1. The sum of two forces acting at a point is 16 *N.* If the resultant force is 8 *N* and its direction is perpendicular to minimum force then the forces are

(a) 6 *N* and 10 *N*

(b) 8 *N* and 8 *N*

(c) 4 *N* and 12 *N*

(d) 2 *N* and 14 *N*

2. A particle moves in the *x-y* plane under the action of a force $\vec{F}$ such that the value of its linear momentum $(\vec{P})$ at anytime *t* is $P_x = 2\cos t, p_y = 2\sin t.$ The angle θ between $\vec{F}$ and $\vec{P}$ at a given time *t.* will be

(a) $\theta = 0°$

(b) $\theta = 30°$

(c) $\theta = 90°$

(d) $\theta = 180°$

3. The position of a particle is given by $\vec{r} = (\hat{i} + 2\hat{j} - \vec{k})$ momentum $\vec{P} = (3\hat{i} + 4\hat{j} - 2\vec{k}).$ The angular momentum is perpendicular to

(a) *x*-axis

(b) *y*-axis

(c) *z*-axis

(d) Line at equal angles to all the three axes

4. The value of $(\vec{A} + \vec{B}) \times (\vec{A} - \vec{B})$ is

(a) 0

(b) $A^2 - B^2$

(c) $\vec{B} \times \vec{A}$

(d) $2(\vec{B} \times \vec{A})$

5. If $\vec{A}$ and $\vec{B}$ are perpendicular vectors and vector $\vec{A} = 5\hat{i} + 7\hat{j} - 3\hat{k}$ and $\vec{B} = 2\hat{i} + 2\hat{j} - a\hat{k}.$ The value of *a* is

(a) – 2

(b) 8

(c) – 7

(d) – 8

6. If $|\vec{A} \times \vec{B}| = \sqrt{3}\vec{A}.\vec{B},$ then the value of $|\vec{A} + \vec{B}|$ is

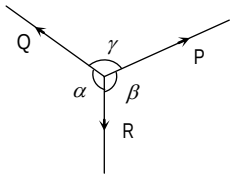
(a) $\left(A^2 + B^2 + \frac{AB}{\sqrt{3}}\right)^{1/2}$

(b) $A + B$

(c) $(A^2 + B^2 + \sqrt{3}AB)^{1/2}$

(d) $(A^2 + B^2 + AB)^{1/2}$

7. A body is in equilibrium under the action of three coplanar forces *P, Q* and *R* as shown in the figure. Select the correct statement



(a) $\frac{P}{\sin\alpha} = \frac{Q}{\sin\beta} = \frac{R}{\sin\gamma}$ (b) $\frac{P}{\cos\alpha} = \frac{Q}{\cos\beta} = \frac{R}{\cos\gamma}$

(c) $\frac{P}{\tan\alpha} = \frac{Q}{\tan\beta} = \frac{R}{\tan\gamma}$ (d) $\frac{P}{\sin\beta} = \frac{Q}{\sin\gamma} = \frac{R}{\sin\alpha}$

8. The dimensions of universal gravitational constant are

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

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

9. The equation of state of some gases can be expressed as $\left(P + \frac{a}{V^2}\right)(V - b) = RT$. Here P is the pressure, V is the volume, T is the absolute temperature and a, b, R are constants. The dimensions of $'a'$ are

(a) ML^5T^{-2} (b) $ML^{-1}T^{-2}$

(c) $M^0L^3T^0$ (d) $M^0L^6T^0$

10. The frequency of vibration f of a mass m suspended from a spring of spring constant K is given by a relation of this type $f = Cm^xK^y$; where C is a dimensionless quantity. The value of x and y are

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

(c) $x = \frac{1}{2}, y = -\frac{1}{2}$ (d) $x = -\frac{1}{2}, y = \frac{1}{2}$

11. If the velocity of light (c), gravitational constant (G) and Planck's constant are chosen as fundamental units, then the dimensions of mass in new system is

(a) (b)

(c) (d)

12. Out of the following pair, which one does not have identical dimensions?

(a) Moment of inertia and moment of force

(b) Work and torque

(c) Angular momentum and Planck's constant

(d) Impulse and momentum