]$
- 4 The number of significant figures in 0.007020 is
(A) 6 (B) 4
(C) 3 (D) 7
- 5 One light year is a unit of
(A) intensity of light (B) speed
(C) distance (D) time
- 6 1 parsec is approximately equal to
(A) 9.46×10^{15} m (B) 3.26×10^{15} m
(C) 1.5×10^{11} m (D) 3.08×10^{16} m
- 7 Which pair of physical quantities has the same dimensions?
(A) Work and torque (B) Force and power
(C) Momentum and impulse per unit time (D) Pressure and force
- 8 The dimensional formula of coefficient of viscosity η is
(A) $[MLT^{-1}]$ (B) $[ML^0T^{-1}]$
(C) $[ML^{-1}T^{-1}]$ (D) $[ML^{-2}T^{-2}]$

- 9 If force F , length L and time T are taken as fundamental quantities, the dimensional formula of mass is
 (A) $[FL^{-1}T^2]$ (B) $[FL^2T^{-2}]$
 (C) $[FL^{-1}T^{-2}]$ (D) $[FLT^{-2}]$
- 10 The percentage error in the measurement of mass and speed are 2% and 3% respectively. The maximum percentage error in kinetic energy is
 (A) 8% (B) 5%
 (C) 11% (D) 1%
- 11 The radius of a sphere is measured as (5.0 ± 0.1) cm. The percentage error in its volume is
 (A) 3% (B) 6%
 (C) 2% (D) 4%
- 12 The result of 2.5×3.14 expressed to correct significant figures is
 (A) 8 (B) 7.850
 (C) 7.85 (D) 7.9
- 13 The sum of 12.345 g, 2.1 g and 0.37 g with correct significant figures is
 (A) 14.815 g (B) 15 g
 (C) 14.8 g (D) 14.82 g
- 14 The least count of a vernier callipers in which 10 vernier divisions coincide with 9 main scale divisions (1 MSD = 1 mm) is
 (A) 0.9 mm (B) 0.1 mm
 (C) 0.01 mm (D) 1 mm
- 15 A screw gauge has pitch 0.5 mm and 50 divisions on its circular scale. Its least count is
 (A) 0.05 mm (B) 0.01 mm
 (C) 0.001 mm (D) 0.1 mm
- 16 Which of the following quantities is dimensionless?
 (A) Young's modulus (B) Stress
 (C) Pressure (D) Strain
- 17 The dimensional formula of impulse is
 (A) $[MLT^{-2}]$ (B) $[ML^2T^{-1}]$
 (C) $[MLT^{-1}]$ (D) $[ML^{-1}T^{-1}]$
- 18 If $x = at + bt^2$, where x is in metres and t in seconds, the dimensions of b are
 (A) $[LT^{-2}]$ (B) $[L]$
 (C) $[T^{-2}]$ (D) $[LT^{-1}]$
- 19 In the equation $(P + a/V^2)(V - b) = RT$, the dimensions of a are
 (A) $[ML^2T^{-2}]$ (B) $[ML^5T^{-2}]$
 (C) $[L^3]$ (D) $[ML^{-1}T^{-2}]$



