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Instructor: Vikas Sharma Sir

Target: JEE Main & Advanced | NEET
Marking Scheme: +4 & -1
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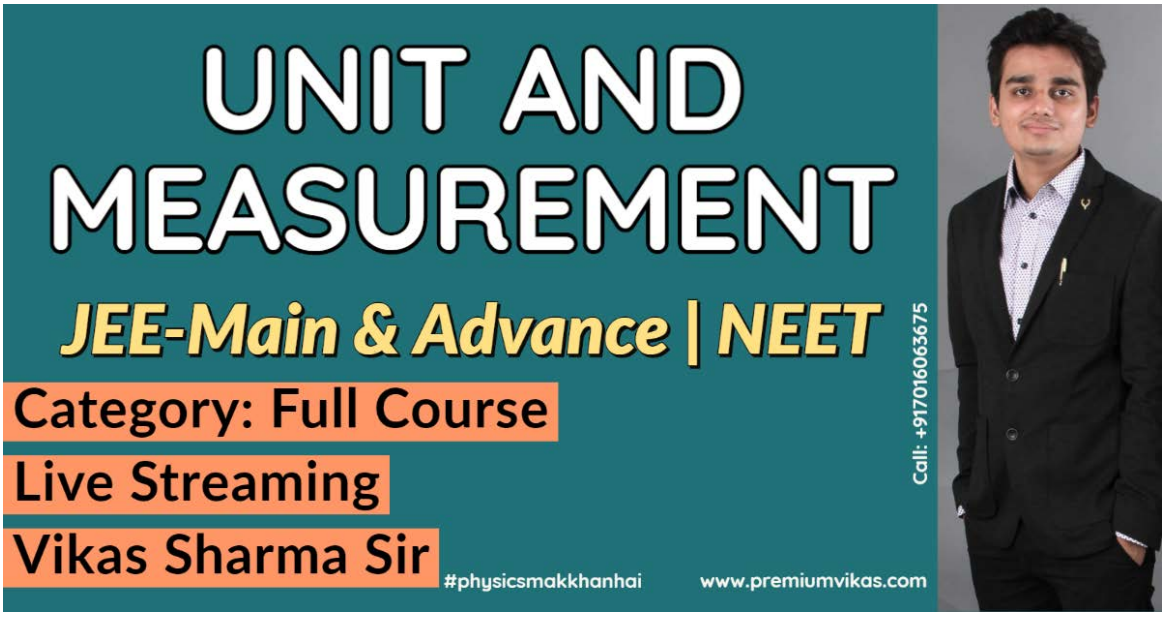

01. The length of a simple pendulum executing simple harmonic motion is increased by 21%. The percentage increase in the time period of pendulum of increased length is

(a) 11% (b) 21%
(c) 42% (d) 10.5%

02. The length of a given cylindrical wire is increased by 100%. Due to consequent decrease in diameter the change in the resistance of the wire will be

(a) 200% (b) 100%
(c) 50% (d) 300%

03. If physical quantity x is represented by $x = [M^a L^b T^{-c}]$ and the maximum percentage errors in M, L and T are α%, β% and γ%, respectively then the total maximum error in x is

(a) $(\alpha a + \beta b - \gamma c) \times 100\%$
(b) $(\alpha a + \beta b + \gamma c) \times 100\%$
(c) $(\alpha a - \beta b - \gamma c) \times 100\%$
(d) $\frac{\alpha a + \beta b}{\gamma c} \times 100\%$

04. While measuring acceleration due to gravity by a simple pendulum, a student makes a positive error of 2% in length of the pendulum and a positive error of 1% in the value of time period. The actual percentage error in the measurement of the value of g will be

(a) 3% (b) 4%
(c) 5% (d) 0%

05. The percentage errors in the measurement of mass and speed are 2% and 3%, respectively. How much will be the maximum error in kinetic energy?

