SHANTIBARTA FOUNDATION

Subject : Physics
Standard : 11
Total Mark : 180

Unit and Measurement

Paper Set : 1
Date : 18-11-2022
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Physics - Section A - MCQ

[1] The SI unit of a physical quantity is pascal-second. The dimensional formula of this quantity will be .....

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

[2] If pressure P, velocity V and time T are taken as fundamental physical quantities, the dimensional formula of force is

(A) PV^2T^2 (B) $P^{-1}V^2T^{-2}$ (C) PVT^2 (D) $P^{-1}VT^2$

[3] Match List-I with List-II and select the correct answer by using the codes given below the lists

List - I	List - II
(A) Distance between earth and stars	(1) Microns
(B) Inter-atomic distance in a solid	(2) Angstroms
(C) Size of the nucleus	(3) Light years
(D) Wavelength of infrared laser	(4) Fermi
	(5) Kilometres

(A) $A-5, B-4, C-2, D-1$ (B) $A-3, B-2, C-4, D-1$ (C) $A-5, B-2, C-4, D-3$ (D) $A-3, B-4, C-1, D-2$

[4] The Bernoulli's equation is given by $p+\frac{1}{2}\rho v^2+h\rho g=k$
where $p=$ pressure, $\rho=$ density, $v=$ speed, $h=$ height of the liquid column, $g=$ acceleration due to gravity and k is constant. The dimensional formula for k is same as that for

(A) Velocity gradient (B) Pressure gradient (C) Modulus of elasticity (D) Thrust

[5] According to Joule's law of heating, heat produced $H=I^2Rt$, where I is current, R is resistance and t is time. If the errors in the measurement of I, R and t are $3\%, 4\%$ and 6% respectively then error in the measurement of H is

(A) $\pm 17\%$ (B) $\pm 16\%$ (C) $\pm 19\%$ (D) $\pm 25\%$

[6] The dimensional formula for impulse is same as the dimensional formula for

(A) Momentum (B) Force (C) Angular momentum (D) Torque

[7] Dimensions of $\frac{1}{\mu_0\varepsilon_0}$, where symbols have their usual meaning, are

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

[8] If x and a stand for distance then for what value of n is given equation dimensionally correct the eq. is $\int \frac{dx}{\sqrt{a^2-x^n}} = \sin^{-1}\frac{x}{a}$

(A) 0 (B) 2 (C) -2 (D) 1

[9] The pair(s) of physical quantities that have the same dimensions, is (are)

(A) Reynolds number and coefficient of friction (B) Latent heat and gravitational potential
(C) Curie and frequency of a light wave (D) All of these

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

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

[11] Measure of two quantities along with the precision of respective measuring instrument $A=2.5\,ms^{-1}\pm 0.5\,ms^{-1}$, $B=0.10\,s\pm 0.01\,s$ The value of AB will be

(A) $(0.25\pm 0.08)\,m$ (B) $(0.25\pm 0.5)\,m$ (C) $(0.25\pm 0.05)\,m$ (D) $(0.25\pm 0.135)\,m$

[12] The maximum percentage errors in the measurement of mass (M), radius (R) and angular velocity (ω) of a ring are 2%, 1% and 1% respectively, then find the maximum percenta? error in the measurement of its moment of inertia $\left(1=\frac{1}{2}MR^2\right)$ about its geometric axis.

(A) 4 (B) 5 (C) 6 (D) 7

[13] Unit of self inductance is

(A) $\frac{Newton-second}{Coulomb\times Ampere}$ (B) $\frac{Joule/Coulomb\times Second}{Ampere}$ (C) $\frac{Volt\times metre}{Coulomb}$ (D) $\frac{Newton\times metre}{Ampere}$

[14] The resistance $R=\frac{V}{I}$, where $V=(50\pm 2)\ V$ and $I=(20\pm 0.2)\ A$. The percentage error in R is $'x'$%. The value of $'x'$ to the nearest integer is .....