- 20 In the van der Waals equation $(P + a/V^2)(V - b) = RT$, the dimensions of b are those of
(A) force (B) energy
(C) volume (D) pressure
- 21 The time period of a simple pendulum depends on length l and acceleration due to gravity g . Using dimensions, T is proportional to
(A) l/g (B) $\sqrt{l/g}$
(C) $\sqrt{lg}$ (D) $\sqrt{g/l}$
- 22 Which of the following is the dimensional formula of surface tension?
(A) $[MT^{-2}]$ (B) $[ML^2T^{-2}]$
(C) $[MLT^{-2}]$ (D) $[ML^{-1}T^{-2}]$
- 23 The dimensional formula of pressure is the same as that of
(A) energy per unit area (B) force per unit length
(C) energy per unit volume (D) momentum per unit volume
- 24 1 newton expressed in CGS units is
(A) 10^{-5} dyne (B) 10^3 dyne
(C) 10^7 dyne (D) 10^5 dyne
- 25 1 joule expressed in erg is
(A) 10^3 erg (B) 10^5 erg
(C) 10^7 erg (D) 10^{-7} erg
- 26 The value of G in CGS is 6.67×10^{-8} dyne $\text{cm}^2 \text{g}^{-2}$. Its value in SI is
(A) $6.67 \times 10^{-5} \text{N m}^2 \text{kg}^{-2}$ (B) $6.67 \times 10^{-14} \text{N m}^2 \text{kg}^{-2}$
(C) $6.67 \times 10^{-8} \text{N m}^2 \text{kg}^{-2}$ (D) $6.67 \times 10^{-11} \text{N m}^2 \text{kg}^{-2}$
- 27 Which of the following has the dimensions of frequency?
(A) g/l (B) l/g
(C) $\sqrt{l/g}$ (D) $\sqrt{g/l}$
- 28 The quantity $(1/\sqrt{\mu_0\epsilon_0})$ has the dimensions of
(A) speed (B) acceleration
(C) force (D) time
- 29 The dimensional formula of the gas constant R is
(A) $[ML^2T^{-2}K \text{mol}^{-1}]$ (B) $[ML^2T^{-2}K^{-1}\text{mol}^{-1}]$
(C) $[ML^2T^{-1}K^{-1}\text{mol}^{-1}]$ (D) $[MLT^{-2}K^{-1}\text{mol}^{-1}]$
- 30 Two resistances $R_1 = (100 \pm 3) \Omega$ and $R_2 = (200 \pm 4) \Omega$ are connected in series. The equivalent resistance is
(A) $(300 \pm 12) \Omega$ (B) $(300 \pm 5) \Omega$
(C) $(300 \pm 1) \Omega$ (D) $(300 \pm 7) \Omega$

- 31** A physical quantity $P = a^2b^3/(c\sqrt{d})$. If percentage errors in a , b , c and d are 1%, 2%, 3% and 4% respectively, the maximum percentage error in P is
(A) 14% **(B)** 10%
(C) 12% **(D)** 13%
- 32** The length of a rod is measured as 2.31 cm, 2.33 cm, 2.29 cm, 2.32 cm and 2.30 cm. The mean absolute error is
(A) 0.012 cm **(B)** 0.006 cm
(C) 0.020 cm **(D)** 0.010 cm
- 33** Which of the following measurements is the most precise?
(A) 5.00 m **(B)** 5.00 mm
(C) 5.00 cm **(D)** 5.00 km
- 34** The dimensional formula of electric charge is
(A) $[AT]$ **(B)** $[MAT]$
(C) $[AT^{-1}]$ **(D)** $[A^{-1}T]$
- 35** The dimensional formula of electric potential (voltage) is
(A) $[MLT^{-3}A^{-1}]$ **(B)** $[ML^2T^{-3}A^{-1}]$
(C) $[ML^2T^{-3}A]$ **(D)** $[ML^2T^{-2}A^{-1}]$
- 36** The dimensional formula of resistance is
(A) $[ML^2T^{-3}A^{-2}]$ **(B)** $[ML^2T^{-3}A^{-1}]$
(C) $[ML^2T^{-2}A^{-2}]$ **(D)** $[MLT^{-3}A^{-2}]$
- 37** Which one of the following is a unit of energy?
(A) newton per second **(B)** joule per second
(C) kilowatt **(D)** kilowatt-hour
- 38** The velocity v of a particle is given by $v = A \sin(Bt)$, where t is time. The dimensions of B are
(A) dimensionless **(B)** $[T^{-1}]$
(C) $[LT^{-1}]$ **(D)** $[T]$
- 39** In the relation $y = A \sin(\omega t - kx)$, the dimensions of ω/k are
(A) $[L]$ **(B)** $[L^{-1}T]$
(C) $[LT^{-1}]$ **(D)** $[T^{-1}]$
- 40** If the unit of length is doubled and unit of mass is halved (time unchanged), the numerical value of a force of 8 units in the new system becomes
(A) 32 **(B)** 2
(C) 8 **(D)** 4
- 41** The angle subtended by the Moon's diameter at a point on Earth is about 0.5° . If Earth–Moon distance is 3.84×10^8 m, the diameter of the Moon is about
(A) 1.5×10^6 m **(B)** 6.7×10^6 m
(C) 1.92×10^8 m **(D)** 3.35×10^6 m

