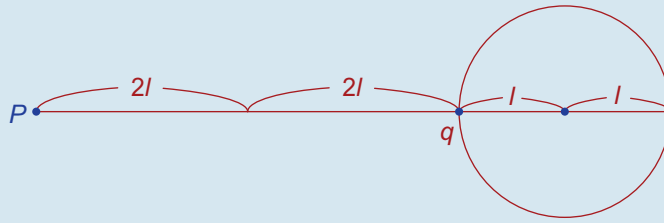


Q. 7. (i)



Rod:

$$I_p = \frac{4}{3}m(2l)^2$$

$$= \frac{16}{3}ml^2$$

Disc:

$$I_p = I_C + md^2$$

$$= \frac{1}{2}ml^2 + m(5l)^2$$

$$= \frac{51}{2}ml^2$$

$$\text{Total} = \frac{16}{3}ml^2 + \frac{51}{2}ml^2$$

$$= \frac{185}{6}ml^2$$

$$(ii) \underbrace{mgh}_{\text{Rod}} + \underbrace{mgh}_{\text{Disc}} + \underbrace{\frac{1}{2}I\omega^2}_{\text{System}} = \underbrace{mgh}_{\text{Rod}} + \underbrace{mgh}_{\text{Disc}} + \underbrace{\frac{1}{2}I\omega^2}_{\text{System}}$$

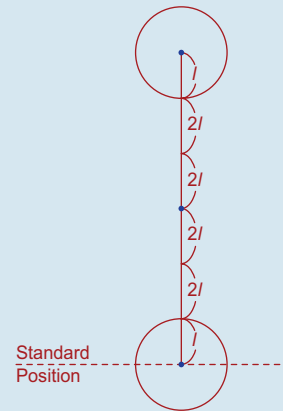
$$mg(7l) + mg(10l) + \frac{1}{2}I(0)^2 = mg(3l) + mg(0) + \frac{1}{2}I\omega^2$$

$$\Rightarrow I\omega^2 = 28mgl$$

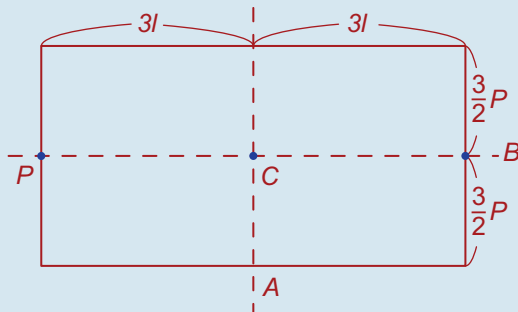
$$\Rightarrow \frac{185}{6}ml^2 \omega^2 = 28mgl$$

$$\Rightarrow \omega = \sqrt{\frac{168g}{185l}}$$

$$\therefore v = \omega r = 5l\sqrt{\frac{168g}{185l}}$$



Q. 8. The rectangular lamina:



$$I_A = \frac{1}{3}m(3l)^2$$

$$= 3ml^2$$

$$I_B = \frac{1}{3}m\left(\frac{3l}{2}\right)^2$$

$$= \frac{3}{4}ml^2$$

$$I_C = I_A + I_B$$

$$= \frac{15}{4}ml^2$$

$$I_P = I_C + md^2$$

$$= \frac{15}{4}ml^2 + m(3l)^2$$

$$= \frac{51}{4}ml^2$$