(A) 3 (B) 6 (C) 7 (D) 5

[15] The dimensions of inter atomic force constant are

(A) MT^{-2} (B) MLT^{-1} (C) MLT^{-2} (D) $ML^{-1}T^{-1}$

[16] The least count of stop watch is $\frac{1}{5}\ second$. The time of 20 oscillations of pendulum is measured to be $25\ seconds$. Then percentage error in the measurement of time will be..... %

(A) 8 (B) 1 (C) 0.8 (D) 16

[17] If force (F), length (L) and time (T) are assumed to be fundamental units, then the dimensional formula of the mass will be

(A) $FL^{-1}T^2$ (B) $FL^{-1}T^{-2}$ (C) $FL^{-1}T^{-1}$ (D) FL^2T^2

[18] Two full turns of the circular scale of screw gauge cover a distance of $1\ mm$ on scale. The total number of divisions on circular scale is 50. Further, it is found that screw gauge has a zero error of $+0.03\ mm$. While measuring the diameter of a thin wire a student notes the main scale reading of $3\ mm$ and the number of circular scale division in line, with the main scale is 35. The diameter of the wire is ..... mm

(A) 3.32 (B) 3.73 (C) 3.67 (D) 3.38

[19] Unit of Stefan's constant is

(A) $J\,s^{-1}$ (B) $J\,m^{-2}s^{-1}K^{-4}$ (C) $J\,m^{-2}$ (D) $J\,s$

[20] $Pascal-Second$ has dimension of

(A) Force (B) Energy (C) Pressure (D) Coefficient of viscosity

[21] The density of a material is CGS system of units is $4\ g/cm^3$. In a system of units in which unit of length is $10\ cm$ and unit of mass is $100\ g$, the value of density of material will be

(A) 400 (B) 0.04 (C) 0.4 (D) 40

[22] If the unit of length and force be increased four times, then the unit of energy is

(A) Increased 4 times (B) Increased 8 times (C) Increased 16 times (D) Decreased 16 times

[23] E, m, l and G denote energy, mass, angular momentum and gravitational constant respectively, then the dimension of $\frac{El^2}{m^5G^2}$ are

(A) Angle (B) Length (C) Mass (D) Time

[24] The dimensional formula $M^0L^2T^{-2}$ stands for

(A) Torque (B) Angular momentum

(C) Latent heat (D) Coefficient of thermal conductivity

[25] A physical quantity z depends on four observables a, b, c and d, as $z=\frac{a^2b^{\frac{2}{3}}}{\sqrt{c}d^3}$. The percentage of error in the measurement of a, b, c and d are $2\%, 1.5\%, 4\%$ and 2.5% respectively. The percentage of error in z is.....%

(A) 12.5 (B) 14.5 (C) 16.5 (D) 13.5

[26] The force F on a sphere of radius $'a'$ moving in a medium with velocity $'v'$ is given by $F=6\pi\eta av$. The dimensions of η are

(A) $ML^{-1}T^{-1}$ (B) MT^{-1} (C) MLT^{-2} (D) ML^{-3}

[27] Dimensional formula for thermal conductivity is (here K denotes the temperature)

(A) $MLT^{-3}K$ (B) $MLT^{-2}K$ (C) $MLT^{-2}K^{-2}$ (D) $MLT^{-3}K^{-1}$

[28] The dimension of $\frac{1}{\sqrt{\varepsilon_0 \mu_0}}$ is that of

(A) Velocity (B) Time (C) Capacitance (D) Distance

[29] The quantity $X = \frac{\varepsilon_0 LV}{t}$: ε_0 is the permittivity 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

[30] The foundations of dimensional analysis were laid down by

(A) Gallileo (B) Newton (C) Fourier (D) Joule

[31] The frequency of vibration of string is given by $\nu = \frac{p}{2l}\left[\frac{F}{m}\right]^{1/2}$. Here p is number of segments in the string and l is the length. The dimensional formula for m will be

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

[32] The dimensions of couple are

(A) ML^2T^{-2} (B) MLT^{-2} (C) $ML^{-1}T^{-3}$ (D) $ML^{-2}T^{-2}$

[33] If the acceleration due to gravity is $10\,ms^{-2}$ and the units of length and time are changed in kilometer and hour respectively, the numerical value of the acceleration is

(A) 360000 (B) 72000 (C) 36000 (D) 129600

[34] A student measures the distance traversed in free fall of a body, initially at rest in a given time. He uses this data to estimate g, the acceleration due to gravity. If the maximum percentage errors in measurement of the distance and the time are e_1 and e_2 respectively, the percentage error in the estimation of g is