- 42** The unit of the Stefan–Boltzmann constant σ is
(A) $\text{W m}^2 \text{K}^{-4}$ (B) $\text{W m}^{-2} \text{K}^{-4}$
(C) $\text{J m}^{-2} \text{K}^{-4}$ (D) $\text{W m}^{-2} \text{K}^4$
- 43** Which of the following pairs does NOT have identical dimensions?
(A) Angular momentum and torque (B) Stress and pressure
(C) Impulse and linear momentum (D) Work and energy
- 44** The number of significant figures in 6.023×10^{23} is
(A) 3 (B) 27
(C) 4 (D) 23
- 45** The area of a rectangle with sides 4.234 m and 1.005 m, with correct significant figures, is
(A) 4.255 m^2 (B) 4.2552 m^2
(C) 4.26 m^2 (D) 4.25517 m^2
- 46** Which instrument would be most suitable to measure the diameter of a thin wire of about 0.5 mm?
(A) Metre scale (B) Vernier callipers with LC 0.1 mm
(C) Screw gauge (D) Measuring tape

Answer Key

1	2	3	4	5	6	7	8	9	10
D	A	B	B	C	D	A	C	A	A
11	12	13	14	15	16	17	18	19	20
B	D	C	B	B	D	C	A	B	C
21	22	23	24	25	26	27	28	29	30
B	A	C	D	C	D	D	A	B	D
31	32	33	34	35	36	37	38	39	40
D	A	B	A	B	A	D	B	C	C
41	42	43	44	45	46				
D	B	A	C	A	C				

Hints & Solutions

- (D)** The seven SI base units are metre, kilogram, second, ampere, kelvin, mole and candela. Newton is a derived unit (kg m s^{-2}).
- (A)** $h = E/v \rightarrow [\text{ML}^2\text{T}^{-2}]/[\text{T}^{-1}] = [\text{ML}^2\text{T}^{-1}]$, same as angular momentum (mvr).
- (B)** $F = Gm_1m_2/r^2 \rightarrow G = Fr^2/m^2 = [\text{MLT}^{-2}][\text{L}^2]/[\text{M}^2] = [\text{M}^{-1}\text{L}^3\text{T}^{-2}]$.
- (B)** Leading zeros are not significant; the trailing zero after the decimal is significant. Significant digits: 7, 0, 2, 0 $\rightarrow$ 4.
- (C)** A light year is the distance travelled by light in one year $\approx 9.46 \times 10^{15}$ m.
- (D)** 1 parsec ≈ 3.26 light years $\approx 3.08 \times 10^{16}$ m.
- (A)** Work = $F \cdot s$ and torque = $r \times F$, both $[\text{ML}^2\text{T}^{-2}]$.
- (C)** $F = \eta A(dv/dx) \rightarrow \eta = F/(A \cdot dv/dx) = [\text{MLT}^{-2}]/([\text{L}^2][\text{T}^{-1}]) = [\text{ML}^{-1}\text{T}^{-1}]$.
- (A)** $F = ma = M \cdot L/T^2 \rightarrow M = F T^2 / L = [\text{FL}^{-1}\text{T}^2]$.
- (A)** $K = \frac{1}{2}mv^2 \rightarrow \Delta K/K = \Delta m/m + 2\Delta v/v = 2\% + 6\% = 8\%$.
- (B)** $V \propto r^3 \rightarrow \Delta V/V = 3(\Delta r/r) = 3 \times (0.1/5.0) \times 100 = 6\%$.
- (D)** In multiplication, the result has as many significant figures as the least precise factor ($2.5 \rightarrow 2$ s.f.). $7.85 \rightarrow 7.9$.
- (C)** In addition, keep the least number of decimal places (one, from 2.1). $14.815 \rightarrow 14.8$ g.
- (B)** $LC = 1 \text{ MSD} - 1 \text{ VSD} = 1 - 9/10 = 0.1$ mm.
- (B)** $LC = \text{pitch} / \text{number of circular divisions} = 0.5/50 = 0.01$ mm.
- (D)** Strain = change in length / original length, a ratio, hence dimensionless.
- (C)** Impulse = $F \times t = [\text{MLT}^{-2}][\text{T}] = [\text{MLT}^{-1}]$, same as momentum.
- (A)** Each term must have dimension of $x = [\text{L}]$. $bt^2 = [\text{L}] \rightarrow b = [\text{LT}^{-2}]$.
- (B)** a/V^2 has dimensions of pressure $\rightarrow a = P \times V^2 = [\text{ML}^{-1}\text{T}^{-2}][\text{L}^6] = [\text{ML}^5\text{T}^{-2}]$.
- (C)** b is subtracted from V , so b has dimensions of volume $[\text{L}^3]$.
- (B)** $T \propto l^a g^b \rightarrow [T] = [\text{L}]^a [\text{LT}^{-2}]^b$. $L: a + b = 0$, $T: -2b = 1 \rightarrow b = -\frac{1}{2}$, $a = \frac{1}{2}$. $T \propto \sqrt{l/g}$.

