



1. Unit, Dimension & Measurement

STBG

1. The force of interaction between two atoms is given by $F = \alpha\beta \exp\left(-\frac{x^2}{\alpha KT}\right)$; where x is the distance, K is the Boltzmann constant and T is temperature and α and β are two constants. The dimension of β is:

[2024]

- (a) $M^0L^2T^{-4}$ (b) MLT^{-2}
 (c) M^2LT^{-4} (d) $M^2L^2T^{-2}$

2. The dimensions of $\frac{B^2RC}{\mu_0}$ (where B is magnetic field, R is resistance, C is capacitance and μ_0 is permeability of free space) are the same as those of:

[2023]

- (a) impulse
 (b) angular momentum
 (c) energy
 (d) viscosity

3. The error in the measurement of the radius of a sphere is 2%. What will be the percentage error in the estimation of the volume of the sphere?

[2022]

- (a) 2% (b) 4%
 (c) 6% (d) 8%

4. The dimension of the quantity $\frac{1}{2}\epsilon_0 E^2$, where ϵ_0 is the permittivity of free space and E is the electric field, is

[2021]

- (a) $[ML^{-1}T^{-2}]$ (b) $[ML^{-1}T^{-1}]$
 (c) $[ML^2T^{-2}]$ (d) $[ML^{-2}T^{-2}]$

5. Which of the following has the dimensional formula $ML^{-1}T^{-1}$?

[2020]

- (a) Surface tension
 (b) Thermal conductivity
 (c) Universal constant of gravitation
 (d) Coefficient of viscosity

6. The dimensional formula for pressure gradient of a liquid flowing in a tube is

[2019]

- (a) ML^2T^{-2} (b) $ML^{-1}T^{-2}$
 (c) MLT^{-2} (d) $ML^{-2}T^{-2}$

7. The nearest star to our solar system is 4.3 light years away. The distance of this star in Parsec is (Mean distance between the earth and the sun = 1.5×10^{11} m and one light year = 9.46×10^{15} m)

[2018]

- (a) 1.3 (b) 8.0
 (c) 13.0 (d) 3.3×10^4

8. The velocity of a transverse wave in a string is directly proportional to \sqrt{T} and inversely proportional to $\sqrt{\mu}$. In a measurement, the mass applied at the end of string is 3.0 gm, length of string is 1 m and mass of string is 5 gm. If possible error in measuring mass is 0.1 gm and that of length is 1mm, the percentage error in measurement of velocity is

[2016]

- (a) 4.5% (b) 2.7%
 (c) 2.1% (d) 3.7%

9. The dimension of magnetic field in M. L. T and C (coulomb) is given as

[2015]

- (a) $[MLT^{-1}C^{-1}]$ (b) $[MT^{-2}C^{-1}]$
 (c) $[MT^{-2}C^{-2}]$ (d) $[MT^{-1}C^{-1}]$

10. The height of a man is measured by a metre scale having graduations in cm only and the height turns out to be 170 cm. The scientific method for reporting the measurement is

[2014]

- (a) 170×10^0 cm (b) 1.700 m
 (c) 170 cm (d) 1.70×10^2 cm

11. What are the dimensions of A/B in the relation $F = A\sqrt{x} + Bt^2$, where F is the force, x is distance and t is time?

[2014]

- (a) $[ML^2T^{-2}]$ (b) $[L^{-1/2}T^2]$
 (c) $[L^{-1/2}T^{-1}]$ (d) $[LT^{-2}]$



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12. In a new system of units called star units, $1 \text{ kg}^* = 10 \text{ kg}$, $1 \text{ m}^* = 1 \text{ km}$ and $1 \text{ s}^* = 1 \text{ minute}$, what will be the value of 1 J in the new system?

[2013]

- (a) $2.4 \times 10^{-5} \text{ J}^*$
- (b) $3.6 \times 10^{-4} \text{ J}^*$
- (c) $4.2 \times 10^{-3} \text{ J}^*$
- (d) $4.2 \times 10^{-2} \text{ J}^*$

13. If mass is measure in units of $\alpha \text{ kg}$, length in $\beta \text{ m}$ and time in $\gamma \text{ s}$ then calorie would be

[2012]

- (a) $4.2 \alpha \beta^2 \gamma^{-2}$
- (b) $4.2 \alpha^{-1} \beta^2 \gamma^2$
- (c) $4.2 \alpha^{-1} \beta^{-2} \gamma^2$
- (d) $4.2 \alpha^{-2} \beta^{-1} \gamma^{-2}$

14. A new unit of length is so chosen that the speed of light in vacuum is unity. Calculate the distance (in this new unit) between the sun and the earth. If light

takes 8 min and 20 s to reach earth from sun.

[2012]

- (a) 300
- (b) 400
- (c) 500
- (d) 600

15. In the following equation x , t and F represent respectively, displacement, time and force

$$F = a + bt + \frac{1}{c + dx} + A \sin(\omega t + \phi)$$

The dimensional formula for $A.d$ is

[2011]

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

ANSWERS KEY

1	2	3	4	5	6	7	8	9	10
C	B	C	A	D	D	A	B	D	D
11	12	13	14	15					
B	B	C	C	B					