

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 6 Connected particles

### Exercise A, Question 22

#### Question:

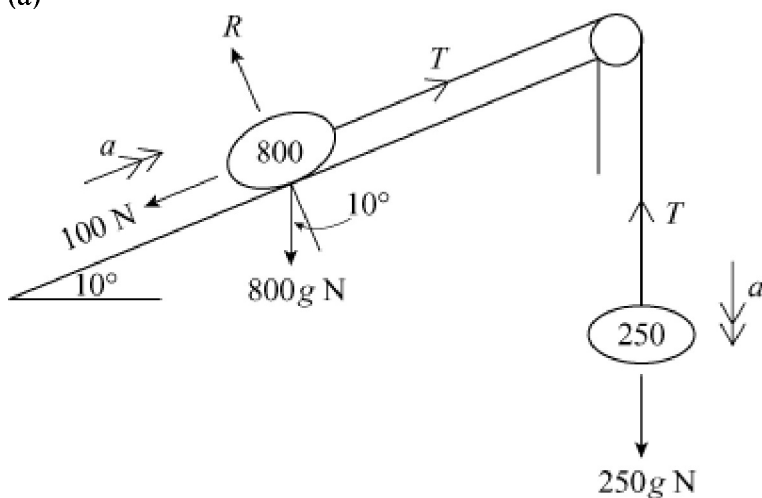
At an old mine trolleys move on tracks up a slope inclined at  $10^\circ$  to the horizontal. They are pulled up by a rope that passes over a pulley and then hangs down the mine shaft. A weight of mass 250 kg is attached to this end of the rope. The mass of an empty truck is 800 kg. The truck is subject to a resistance force of 100 N as it moves.

(a) Find the acceleration of an empty truck as it moves up the slope.

(b) At the top of the slope the truck is loaded with 1000 kg of coal. Find the acceleration of the truck as it moves down the slope.

#### Solution:

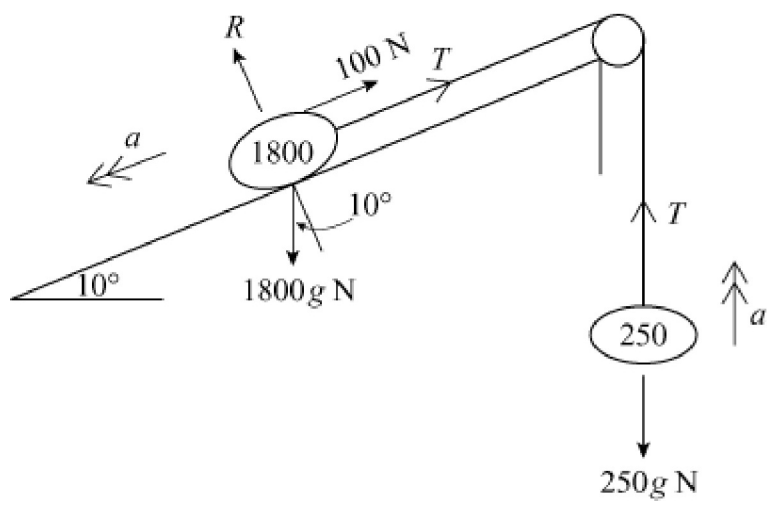
(a)



$$\begin{aligned}
 \text{Using } F = ma \text{ for 250 kg weight; } & 250g - T & = 250a \\
 \text{for 800 kg trolley (along the slope); } & T - 800g \sin 10^\circ - 100 & = 800a \\
 \text{Adding } & 250g - 800g \sin 10^\circ - 100 & = 1050a \\
 & 988.59 & = 1050a \\
 & a & = 0.94151
 \end{aligned}$$

$\therefore$  Acceleration of empty truck is  $0.942 \text{ m s}^{-1}$ .

(b)



Using  $F = ma$  for 250 kg weight;  $T - 250g = 250a$   
 for 1800 trolley (along the slope);  $1800g \sin 10^\circ - 100 - T = 1800a$   
 Adding  $1800g \sin 10^\circ - 100 - 250g = 2050a$   
 $513.15 = 2050a$   
 $a = 0.2503$

$\therefore$  Acceleration is  $0.250 \text{ m s}^{-2}$ .