PHYSICS

CLASS-XI NEET

MODULE-01

Units and measurements

Motion in a straight line | Motion in a plane | Laws of motion

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1. The time dependence of a physical quantity P is given by $P = P_0 \exp(-\alpha t^2)$, where α is a constant and t is time. The constant α is:

a. Dimensionless
b. Has dimensions T^{-2}
c. Has dimension of P
d. Has dimensions T^2

2. Which of the following sets cannot enter into the list of fundamental quantities in any system of units?

a. Length, time and velocity
b. Length, mass and velocity
c. Mass, time and velocity
d. Length, time and mass

3. Dimensions of 'ohm' are same as (where h is planck's constant and e is charge):

a. $\frac{h}{e}$
b. $\frac{h}{e^2}$
c. $\frac{h^2}{e}$
d. $\frac{h^2}{e^2}$

4. The quantity $X = \frac{\varepsilon_0 LV}{t}$; ε_0 is the permitivity of free space, L is length, V is potential difference and t is time. The dimensions of X are same as that of:

a. Resistance
b. Charge
c. Voltage
d. Current

5. The velocity of a particle (V) at a instant (t) is given by $V = at + bt^2$ the dimension of b is:

a. L
b. LT^{-1}
c. LT^{-2}
d. LT^{-3}

6. If force (F), length (l) and Current (I) and time (T) are taken as bases then the dimensions of ε_0 are:

a. $[FL^2 I^2 T^{-2}]$
b. $[F^{-1} L^2 I^2 T^2]$
c. $[F^{-1}L^{-2}T^2I^2]$
d. $[F^2L^2T^2I^2]$

7. If Planck's constant (h) and speed of light in vaccum (c) are taken as two fundamental quantities, which one of the following should not, in addition, be taken to express length, mass and time in terms of the three chosen fundamental quantities?

a. Mass of electron (m_e)
b. Universal gravitational constant (G)
c. Charge of electron (e)
d. Mass of proton (m_p)

8. The SI unit of energy is J = kg m^2 s^{-2} that of speed v is ms^{-1} and of acceleration a is ms^{-2}. Which of the formulae for kinetic energy (K) given below can you rule out on the basic of dimensional arguments (m stands for the mass of the body).

I. $K = m^2v^2$
II. $K = (1/2)\, mv^2$
III. $K = ma$
IV. $K = (3/16)\, mv^2$
V. $K = \left(\frac{1}{2}\right)mv^2 + ma$

a. I and II
b. Only II
c. II and IV
d. I, III and V

9. A physical quantity P is given by $P = \frac{A^3 b^{1/2}}{C^{-4} D^{3/2}}$. The quantity which brings in the maximum percentage error in P is:

a. A
b. B
c. C
d. D

10. A body travels uniformly a distance of (13.8 ± 0.2)m in a time (4.0 ± 0.3)sec. The velocity of the body within error limits is:

a. (3.45 ± 0.2)m/sec
b. (3.45 ± 0.3)m/sec
c. (3.45 ± 0.4)m/sec
d. (3.45 ± 0.5)m/sec

11. If $Q = \frac{X^n}{Y^m}$ and Δx is absolute error in the measurement of X, Δy is absolute error in the measurement of Y, then absolute error ΔQ in Q is:

a. $\Delta Q = \pm\left(n\frac{\Delta x}{x} + m\frac{\Delta y}{y}\right)$
b. $\Delta Q = \pm\left(n\frac{\Delta x}{x} + m\frac{\Delta y}{y}\right)Q$
c. $\Delta Q = \pm\left(n\frac{\Delta x}{x} - m\frac{\Delta y}{y}\right)Q$
d. $\Delta Q = \pm\left(\frac{n\Delta x}{x} - \frac{m\Delta y}{y}\right)Q$

12. The length of a rod is (11.05 ± 0.05)cm. What is the length of two rods?

a. (22.1 ± 0.05) cm
b. (22.1 ± 0.2) cm
c. (22.10 ± 0.05) cm
d. (22.10 ± 0.10) cm

13. A uniform wire of length L, diameter D and density ρ is stretched under a tension T. The correct relation between its fundamental frequency f, the length L and the diameter D is:

a. $f \propto \frac{1}{LD}$
b. $f \propto \frac{1}{L\sqrt{D}}$
c. $f \propto \frac{1}{D^2}$
d. $f \propto \frac{1}{LD^2}$

14. If E = energy, G = gravitational constant, I = Impulse and M = mass, then dimensions of $\frac{GIM^2}{E^2}$ are same as that of

a. Time b. Mass
c. Length d. Force

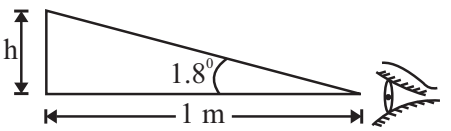
15. The dimension of $\frac{e^2}{4\pi\varepsilon_0 hc}$, where e, ε_0, h and c are electric charge, electric permittivity, Planck's constant and velocity of light in vacuum respectively

a. $[M^0L^0T^0]$ b. $[ML^0T^0]$
c. $[M^0LT^0]$ d. $[M^0L^0T]$

16. A gas bubble formed from an explosion under water oscillates with a period T proportional to $p^a d^b E^c$, where p is pressure, d is the density of water and E is the total energy of explosion. The values of a, b and c are

a. a = 1, b = 1, c = 2 b. a = 1, b = 2, c = 1
c. $a=\frac{5}{6}, b=\frac{1}{2}, c=\frac{1}{3}$ d. $a=-\frac{5}{6}, b=\frac{1}{2}, c=\frac{1}{3}$

