



NEET — JEE MAINS - ADVANCED

Chapter 1 : Units and Measurement (50 Important MCQs)

by - Tomar Sir

Notes

50 important MCQs from GSEB, CBSE, NEET and JEE exams • Answer key at the end

Section A — Multiple Choice Questions

Each question carries 1 mark. Choose the correct option.

Q.1 is the solid angle subtended by a hemisphere at its centre.

- (A) 1 sr (B) 2π sr (C) 4π sr (D) π sr

Q.2 In the equation $b = a^2 \cos^2 \left(\frac{2\pi\beta\gamma}{\alpha} \right)$, the units of a , α and β are m, s^{-1} and $(m s^{-1})^{-1}$ respectively. The units of b and γ are

- (A) m and $m s^{-2}$ (B) m^2 and $m s^{-2}$ (C) m^2 and $(m s^{-2})^{-1}$ (D) m and $(m s^{-2})^{-1}$

Q.3 The dimensional formula of energy propagated per unit area at a given point in unit time is

- (A) $[M L^2 T^{-2}]$ (B) $[M L^0 T^{-3}]$ (C) $[M L^2 T^{-3}]$ (D) $[M L^0 T^{-1}]$

Q.4 If frequency (F), velocity (V) and density (D) are considered as fundamental units, the dimensional formula for momentum will be

- (A) $[D^2 V^2 F^2]$ (B) $[D V^4 F^{-3}]$ (C) $[D^{-1} V^{-4} F^3]$ (D) $[D V F^{-2}]$

Q.5 The dimensional formula of thermal resistance R_H is

- (A) $[M^{-1} L^{-2} T^{-3} K^2]$ (B) $[M^{-1} L^{-2} T^3 K^{-1}]$ (C) $[M^{-1} L^{-2} T^3 K]$ (D) $[M L^2 T^{-3} K]$

Q.6 In the equation $\left(P + \frac{a}{V^2} \right) (V - b) = RT$, the dimensional formula of $a \cdot b$ will be (where P = pressure, V = volume and T = temperature).

- (A) $[M L^2 T^{-2}]$ (B) $[M L^8 T^{-2}]$ (C) $[M L^2 T^{-2} K]$ (D) $[M L^8 T^{-2} K^{-1}]$

Q.7 $100 \text{ g cm s}^{-1} = x \text{ N s}$, then $x =$

- (A) 3.6×10^{-3} (B) 1×10^{-3} (C) 6×10^{-4} (D) 1×10^{-5}

Q.8 In the equation $\left(P + \frac{a}{V^2} \right) = b \frac{\theta}{V}$, P = pressure, V = volume, θ = absolute temperature, and a , b are constants. Find the dimensions of a .

- (A) $[M L^5 T^{-2}]$ (B) $[M^{-1} L^5 T^2]$ (C) $[M L^{-5} T^{-1}]$ (D) $[M L^5 T]$

Q.9 If force (F), velocity (V) and time (T) are taken as fundamental units, the dimensions of mass are

- (A) $[F V T^{-1}]$ (B) $[F V T^{-2}]$ (C) $[F V^{-1} T^{-1}]$ (D) $[F V^{-1} T]$

Q.10 The critical velocity v_c of a liquid flowing through a tube is expressed as $[\eta^x \rho^y r^z]$, where η , ρ and r are the coefficient of viscosity of the liquid, the density of the liquid and the radius of the tube respectively. The values of x , y and z are:

- (A) 1, 1, 1 (B) 1, -1, -1 (C) -1, -1, 1 (D) -1, -1, -1

Q.11 If Planck's constant (h), the speed of light in free space (c) and Newton's gravitational constant (G) are chosen as the fundamental quantities, the dimensional formula of length will be

- (A) $\sqrt{\frac{hc}{G}}$ (B) $\sqrt{\frac{Gc}{h^{3/2}}}$ (C) $\frac{\sqrt{hG}}{c^{3/2}}$ (D) $\frac{\sqrt{hG}}{c^{5/2}}$

Q.12 A screw gauge has a least count of 0.01 mm and there are 50 divisions on its circular scale. The pitch of the screw gauge is

- (A) 0.25 mm (B) 0.5 mm (C) 1.0 mm (D) 0.01 mm

Q.13 Taking into account the significant figures, what is the value of $9.99 \text{ m} - 0.0099 \text{ m}$?

