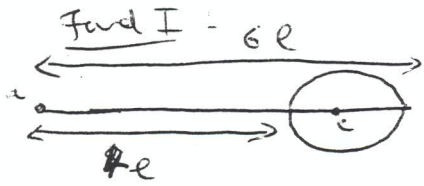


H147608



$I_{\text{disk about } c} = \frac{1}{2}(4m)l^2$

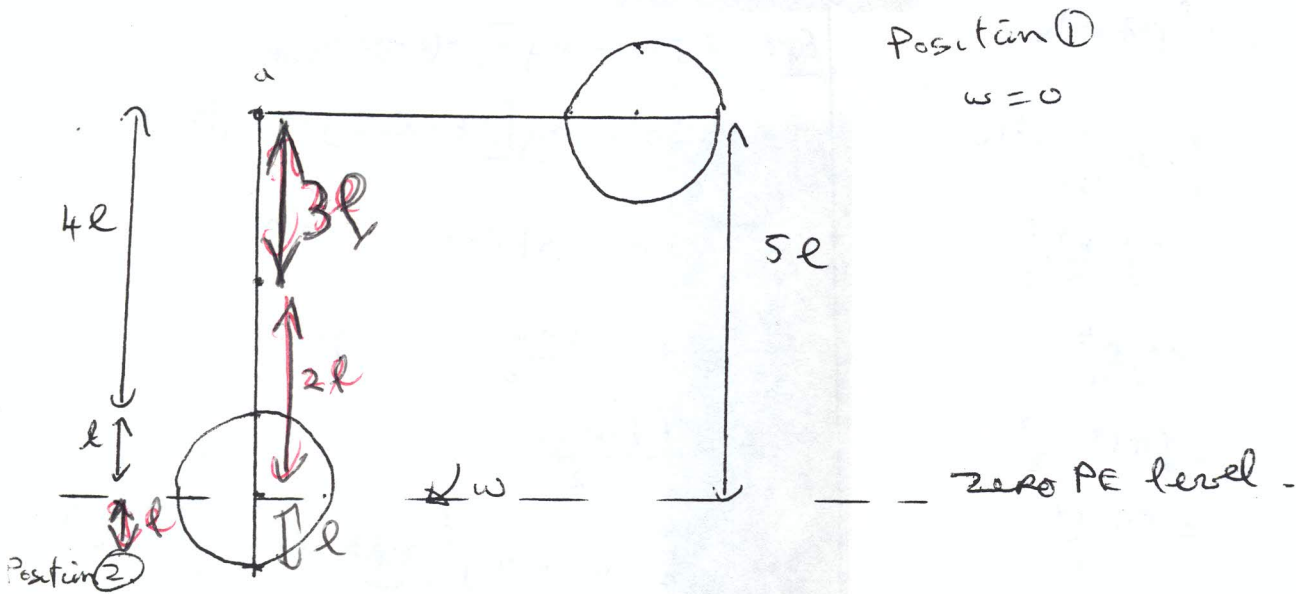
$I_a = I_{\text{rod}} + I_{\text{disk}}$

$= \frac{4}{3}m[3l]^2 + \left[ \frac{1}{2}(4m)l^2 + 4m(5l)^2 \right]$

parallel axis theorem

$= 12ml^2 + 2ml^2 + 100ml^2$

$= 114ml^2$  qed.



Position ①

$\omega = 0$

zero PE level.

Position ② :

$E_2 = PE(\text{rod}) + PE(\text{Disk}) + KE(\text{System})$

$= mg(2l) + 4mg(0) + \frac{1}{2} I \omega^2$

$= 2mgl + \frac{1}{2} I \omega^2$

Position ①

$E_1 = PE(\text{rod}) + PE(\text{disk}) + KE(\text{System})$

$= mg(5l) + 4mg(5l) + \frac{1}{2} I \omega^2$

$= 5mgl + 20mgl$

$= 25mgl$

PE  $\Rightarrow$

$E_2 = E_1$

$2mgl + \frac{1}{2} I \omega^2 = 25mgl$

$+\frac{1}{2} I \omega^2 = 23mgl$

$I \omega^2 = 46mgl$

$114m l^2 \omega^2 = 46mgl$

$\omega = \sqrt{\frac{23g}{57l}} \Rightarrow \text{Speed} = (6l) \sqrt{\frac{23g}{57l}}$