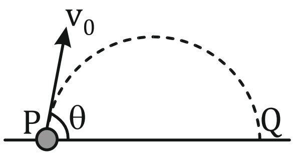
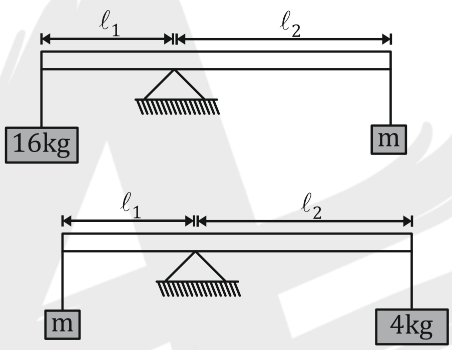
DPP 02

1. A particle having mass m is projected with a velocity v_0 from a point P on a horizontal ground making an angle θ with horizontal. The torque about the point of projection acting on the particle when it is at its maximum height is $\tau = \frac{mv_0^2 \sin k\theta}{k}$ then k is_ _ _.

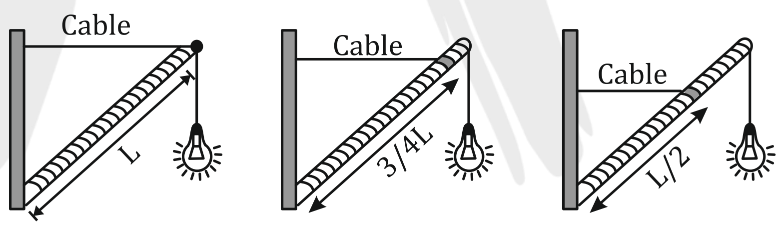


2. In an experiment with a beam balance an unknown mass m is balanced by two known masses of 16 kg and 4 kg as shown in figure. The value of the unknown mass m is :-



(A) 10 kg (B) 6 kg (C) 8 kg (D) 12 kg

3. If a street light of mass M is suspended from the end of uniform rod of length L in the different possible patterns as shown in figure, then :-



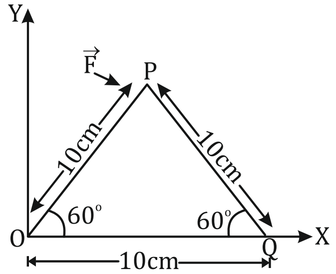
(A) Pattern A is more sturdy (B) Pattern B is more sturdy

(C) Pattern C is more sturdy (D) All will have same sturdiness

4. The torque of a force $5\hat{i} + 3\hat{j} - 7\hat{k}$ about the origin is τ. If the force acts on a particle whose position vector is $2\hat{i} + 2\hat{j} + \hat{k}$, then the value of τ will be

(A) $1\hat{i} + 19\hat{j} - 4\hat{k}$ (B) $-1\hat{i} + 9\hat{j} - 16\hat{k}$ (C) $-17\hat{i} + 19\hat{j} - 4\hat{k}$ (D) $17\hat{i} + 9\hat{j} + 16\hat{k}$

5. A triangular plate is shown. A force $\vec{F} = 4\hat{i} - 3\hat{j}$ is applied at point P. The torque at point P with respect to point O and Q are



(A) $-15 + 20\sqrt{3}, 15 + 20\sqrt{3}$ (B) $-15 - 20\sqrt{3}, 15 - 20\sqrt{3}$

(C) $15 + 20\sqrt{3}, 15 - 20\sqrt{3}$ (D) $15 - 20\sqrt{3}, 15 + 20\sqrt{3}$

6. A particle of mass m is moving along a trajectory given by

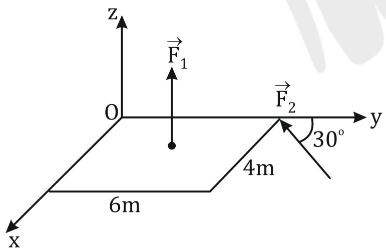
$x = x_0 + a\cos\ \omega_1 t; t = y_0 + b\sin\ \omega_2 t$

The torque, acting on the particle about the origin, at $t = 0$ is

(A) $m(-x_0 b + y_0 a)\omega_1^2\hat{k}$ (B) $-m(x_0 b\omega_2^2 - y_0 a\omega_1^2)\hat{k}$

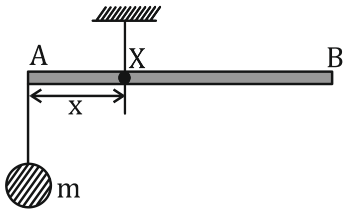
(C) $+my_0 a\omega_1^2\hat{k}$ (D) Zero

7. A slab is subjected to two forces $\vec{F}_1$ and $\vec{F}_2$ of same magnitude F as shown in the figure. Force $\vec{F}_2$ is in xy-plane while force F_1 acts along z-axis at the point $(2\hat{i} + 3\hat{j})$. The moment of these forces about point O will be



(A) $(3\hat{i} - 2\hat{j} - 3\hat{k})F$ (B) $(3\hat{i} + 2\hat{j} + 3\hat{k})F$ (C) $(3\hat{i} - 2\hat{j} + 3\hat{k})F$ (D) $(3\hat{i} + 2\hat{j} - 3\hat{k})F$

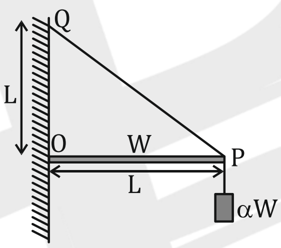
8. A uniform rod AB is suspended from a point X, at a variable distance x from A, as shown. To make the rod horizontal, a mass m is suspended from its end A. A set of (m, x) values is recorded. The appropriate variables that give a straight line, when plotted, are



(A) $m, \frac{1}{x^2}$ (B) m, x^2 (C) m, x (D) $m, \frac{1}{x}$

9. One end of a horizontal uniform beam of weight W and length L is hinged on a vertical wall at point O and its other end is supported by a light inextensible rope. The other end of the rope is fixed at point Q, at a height L above the hinge at point O. A block of weight αW is attached at the point P of the beam, as shown in the figure. The rope can sustain a maximum tension of $(2\sqrt{2})W$.

Which of the following statement(s) is(are) correct?



(A) The vertical component of reaction force at O does not depend on α.

(B) The horizontal component of reaction force at O is equal to W for $\alpha = 0.5$.

(C) The tension in the rope is 2W for $\alpha = 0.5$.

(D) The rope breaks if $\alpha > 1.5$.

ANSWER KEY

1.	2	**2.**	(C)	**3.**	(A)	**4.**	(C)	**5.**	(B)	**6.**	(C)	**7.**	(C)
8.	(D)	**9.**	(A, B, D)										

Home Work

Ex. 1	Q. 1, 2, 3, 5, 13
Ex. 2	Q
Ex.3	Q.
Ex.4	Q.
Ex.5	Q.