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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Physics Wallah

Multi-Concept Questions

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1. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants, which of the following combinations of these has the dimension of length?

a. $\sqrt{\frac{hc}{G}}$ b. $\sqrt{\frac{G}{h^{3/2}}}$

c. $\sqrt{\frac{hG}{c^{5/2}}}$ d. $\frac{\sqrt{hG}}{c^{3/2}}$

2. A book with many printing errors contains four different formulae for the displacement y of a particle undergoing a certain periodic motion.

I. $y = a\sin\frac{2\pi t}{T}$

II. $y = a \sin vt$

III. $y = \left(\frac{a}{T}\right)\sin\left(t/a\right)$

IV. $y = \left(\frac{a}{\sqrt{2}}\right)\left(\sin\frac{2\pi t}{T} + \cos\frac{2\pi t}{T}\right)$

(Where, a = maximum displacement of the particle, v = speed of the particle, T = time period of motion). Which is the wrong formulae on dimensional grounds?

a. I, II and III b. III and II

c. I and IV d. II and I

3. The relative density of a metal may be found by hanging a block of the metal from a spring balance and nothing that in air, the balance reads (5.00 ± 0.05)N while in water, it reads (4.00 ± 0.05)N. The relative density would be quoted as:

a. 5.00 ± 0.05 b. 5.00 ± 11%

c. 5.00 ± 0.10 d. 5.00 ± 6%

4. In a vernier calipers, one main scale division is x cm and n division of the vernier scale coincide with (n-1) divisions of the main scale. The least count (in cm) of the calipers is:

a. $\left(\frac{n-1}{n}\right)x$ b. $\left(\frac{nx}{n-1}\right)$

c. $\frac{x}{n}$ d. $\left(\frac{x}{n-1}\right)$

5. The speed of light c, gravitational constant G and Planck's constant h are taken as fundamental units in a system. The dimensions of time in this new system should be

a. $[G^{1/2}h^{1/2}c^{-5/2}]$ b. $[G^{-1/2}h^{1/2}c^{1/2}]$

c. $[G^{-1/2}h^{1/2}c^{-3/2}]$ d. $[G^{-1/2}h^{1/2}c^{1/2}]$

6. The position of the particle moving along Y-axis is given as $y = At^2 - Bt^3$, where y is measured in metre and t in second. Then, the dimensions of B are

a. $[LT^{-2}]$ b. $[LT^{-1}]$

c. $[LT^{-3}]$ d. $[MLT^{-2}]$

7. A physical quantity x is given by $x = \frac{2k^3l^2}{m\sqrt{n}}$. The percentage error in the measurements of k, l, m and n are 1%, 2%, 3% and 4% respectively. The value of x is uncertain by

a. 8% b. 10%

c. 12% d. None of these

8. It is known that the time of revolution T of a satellite around the earth depends on the universal gravitational constant G, the mass of the earth M, and the radius of the circular orbit R. Obtain an expression for T using dimensional analysis.

a. $2\pi\sqrt{\frac{R^3}{GM}}$ b. $\pi\sqrt{\frac{R^3}{GM}}$

c. $\pi\sqrt{\frac{R}{GM}}$ d. None of these

9. A uniform wire of length L and mass M is stretched between two fixed points, keeping a tension F. A sound of frequency μ is impressed on it. Then the maximum vibrational energy is existing in the wire when μ=

a. $\frac{1}{2}\sqrt{\frac{ML}{F}}$ b. $\sqrt{\frac{FL}{M}}$

c. $2\times\sqrt{\frac{FM}{L}}$ d. $\frac{1}{2}\sqrt{\frac{F}{ML}}$

10. Given: $\text{Force} = \frac{\alpha}{\text{density} + \beta^3}$. What are the dimensions of α, β?

a. $ML^{-2}T^{-2}$, $ML^{-1/3}$ b. $M^2L^4T^{-2}$, $M^{-1/3}L^{-1}$

c. $M^2L^{-2}T^{-2}$, $M^{1/3}L^{-1}$ d. $M^2L^{-2}T^{-2}$, ML^{-3}

11. The dimension of a/b in the equation $P = \frac{a - t^2}{bx}$ where P is pressure, x is distance and t is time, are:

a. $[M^2 L T^{-3}]$ b. $[MT^{-2}]$

c. $[LT^{-3}]$ d. $[ML^3 T^{-1}]$

12. If E, m, l and G denote energy, mass, angular momentum and gravitational constant respectively, the quantity $\left(\frac{El^2}{m^5G^2}\right)$ has the dimensions of:

a. Mass b. Length

c. Time d. Angle

13. If the units of length , velocity and force are half, then the units of Power will be :

a. Doubled b. Halved

c. $\frac{1}{4}$th d. Remain unaffected

14. Suppose mass, velocity & time were fundamental physical quantities then find the dimensional formula of pressure.

a. $[M^1V^{-1}T^{-2}]$ b. $[M^1V^{-1}T^{-3}]$

c. $[M^1V^{-2}T^{-3}]$ d. $[M^2V^{-2}T^{-3}]$

15. According to Newton, the viscous force acting between liquid layers of area (A) and velocity gradient $\left(\frac{\Delta V}{\Delta Z}\right)$ is given by $F = -\eta A\frac{\Delta V}{\Delta Z}$, where η is constant called coefficient of viscosity. The dimensional formula of η is:

a. $[ML^{-2}T^{-2}]$ b. $[M^0L^0T^0]$

c. $[ML^2T^2]$ d. $[ML^{-1}T^{-1}]$

16. Given that $\int\frac{dx}{\sqrt{2ax - x^2}} = a^n\sin^{-1}\left(\frac{x - a}{a}\right)$ where a = constant, using dimensional analysis, the value of n is-

a. 1 b. –1

c. 0 d. None of the above

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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