Physical Quantities (Assignment)

1. Which of the following length measurements is the most precise?

A. $l = 6\,cm$ B. $l = 6.00\,cm$ C. $l = 6.000\,cm$ D. $l = 6.0\,cm$

2. A metre rule is used to measure the length of a piece of string in a certain experiment. It is found to be 20 cm long to the nearest millimetre. How should this result be recorded in a table of results?

A. $0.2000m$ B. $0.200m$ C. $0.20m$ D. $0.2m$

3. The value of a physical quantity is written as 0.0250. How many significant figures are in this number?

A. 2 B. 3 C. 4 D. 5

4. The value of a physical quantity is given as 9.99, round off the given number into 2 significant figure,

A. 9.9 B. 9.0 C. 10 D. 1.0×10^1

5. The mass of a box is $2.3\,kg$. Two marbles of masses $2.15\,g$ and $12.39\,g$ are added to it. The total mass of the box to the correct number of significant figures is:

A. $2.340\,kg$ B. $2.3145\,kg$ C. $2.3\,kg$ D. $2.31\,kg$

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

A. $1.6048gcm^{-3}$ B. $1.69gcm^{-3}$ C. $1.7gcm^{-3}$ D. $1.695gcm^{-3}$

7. The least count is 0.01mm. Two wires of length $L_1$and L_2 are measured and they are connected forming a single wire. Then the measurement is,

A. $(L_1 + L_2)m \pm 0.02mm$ C. $(L_1 - L_2)m \pm 0.02mm$

B. $(L_1 + L_2)m \pm 0.01mm$ D. $(L_1 - L_2)m \pm 0.01mm$

8. Precision pertains to all of the following except:

A. Reproducibility of measurements. C. Agreement among numerical values.

B. The sameness of measurements. D. The closeness of a measurement to an accepted value.

9. The $[M^1L^1T^{-2}]$ is the dimensional formula of;

A. $Force$ B. $Pressure$ C. $Velocity$ D. $Acceleration$

10. The Dimension formula for relative density;

A. $[M^1L^1T^{-1}]$ B. $[M^0L^1T^{-1}]$ C. $[M^0L^0T^0]$ D. $[M^{-1}L^1T^{-1}]$

11. Which of the following has the same dimension?

A. Work & Energy C. Work and Power

B. Force & Impulse D. Linear & Angular Momentum

12. Which of the following has the same dimensions?

A. Potential energy and force
C. Torque and Potential Energy
B. Torque and force
D. Planck's Constant and Momentum

13. The dimension formula for the Universal Gravitational constant is,

A. $[M^1L^3T^{-1}]$ B. $[M^{-1}L^3T^{-2}]$ C. $[M^{-1}L^3T^{-1}]$ D. $[M^1L^3T^{-2}]$

14. A physical quantity given by $P = P_o e^{-\beta t^2}$, where t is time and β is constant. The constant β:

A. Is dimensionless
C. has dimension $[M^0L^0T^{-2}]$
B. has dimension $[M^0L^0T^2]$
D. has a dimension of P

15. Find out the dimension of K in the equation: E $= \frac{1}{2}Kx^2$, where E is energy and x is displacement:

A. $[M^1L^0T^{-1}]$ B. $[M^1L^0T^{-2}]$ C. $[M^1L^2T^{-1}]$ D. $[M^1L^2T^{-2}]$

16. The position x of a particle at time t is given by $x = \frac{b}{a}(1 - e^{at})$ where a & b are non-zero constants. The dimension of b is:

A. $[M^0L^1T^2]$ B. $[M^0L^1T^0]$ C. $[M^0L^0T^{-1}]$ D. $[M^0L^1T^{-1}]$

17. Van der Waal's equation of state is: $\left(\mathrm{P} + \frac{a}{V^2}\right)(V - b) = RT$ where P is pressure, V is volume, T is temperature and R is universal gas constant. Find the dimensions of Vander Waal's constants a and b. What is the dimension of b:

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

18. The force F is given in terms of time (t) and the displacement (x) by the equation: $F = AcosBx + CsinDt$. The dimension of $\frac{D}{B}$ is:

A. $[M^0L^1T^1]$ B. $[M^0L^1T^{-1}]$ C. $[M^0L^{-1}T^1]$ D. $[M^0L^0T^0]$

SAQs

1. What is the dimension of α and a in the relation $y = ae^{\alpha t}$. Where y is displacement and t is time.
2. What is the dimension of a, b and c in $y = \mathrm{a}\sin(bt - cx)$, where, y is in m, t sec. and x is m.
3. The density ρ of the earth and radius R is given by $\rho = \frac{3g}{4\pi RG}$, where g is the acceleration due to gravity and G is gravitational constant. Check the dimensional consistency of this relation.
4. Let us consider an equation $\frac{1}{2}mv^2 = mgh$ where m is the mass of the body, v its velocity, g is the acceleration due to gravity and h is the height. Check whether this equation is dimensionally correct.
5. Kinetic energy of a particle moving in along elliptical trajectory is given by $E = \alpha S^2$,where S is the distance travelled by the particle. Determine the dimension of α.
6. Using the method of dimensions, derive an expression for the time period of simple pendulum which depends on mass $'m'$ of the bob, length $'l'$ of the string and acceleration due to gravity $'g'$.
7. If the length of the certain specimen is $(6.2 \pm 0.1)cm$. What does it mean?