

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

6 Connected particles

Exercise A, Question 3

Question:

Two particles, of mass 4 kg and 7 kg, are attached to the ends of a light, inextensible string, which passes over a smooth pulley. Initially the particles are at rest and at the same level. The particles are then released.

- (a) Find the acceleration of the particles.
 (b) Find the time when the difference in height of the particles is 1 m.

Solution:

(a) Using $F = ma$,

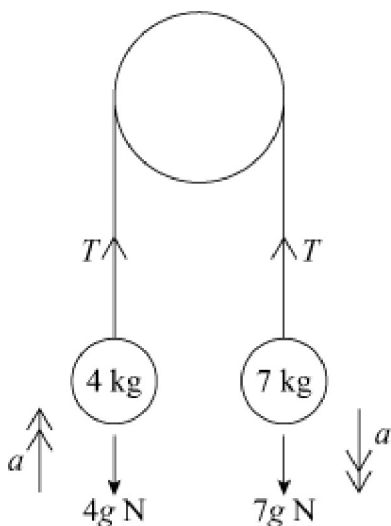
$$\text{For 7 kg particle; } 7g - T = 7a$$

$$\text{For 4 kg particle; } T - 4g = 4a$$

$$\text{Adding; } 3g = 11a$$

$$a = \frac{3}{11}g$$

\therefore Acceleration is 2.67 m s^{-2}



(b) Particles are moving with constant acceleration.
 You know a , s , u and require t .

The equation connecting these is $s = ut + \frac{1}{2}at^2$

Substitute $a = 2.67$, $s = \frac{1}{2}$, $u = 0$ [Particles at 1m apart. \therefore Each have moved 0.5 m]

$$\begin{aligned}\frac{1}{2} &= \frac{1}{2} \times 2.67 \times t^2 \\ 0.37453\dots &= t^2 \\ t &= 0.612\end{aligned}$$

∴ Time is 0.612 seconds.

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