- (A) 9.98 m (B) 9.980 m (C) 9.9 m (D) 9.9801 m

Q.14 If force $[F]$, acceleration $[A]$ and time $[T]$ are chosen as the fundamental physical quantities, find the dimensions of energy.

- (A) $[F][A^{-1}][T]$ (B) $[F][A][T]$ (C) $[F][A][T^2]$ (D) $[F][A][T^{-1}]$

Q.15 If E and G respectively denote energy and gravitational constant, then $\frac{E}{G}$ has the dimensions of

- (A) $[M^2 L^{-2} T^{-1}]$ (B) $[M^2 L^{-1} T^0]$ (C) $[M L^{-1} T^{-1}]$ (D) $[M L^0 T^0]$

Q.16 The dimensions $[M L T^{-2} A^{-2}]$ belong to the

- (A) magnetic permeability (B) electric permittivity
(C) magnetic flux (D) self inductance

Q.17 Plane angle and solid angle have

- (A) no units and no dimensions (B) both units and dimensions
(C) units but no dimensions (D) dimensions but no units

Q.18 Match List-I with List-II.

List-I	List-II
(a) Gravitational constant (G)	(i) $[L^2 T^{-2}]$
(b) Gravitational potential energy	(ii) $[M^{-1} L^3 T^{-2}]$
(c) Gravitational potential	(iii) $[L T^{-2}]$
(d) Gravitational intensity	(iv) $[M L^2 T^{-2}]$

Choose the correct answer from the options given below.

- (A) (a-ii), (b-iv), (c-iii), (d-i) (B) (a-iv), (b-ii), (c-i), (d-iii)
(C) (a-ii), (b-i), (c-iv), (d-iii) (D) (a-ii), (b-iv), (c-i), (d-iii)

Q.19 The area of a rectangular field (in m^2) of length 55.3 m and breadth 25 m, after rounding off the value for correct significant digits, is

- (A) 1382.5 (B) 14×10^2 (C) 138×10^1 (D) 1382

Q.20 A metal wire has mass $(0.4 \pm 0.002) \text{ g}$, radius $(0.3 \pm 0.001) \text{ mm}$ and length $(5 \pm 0.02) \text{ cm}$. The maximum possible percentage error in the measurement of density will nearly be

- (A) 1.4 % (B) 1.2 % (C) 1.3 % (D) 1.6 %

Q.21 The quantities which have the same dimensions as those of solid angle are:

- (A) strain and arc (B) angular speed and stress
(C) strain and angle (D) stress and angle

Q.22 In a vernier callipers, $(N + 1)$ divisions of the vernier scale coincide with N divisions of the main scale. If 1 MSD represents 0.1 mm, the vernier constant (in cm) is:

- (A) 100 N (B) $10(N + 1)$ (C) $\frac{1}{10N}$ (D) $\frac{1}{100(N+1)}$

Q.23 A force defined by $F = \alpha t^2 + \beta t$ acts on a particle at a given time t . The factor which is dimensionless, if α and β are constants, is:

- (A) $\alpha\beta t$ (B) $\frac{\alpha\beta}{t}$ (C) $\frac{\beta t}{\alpha}$ (D) $\frac{\alpha t}{\beta}$

Q.24 Let $[\epsilon_0]$ denote the dimensional formula of the permittivity of vacuum. If M = mass, L = length, T = time and A = electric current, then:

- (A) $[\epsilon_0] = [M^{-1} L^{-3} T^2 A]$ (B) $[\epsilon_0] = [M^{-1} L^{-3} T^4 A^2]$
(C) $[\epsilon_0] = [M^{-1} L^2 T^{-1} A^{-2}]$ (D) $[\epsilon_0] = [M^{-1} L^2 T^{-1} A]$

Q.25 The diameter and height of a cylinder are measured by a metre scale to be 12.6 ± 0.1 cm and 34.2 ± 0.1 cm respectively. What will be the value of its volume in appropriate significant figures?

