

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 6 Connected particles

### Exercise A, Question 11

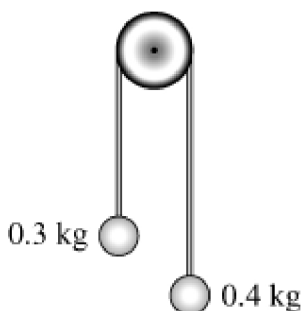
#### Question:

Two particles, of masses 0.3 kg and 0.4 kg, are connected by a light, inextensible string which hangs over a smooth fixed peg, as shown in the diagram. The system is released from rest.

- (a) (i) Show that, in the subsequent motion, the acceleration of the particles is of magnitude  $1.4 \text{ m s}^{-2}$ .  
 (ii) Find the tension in the string during this motion.

- (b) Find the distance travelled by each particle during the first 2 seconds of the motion.

[A]



#### Solution:

- (a) (i) Using  $F = ma$

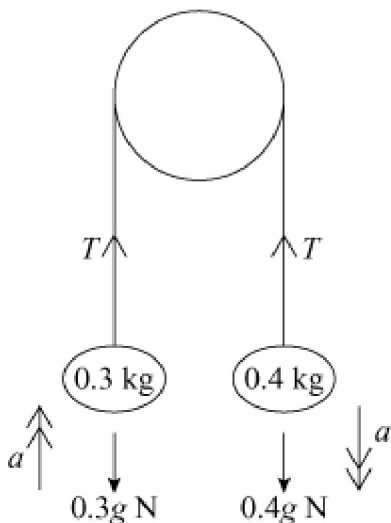
$$\text{for } 0.4 \text{ kg particle; } 0.4g - T = 0.4a$$

$$\text{for } 0.3 \text{ kg particle; } T - 0.3g = 0.3a \quad [1]$$

$$\text{Adding } 0.1g \qquad \qquad \qquad = 0.7a$$

$$a \qquad \qquad \qquad = \frac{g}{7} = 1.4$$

$\therefore$  Acceleration is  $1.4 \text{ m s}^{-2}$



$$\begin{aligned} \text{(ii) From [1] } T &= 0.3g + 0.3 \times 1.4 \\ &= 3.36 \end{aligned}$$

Tension is 3.36 N

When  $t = 2$ ,

using  $s = ut + \frac{1}{2}at^2$  ( we do not know  $v$  )

$$\begin{aligned} \text{(b) } s &= \frac{1}{2} \times 1.4 \times 2^2 \\ &= 2.8 \end{aligned}$$

$\therefore$  Distance travelled by each particle is 2.8 m.

© Harcourt Education Ltd 2005