(a) 1% (b) 5%
(c) 8% (d) 12%

06. A physical parameter a can be determined by measuring the parameters b, c, d and e using the relation $a = b^\alpha c^\beta / d^\gamma e^\delta$. If the maximum errors in the measurement of b, c, d and e are b_1%, c_1%, d_1% and e_1%, then the maximum error in the value of a determined by the experiment is

(a) $(b_1 + c_1 + d_1 + e_1)$%
(b) $(b_1 + c_1 - d_1 - e_1)$%
(c) $(\alpha b_1 + \beta c_1 - \gamma d_1 - \delta e_1)$%
(d) $(\alpha b_1 + \beta c_1 + \gamma d_1 + \delta e_1)$%

07. Heat is evolved in a resistance on passing current up to definite time. Measurements for current time and resistance suffer practical errors of magnitudes 1%, 2% and 2%, respectively. The maximum percentage error in the heat evolved will be

(a) 3% (b) 3/4%
(c) 6% (d) 4%

08. The random error in the arithmetic mean of 100 observations is x, then random error in the arithmetic mean of 400 observations would be

(a) $\frac{1}{4}x$ (b) $\frac{1}{2}x$
(c) $4x$ (d) $2x$

09. If the error in the measurement of momentum of a particle is 100% then the error in the measurement of kinetic energy would be

(a) 400% (b) 300%
(c) 200% (d) 100%

10. The measured mass and volume of a body are 22.42 g and 4.7 cm^3, respectively. The maximum possible error in density is approximately

(a) 2% (b) 0.2%
(c) 1% (d) 10%

11. The resistance $R = \frac{V}{i}$ where $V = 100 \pm 5$ volts and $i = 10 \pm 0.2$ amperes. What is the total error in R?

(a) 5% (b) 7%
(c) 5.2% (d) $\frac{5}{2}$%

12. The period of oscillation of a simple pendulum in the experiment is recorded as 2.63 s, 2.56 s, 2.42 s, 2.71 s and 2.80 s respectively. The average absolute error is

(a) 0.1 s (b) 0.11 s
(c) 0.01 s (d) 1.0 s

13. If separation between screen and point source is increased by 2% what would be the effect on the intensity?

(a) Increases by 4% (b) Increases by 2%
(c) Decreases by 2% (d) Decreases by 4%

14. The heat generated in a circuit is dependent upon the resistance, current and time for which the current is flown. If the errors in measuring the above are 1%, 2% and 1%, respectively, then the maximum error in measuring heat is

(a) 8% (b) 6%
(c) 18% (d) 12%

15. In the measurement of physical quantity $X = \frac{A^2 B}{C^{1/3} D}$, the percentage error introduced in the measurements

of the quantities A, B, C and D are 2%, 2%, 4% and 5%, respectively. Then the minimum amount of percentage error in the measurement of X is contributed by

(a) A (b) B
(c) C (d) D

16. The velocity of water waves v may depend upon their wave length λ, the density of water ρ and the acceleration due to gravity g. The method of dimensions gives the relation between these quantities as

(a) $v^2 \propto \lambda g^{-1}\rho^{-1}$ (b) $v^2 \propto g\lambda\rho$
(c) $v^2 \propto g\lambda$ (d) $v^2 \propto g^{-1}\lambda^{-3}$

17. A small steel ball of radius r is allowed to fall under gravity through a column of a viscous liquid of coefficient of viscosity η. After some time the velocity of the ball attains a constant value known as terminal velocity v_T. The terminal velocity depends on (i) the mass of the ball m, (ii) η, (iii) r and (iv) acceleration due to gravity g.Which of the following relations is dimensionally correct?

(a) $v_T \propto \dfrac{mg}{\eta r}$ (b) $v_T \propto \dfrac{\eta r}{mg}$

(c) $v_T \propto \eta rmg$ (d) $v_T \propto \dfrac{mgr}{\eta}$

18. In a system of units if force (F), acceleration (A) and time (T) and taken as fundamental units then the dimensional formula of energy is

(a) FA^2T (b) FAT^2
(c) F^2AT (d) FAT

19. Parallactic second is the unit of

(a) time (b) velocity
(c) distance (d) angle

20. The current flowing through a resistor 10.932 ohm is 4.25 amp. The potential difference is 46.461 volt. The potential in significant figures is

(a) 46.461 V (b) 46.46 V
(c) 46.4 V (d) 46.0 V

21. The velocity v (in cms^{-1}) of a particle is given in terms of time t (in seconds) by the relation, $v = at + \dfrac{b}{t+c}$; the dimensions of a, b and c are

(a) $a = L^2, b = T, c = LT^2$
(b) $a = TL^2, b = LT, c = L$
(c) $a = LT^{-2}, b = L, c = T$
(d) $a = L, b = LT, c = T^2$

22. If $x = at + bt^2$, where x is the distance travelled by the body in kilometre while t is the time in second, then the unit of b are

(a) km/s (b) km-s
(c) km/s^2 (d) km-s^2

23. If the velocity of light (c), gravitational constant (G) and Planck's constant (h) are chosen as fundamental units, then which of the following represents the dimensions of the mass?