- (A) 4264 ± 81 cm³ (B) 4260 ± 80 cm³ (C) 4300 ± 80 cm³ (D) 4264.4 ± 81.0 cm³

Q.26 A quantity x is given by $\frac{IFv^2}{WL^4}$ in terms of moment of inertia I , force F , velocity v , work W and length L . The dimensional formula for x is the same as that of:

- (A) force constant (B) energy density
(C) Planck's constant (D) coefficient of viscosity

Q.27 Work done by a force is $W = \alpha^2 \beta e^{-\beta x^2/kT}$, where x = distance, k = Boltzmann's constant and T = temperature. The dimension of α is

- (A) $[M L^2 T^{-1}]$ (B) $[M^0 L T^0]$ (C) $[M^0 L T^{-2}]$ (D) $[M^2 L T^{-2}]$

Q.28 If momentum $[p]$, area $[A]$ and time $[T]$ are taken as fundamental quantities, the dimensional formula for the coefficient of viscosity is

- (A) $[p A^{-1} T^0]$ (B) $[p A T^{-1}]$ (C) $[p A^{-1} T]$ (D) $[p A^{-1} T^{-1}]$

Q.29 The maximum errors in the measurement of resistance, current and time for which current flows in an electrical circuit are 1 %, 2 % and 3 % respectively. The maximum percentage error in the detection of the dissipated heat will be

- (A) 2 % (B) 4 % (C) 6 % (D) 8 %

Q.30 If the dimensional formula of pressure gradient is X , of electric field is Y , of energy density is W and of latent heat is Z , find the dimensional formula of $\frac{[X][Y]}{[Z][W]}$.

- (A) $[M L^{-2} T^{-1} A]$ (B) $[M L^{-2} T^{-1} A^{-1}]$ (C) $[M^{-1} L^2 T^{-1} A]$ (D) $[M L^2 T^{-1} A^{-1}]$

Q.31 Statement-1: Linear momentum and moment of force have the same dimensions. Statement-2: Planck's constant and angular momentum have the same dimensions.

- (A) Statement-1 is correct while Statement-2 is false.
(B) Statement-1 is false while Statement-2 is correct.
(C) Both statements are correct.
(D) Both statements are false.

Q.32 The resistance $R = \frac{V}{I}$ where $V = (200 \pm 5) \text{ V}$ and $I = (20 \pm 0.2) \text{ A}$. The percentage error in the measurement of R is

- (A) 3.5 % (B) 7 % (C) 3 % (D) 5.5 %

Q.33 If the percentage errors in measuring the length and diameter of a wire are 0.1 % each, then the percentage error in the resistance of the wire is

- (A) 0.3 % (B) 0.2 % (C) 0.1 % (D) 0.4 %

Q.34 Force F depends on distance (x) and time (t) as $F = ax^2 + bt^{1/2}$. Find the dimensions of $\frac{b^2}{a}$.

- (A) $[M L^2 T^{-3}]$ (B) $[M L^{-3} T^3]$ (C) $[M L^3 T^{-3}]$ (D) $[M^2 L^2 T]$

Q.35 For an experimental expression $y = \frac{32.3 \times 1125}{27.4}$, where all the digits are significant, to report the value of y we should write

- (A) $y = 1330$ (B) $y = 1326.2$ (C) $y = 1326.19$ (D) $y = 1326.186$

Q.36 The expression $v = At^2 + \frac{Bt}{C+t}$ shows the variation of velocity (v) with time (t). The dimensions of ABC are

- (A) $[M^0 L T^{-2}]$ (B) $[M^0 L T^{-3}]$ (C) $[M^0 L^2 T^{-3}]$ (D) $[M^0 L^2 T^{-2}]$

Q.37 The dimensional formula of a physical quantity Z is $[M^a L^b T^{-c}]$. The percentage errors in the measurement of mass, length and time are α %, β % and γ % respectively. The percentage error in Z would be

- (A) $(\alpha + \beta + \gamma) \%$ (B) $(\alpha + \beta - \gamma) \%$ (C) $(a\alpha + b\beta + c\gamma) \%$ (D) $(a\alpha + b\beta - c\gamma) \%$

Q.38 The number of significant figures in 0.0060 is

- (A) 4 (B) 3 (C) 2 (D) 1

Q.39 The number of particles crossing a unit area perpendicular to the X-axis in unit time is given by $n = -D \left(\frac{n_2 - n_1}{x_2 - x_1} \right)$, where n_1 and n_2 are the numbers of particles per unit volume at $x = x_1$ and $x = x_2$ respectively, and D is the diffusion constant. The dimensions of D are

- (A) $[M^0 L T^{-2}]$ (B) $[M^0 L^2 T^{-4}]$ (C) $[M^0 L T^{-3}]$ (D) $[M^0 L^2 T^{-1}]$

Q.40 is obtained when the observations 10.65 cm and 10.55 cm are rounded off to three significant figures.