17. A normal human eye can see an object making an angle of 1.8° at the eye. What is the approximate height of object which can be seen by an eye placed at a distance of 1 m from the object?



a. π cm b. 2π cm
c. 4π cm d. 3π cm

18. In the relation $P=\frac{\alpha}{\beta}e^{\frac{\alpha z}{k\theta}}$ P is pressure, Z is the distance, K is Boltzmann's constant and θ is the temperature. The dimensional formula of α will be:

a. $[M^1L^1T^{-2}]$ b. $[M^1L^2T^1]$
c. $[M^1L^0T^{-1}]$ d. $[M^0L^2T^{-1}]$

19. Consider the equation $\frac{d}{dt}\left(\int \vec{F}\cdot d\vec{S}\right)=A\left(\vec{F}\cdot\vec{p}\right)$ where $\vec{F}$ = force, $\vec{s}$ = displacement, t = time and $\vec{p}$ = momentum. The dimensional formula of A will be :

a. $M^0L^0T^0$ b. ML^0T^0
c. $M^{-1}L^0T^0$ d. $M^0L^0T^{-1}$

20. If P, Q, R are physical quantities, having different dimensions, which of the following combinations can never be a meaningful quantity?

a. $\frac{(P-Q)}{R}$ b. PQ – R
c. $\frac{PQ}{R}$ d. $\frac{(PR-Q^2)}{R}$

21. Given that the displacement of an oscillating particle is given by y = A sin(Bx + Ct + D). The dimensional formula for (ABCD) is:

a. $[M^0L^{-1}T^0]$ b. $[M^0L^0T^{-1}]$
c. $[M^0L^{-1}T^{-1}]$ d. $[M^0L^0T^0]$

22. Force F and density d are related as $F=\frac{\alpha}{\beta+\sqrt{d}}$ then find the dimensions of α:

a. $[M^{1/2}L^{-½}T^{-2}]$ b. $[M^{3/2}L^{½}T^2]$
c. $[M^{3/2}L^{-½}T^{-2}]$ d. $[M^2L^{-½}T^2]$

23. Frequency is the function of density (ρ), length (a) and surface tension (T). The value is:

a. $\frac{k\rho^{1/2}a^{3/2}}{\sqrt{T}}$ b. $\frac{k\rho^{3/2}a^{3/2}}{\sqrt{T}}$
c. $\frac{k\rho^{1/2}a^{3/2}}{T^{3/4}}$ d. None of these

24. A liquid of coefficient of viscosity η is flowing steadily through a capillary tube of radius "r" and length "l". If V is volume of liquid flowing per second, the pressure difference "P" at the end of tube is given by:

a. $P=\frac{8\pi lv}{\eta r^4}$ b. $P=\frac{8\eta r^4 l}{\pi v}$
c. $P=\frac{8\eta lv}{\pi r^4}$ d. $P=\frac{8\eta r^4 v}{\pi l}$

25. The mass and volume of a body are 4.237 g and 2.5 cm^3, respectively. The density of the material of the body in correct significant figures is:

a. 1.6048 g cm^{-3} b. 1.69 g cm^{-3}
c. 1.7 g cm^{-3} d. 1.695 g cm^{-3}

26. The length and breadth of a rectangular sheet are 16.2 cm and 10.1 cm, respectively. The area of the sheet in appropriate significant figures and error is:

a. 164 ± 3 cm^2 b. 163.62 ± 2.6 cm^2
c. 163.6 ± 2.6 cm^2 d. 163.62 ± 3 cm^2

27. You measure two quantities as A = 1.0 m ± 0.2 m, B = 2 .0 m ± 0.2 m. We should report correct value for $\sqrt{AB}$ as:

a. 1.4 m ± 0.4 m b. 1.41 m ± 0.15 m
c. 1.4 m ± 0.3 m d. 1.4 m ± 0.2 m

28. On the basis of dimensions, decide which of the following relations for the displacement of a particle undergoing simple harmonic motion is not correct?

a. $y = a \sin 2\pi\, t/T$ b. $y=a\sin\frac{vt}{\lambda}$
c. $y=\frac{a}{t}\sin\left(\frac{t}{a}\right)$ d. $y=a\sqrt{2}\left(\sin\frac{2\pi t}{T}-\cos\frac{2\pi t}{T}\right)$

29. If P, Q and R are physical quantities, having different dimensions, which of the following combinations can never be a meaningful quantity?

a. (PQ – Q)/R b. PQ – R
c. PQ /R d. (R + Q)/P

ABOUT PHYSICS WALLAH

Alakh Pandey is one of the most renowned faculty in NEET & JEE domain's Physics. On his YouTube channel, Physics Wallah, he teaches the Science courses of 11th and 12th standard to the students aiming to appear for the engineering and medical entrance exams.

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