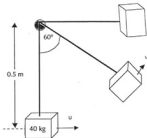


QUESTION 2

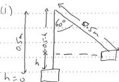
[Marks 12]

A 40 kg mass swings on a light rod of fixed length 0.5 m, as shown. When the mass is at the lowest point the speed of the mass is $u = 3 \text{ m.s}^{-1}$. Take the gravitational potential energy equal to zero when the mass is at the lowest point.



- (a) Determine the gravitational potential energy of the mass
- when the rod makes an angle of 60° to the vertical as shown, and
 - when the rod is horizontal as shown.
- (b) Determine the speed of the mass v when the rod makes an angle of 60° to the vertical as shown.
- (c) Determine the kinetic energy of the mass when the rod is horizontal as shown, and comment on what your result signifies.

(a) (i)



$$\frac{0.5-h}{0.5} = \cos 60^\circ = 0.5$$

$$0.5-h = 0.25 \Rightarrow h = \underline{\underline{0.25 \text{ m}}}$$

$$PE = mgh = 40 \times 9.8 \times 0.25 = \underline{\underline{98 \text{ J}}}$$

(ii)



$$h_2 = \underline{\underline{0.5 \text{ m}}}$$

$$PE = mgh = 40 \times 9.8 \times 0.5 = \underline{\underline{196 \text{ J}}}$$