22. (A) Surface tension = force/length = $[MLT^{-2}]/[L] = [MT^{-2}]$.
23. (C) Energy/volume = $[ML^2T^{-2}]/[L^3] = [ML^{-1}T^{-2}]$ = pressure.
24. (D) $1\text{ N} = 1\text{ kg m s}^{-2} = 10^3\text{ g} \times 10^2\text{ cm s}^{-2} = 10^5\text{ dyne}$.
25. (C) $1\text{ J} = 1\text{ kg m}^2\text{ s}^{-2} = 10^3\text{ g} \times 10^4\text{ cm}^2\text{ s}^{-2} = 10^7\text{ erg}$.
26. (D) $\text{dyne cm}^2\text{ g}^{-2} = (10^{-5}\text{ N})(10^{-4}\text{ m}^2)/(10^{-6}\text{ kg}^2) = 10^{-3}\text{ N m}^2\text{ kg}^{-2}$. So $G = 6.67 \times 10^{-11}\text{ SI}$.
27. (D) $\sqrt{g/l} = \sqrt{[LT^{-2}]/[L]} = [T^{-1}]$, the dimension of frequency (angular frequency of a pendulum).
28. (A) $c = 1/\sqrt{\mu_0\epsilon_0}$ is the speed of light, so its dimension is $[LT^{-1}]$.
29. (B) $PV = nRT \rightarrow R = PV/(nT) = \text{energy}/(\text{mol}\cdot\text{K}) = [ML^2T^{-2}K^{-1}\text{mol}^{-1}]$.
30. (D) In addition, absolute errors add: $R = 300\ \Omega$, $\Delta R = 3 + 4 = 7\ \Omega$.
31. (D) $\Delta P/P = 2(1) + 3(2) + 1(3) + \frac{1}{2}(4) = 2 + 6 + 3 + 2 = 13\%$.
32. (A) Mean = 2.31 cm. Absolute errors: 0, 0.02, 0.02, 0.01, 0.01 $\rightarrow$ sum 0.06 $\rightarrow$ mean $0.06/5 = 0.012\text{ cm}$.
33. (B) All have three significant figures, but 5.00 mm has the smallest least count (0.01 mm), so it is the most precise.
34. (A) $q = I \times t \rightarrow [AT]$.
35. (B) $V = W/q = [ML^2T^{-2}]/[AT] = [ML^2T^{-3}A^{-1}]$.
36. (A) $R = V/I = [ML^2T^{-3}A^{-1}]/[A] = [ML^2T^{-3}A^{-2}]$.
37. (D) kWh = power $\times$ time = energy. $1\text{ kWh} = 3.6 \times 10^6\text{ J}$.
38. (B) The argument of sine must be dimensionless, so Bt is dimensionless $\rightarrow B = [T^{-1}]$.
39. (C) $\omega = [T^{-1}]$, $k = [L^{-1}] \rightarrow \omega/k = [LT^{-1}]$, which is wave speed.
40. (C) $n_2 = n_1(M_1/M_2)(L_1/L_2)(T_1/T_2)^{-2} = 8 \times (1/(1/2)) \times (1/2) \times 1 = 8 \times 2 \times \frac{1}{2} = 8$.
41. (D) $\theta = 0.5^\circ = 0.5 \times \pi/180 = 8.73 \times 10^{-3}\text{ rad}$. $D = \theta \times d = 8.73 \times 10^{-3} \times 3.84 \times 10^8 \approx 3.35 \times 10^6\text{ m}$.
42. (B) $E = \sigma T^4$ (power per unit area) $\rightarrow \sigma = (W\text{ m}^{-2})/K^4 = W\text{ m}^{-2}K^{-4}$.
43. (A) Angular momentum $[ML^2T^{-1}]$ vs torque $[ML^2T^{-2}]$ — different. Others match.
44. (C) In scientific notation only the digits of the coefficient count: 6, 0, 2, 3 $\rightarrow$ 4.
45. (A) $4.234 \times 1.005 = 4.255170$. Both have 4 s.f., so the result is 4.255 m^2 .
46. (C) A screw gauge (LC $\approx 0.01\text{ mm}$) gives the precision needed for a sub-millimetre diameter.

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