- (A) 10.5 cm (B) 10.6 cm (C) 10.7 cm (D) none of these

Q.41 A body of mass M is suspended by a spring with spring constant k (where $k = \text{force/distance}$). Which of the following has the same dimension as $\left(\frac{M}{k} \right)^{1/2}$?

- (A) Frequency (B) Periodic time (C) Velocity (D) Wavelength

Q.42 Which of the following statements is dimensionally true?

- (A) Pressure is energy per unit area. (B) Pressure is energy per unit volume.
(C) Pressure is force per unit volume. (D) Pressure is momentum per unit volume per unit time.

Q.43 The force acting on a body is given by the equation $F = A \cos Bx + C \sin Dt$, where x is in metre and t is in second. The dimension of $\frac{D}{B} = \dots$

- (A) $[M^0 L T^0]$ (B) $[M^0 L^0 T^{-1}]$ (C) $[M^0 L^{-1} T^0]$ (D) $[M^0 L T^{-1}]$

Q.44 If the unit of force is taken as 1 kN, the unit of length as 1 kilometre and the unit of time as 100 s, then the unit of mass will become kg.

- (A) 10^{-3} (B) 1 (C) 10^3 (D) 10^4

Q.45 If velocity V , acceleration A and force F were chosen as fundamental physical quantities, then angular momentum in terms of V , A and F is

- (A) $[FA^{-1}v]$ (B) $[Fv^3A^{-2}]$ (C) $[Fv^2A^{-1}]$ (D) $[ML^2T^{-1}]$

Q.46 The dimensional formula of $\frac{a}{b}$ in the equation $P = \frac{a-t^2}{bx}$, where P = pressure, x = distance and t = time, is

- (A) $[M^2LT^{-3}]$ (B) $[ML^0T^{-2}]$ (C) $[ML^3T^{-2}]$ (D) $[M^0LT^{-3}]$

Q.47 In $S = A(1 - e^{-Bxt})$, S = speed and x = displacement. Write the unit of B .

- (A) $m^{-1}s^{-1}$ (B) $m^{-2}s$ (C) s^{-2} (D) s^{-1}

Q.48 Which of the following pairs does not have identical dimensional formulae?

- (A) Moment of inertia and moment of force (B) Work and torque
(C) Angular momentum and Planck's constant (D) Impulse and momentum

Q.49 The velocity of water waves depends on the wavelength λ , gravity g and density of water ρ . Derive the relation between velocity (v), density (ρ), wavelength (λ) and gravity (g).

- (A) $v^2 \propto \lambda^{-1}\rho^{-1}$ (B) $v^2 \propto \lambda g \rho$ (C) $v^2 \propto \lambda g$ (D) $v^2 \propto \lambda^{-3}g^{-4}$

Q.50 The main scale of a vernier callipers has n divisions/cm. n divisions of the vernier scale coincide with $(n - 1)$ divisions of the main scale. The least count of the vernier callipers is cm.

- (A) $\frac{1}{(n-1)(n+1)}$ (B) $\frac{1}{n}$ (C) $\frac{1}{n^2}$ (D) $\frac{1}{n(n+1)}$

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	11	C	21	C	31	B	41	B
2	B	12	B	22	D	32	A	42	B
3	B	13	A	23	D	33	A	43	D
4	B	14	C	24	B	34	C	44	D
5	C	15	B	25	B	35	A	45	B
6	B	16	A	26	B	36	C	46	B
7	B	17	C	27	B	37	C	47	A
8	A	18	D	28	A	38	C	48	A
9	D	19	B	29	D	39	D	49	C
10	B	20	D	30	B	40	B	50	C