(A) $e_1 + 2e_2$ (B) $e_1 + e_2$ (C) $e_1 - 2e_2$ (D) $e_2 - e_1$

[35] If L and R are respectively the inductance and resistance, then the dimensions of $\frac{R}{L}$ will be

(A) T^2 (B) T (C) T^{-1} (D) T^{-2}

Physics - Section B - MCQ(Attemp any 10)

[36] The vernier constant of Vernier callipers is $0.1\,mm$ and it has zero error of $(-0.05)\,cm$. While measuring diameter of a sphere, the main scale reading is $1.7\,cm$ and coinciding vernier division is 5. The corrected diameter will be_____ $\times 10^{-2}\,cm$

(A) 160 (B) 150 (C) 189 (D) 180

[37] The dimension of the ratio of angular to linear momentum is

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

[38] Dimensional formula for latent heat is

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

[39] The radius of a sphere is measured to be $(7.50 \pm 0.85)\,cm$. Suppose the percentage error in its volume is x. The value of x, to the nearest x, is .....%

(A) 38 (B) 34 (C) 42 (D) 28

[40] The force F is given in terms of time t and displacement x by the equation $F = A\,cos\,Bx + C\,sin\,Dt$. The dimensional formulae of D/B is

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

[41] In an experiment, the values of refractive indices of glass were found to be $1.54, 1.53, 1.44, 1.54, 1.56$ and 1.45 in successive measurements, then Mean absolute error is

(A) 0.004 (B) 0.04 (C) 0.4 (D) 4

[42] In a screw gauge, 5 complete rotations of the screw cause it to move a linear distance of $0.25\,cm$. There are 100 circular scale divisions. The thickness of a wire measured by this screw gauge gives a reading of 4 main scale divisions and 30 circular scale divisions . Assuming negligible zero error, the thickness of the wire is

(A) $0.0430\,cm$ (B) $0.3150\,cm$ (C) $0.4300\,cm$ (D) $0.2150\,cm$

[43] Dimensions of resistance in an electrical circuit in terms of dimension of mass M, of length L of time T and of current I , would be

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

[44] Which of the following is unitless quantity ?

(A) Velocity gradient (B) Pressure gradient (C) Displacement gradient (D) Force gradient

[45] The length, breath and thickness of a metal sheet are $4.234\ m, 1.005\ m$, and $2.01\ cm$ respectively then the volume of the sheet is

(A) $8.72m^2, 0.0855m^3$ (B) $8.12m^2, 0.0755m^3$ (C) $7.82m^2, 1.0855m^3$ (D) $7.12m^2, 0.3855m^3$

[46] The velocity v (in $cm/$ sec) of a particle is given in terms of time t (in sec) by the relation $v = at + \frac{b}{t+c}$; the dimensions of $a,\ b$ and c are

(A) $a = L^2,\ b = T,\ c = LT^2$ (B) $a = LT^2,\ b = LT,\ c = L$ (C) $a = LT^{-2}, b = L,\ c = T$ (D) $a = L,\ b = LT,\ c = T^2$

[47] Two full turns of the circular scale of a screw gauge cover a distance of $1\ mm$ on its main scale. The total number of divisions on the circular scale is 50. Further, it is found that the screw gauge has a zero error of $-0.03\ mm$. While measuring the diameter of a thin wire, a student notes the main scale reading of $3\ mm$ and the number of circular scale divisions in line with the main scale as 35. The diameter of the wire is ..... mm

(A) 3.38 (B) 3.32 (C) 3.73 (D) 3.67

[48] The dimensions of K in the equation $W = \frac{1}{2}\ Kx^2$ is

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

[49] If C and R represent capacitance and resistance respectively, then the dimensions of RC are

(A) $M^0L^0T^2$ (B) M^0L^0T (C) ML^{-1} (D) None of the above

[50] In a particular system the units of length, mass and time are chosen to be $10\ cm$, $10\ g$, and $0.1\ s$ respectively. The units of force in this system will be equal to?

(A) 0.1 (B) 1 (C) 10 (D) 100