

**ASSIGNMENT FOR DIMENSIONAL ANALYSIS**

1. The dimensional formula for latent heat is

- (a) $M^0L^2T^{-2}$
- (b) MLT^{-2}
- (c) ML^2T^{-2}
- (d) ML^2T^{-1}

Ans: (a)

2. The dimensional formula of modulus of elasticity is

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

Ans: (c)

3. The dimension of $\frac{1}{2}\epsilon_0 E^2$ (ϵ_0 = permittivity of free space and E = electric field) is

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

Ans: (c)

4. If velocity (V), acceleration (A) and force (F) are taken as fundamental quantities instead of mass (M), length (L) and time (T), the dimensions of Young's modulus of elasticity would be [with M , L and T as fundamental quantities and Young's modulus = $ML^{-1}T^{-2}$]

- (a) FA^2V^{-2}
- (b) FA^2V^{-3}
- (c) FA^2V^{-4}

(d) FA^2V^{-5}

Ans: (c)

5. The number of particles crossing per unit area perpendicular to X -axis in unit time is

$$N = -D \frac{n_2 - n_1}{x_2 - x_1}$$

where n_1 and n_2 are number of particles per unit volume for the value of x_1 and x_2 respectively. The dimensions of diffusion constant D are

(a) M^0LT^2

(b) $M^0L^2T^{-4}$

(c) M^0LT^{-3}

(d) $M^0L^2T^{-1}$

Ans: (d)

6. The ratios L/R and RC (L = inductance, R = resistance and C = capacitance) have the same dimension as that of

(a) Velocity

(b) Acceleration

(c) Time

(d) Force

Ans: (c)

7. A dimensionally consistent relation for the volume V of a liquid of coefficient of viscosity η flowing per second through a tube of radius r and length ℓ and having a pressure p across its end is $([\eta] = ML^{-1}T^{-1})$

(a) $V = \pi p r^4 / 8 \eta \ell$

(b) $V = \pi \eta \ell / 8 p r^4$

(c) $V = 8 p \eta \ell / \pi r^4$

(d) $V = \pi p \eta / 8 \ell r^4$

Ans: (a)

8. Which of the following relations can be derived by the method of dimensional analysis?

(i) $Q = Q_0 e^{-t/RC}$

(ii) $y = A \cos \frac{2\pi}{\lambda} (ct - x)$

(iii) $K = \frac{1}{2} m v^2 + \frac{1}{2} I \omega^2$

(iv) $V = \frac{\pi P r^4}{8 \eta \ell}$

(a) (i) and (ii)

(b) (ii) and (iii)

(c) (iii) and (iv)

(d) None of these

Ans: (d)

9. The time dependence of a physical quantity P is given by $P = P_0 \exp(-\alpha t^2)$ [where α is a constant and t is time]. The constant α

(a) Is dimensionless

(b) Has dimensions T^{-2}

(c) Has dimensions T^{-1}

(d) Has dimensions of P

Ans: (b)

10. The dimensional formula for Universal Gravitational Constant is

(a) $M^{-1} L^3 T^{-2}$

(b) $M^{-1} L^3 T^{-1}$

(c) $M^0 L T^{-3}$

(d) $M^0 L^2 T^{-1}$

Ans: (a)

11. The viscous force depends on

- (a) η , r & v
- (b) η , P & v
- (c) η , r & P
- (d) P , r & v

Ans: (a)