(a) $[c^{1/2}\, G^{1/2}\, h^{1/2}]$ (b) $[c^{1/2}\, G^{-1/2}\, h^{-1/2}]$
(c) $[c^{1/2}\, G^{-3/2}\, h^{1/2}]$ (d) $[c^{-1/2}\, G^{1/2}\, h^{1/2}]$

24. The quantity X is given by $\varepsilon_0 L \dfrac{\Delta V}{\Delta t}$ where ε_0 is the permittivity of free space, L is a length, ΔV is a potential difference and Δt is a time interval. The dimensional formula for X is same as that of

(a) resistance (b) charge
(c) voltage (d) current

25. In the plane progressive wave propagating with velocity v, the displacement of a wave particle at a position x in time t is represented by the equation:

$$y = a \sin k(vt - x)$$

where, a is the amplitude. The dimension of k will be

(a) $[LT^{-1}]$ (b) $[LT^0]$
(c) $[L^{-1}T^{-1}]$ (d) $[L^{-1}T^0]$

26. In the gas equation $\left(P + \dfrac{a}{V^2}\right)(V - b) = RT$, the dimensions of constant a is

(a) $[L^3]$ (b) $[ML^3T^{-2}]$
(c) $[ML^5T^{-2}]$ (d) $[ML^2T^0]$

27. Position of a body with acceleration a is given by $x = Ka^m t^n$, here t is time. Find dimensions of m and n.

(a) $m = 1, n = 1$ (b) $m = 1, n = 2$
(c) $m = 2, n = 1$ (d) $m = 2, n = 2$

28. If the dimensions of length are expressed as $G^x c^y h^z$, where G, c and h are the universal gravitational constant, speed of light and the Planck's constant, respectively, then

(a) $x = \dfrac{1}{2}, y = \dfrac{1}{2}$ (b) $x = \dfrac{1}{2}, z = -\dfrac{1}{2}$

(c) $y = \dfrac{1}{2}, z = \dfrac{3}{2}$ (d) $y = -\dfrac{3}{2}, z = \dfrac{1}{2}$

29. If E, M, L and G denotes energy, mass, angular momentum and universal gravitational constant, respectively, then EL^2/M^5G^2 represents the unit of

(a) length (b) mass

(c) time (d) angle

30. If the energy (E), velocity (v) and force (F) be taken as the fundamental quantity, then the dimensions of mass will be

(a) Fv^{-2} (b) Fv^{-1}

(c) Ev^{-2} (d) Ev^2

31. The force F is given in terms of time t and displacement x by the equation:

$$F = a \cos \alpha x + b \sin \beta t$$

where a and b are the amplitudes. The dimensions of β/α are:

(a) $[M^0L^0T^0]$ (b) $[M^0L^0T^{-1}]$

(c) $[M^0L^{-1}T^0]$ (d) $[M^0L^1T^{-1}]$

32. Given that $y = A\sin\left(\frac{2\pi}{\lambda}(ct - x)\right)$,

where y and x are measured in metres. Which of the following statements is ture?

(a) The unit of λ is same as that of x and A.

(b) The unit of λ is same as that of x but not of A.

(c) The unit of c is same as that of $2\pi/\lambda$.

(d) The unit of $(ct - x)$ is same as that of $2\pi/\lambda$.

33. If error in measurement of radius of sphere is 1%, what will be the error in measurement of volume?

(a) 1% (b) 1/3%

(c) 3% (d) 10%

In the following questions, a statement of assertion is followed by a statement of reason. You are required to choose the correct one out of the given five responses and *mark it as*

(a) *If both assertion and reason are true and reason is the correct explanation of the assertion.*

(b) *If both assertion and reason are true but reason is not correct explanation of the assertion.*

(c) *If assertion is true, but reason is false.*

(d) *If both assertion and reason are false.*

(e) *If reason is true but assertion is false.*

34.Assertion: SI units are logical and coherent.

Reason: SI system of units is a rationalised system.

35.Assertion: In the relation $f = \frac{1}{2l}\sqrt{\frac{T}{\mu}}$, where symbols have standard meaning, m represent linear mass density.

Reason: The frequency has the dimensions of inverse of time.

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