Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

6 Connected particles

Exercise A, Question 21

Question:

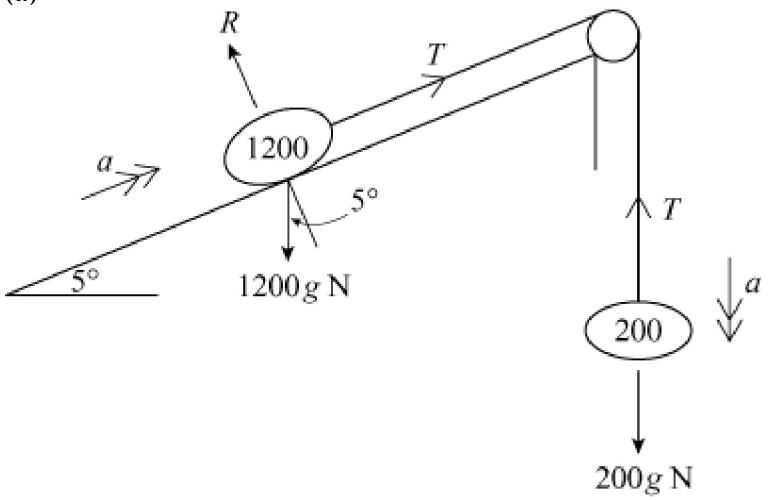
A car of mass 1200 kg is to be pulled 30 m up a slope inclined at 5° to the horizontal. A rope is attached to the car and passes over a smooth pulley and hangs vertically in an old mine shaft. A concrete weight of mass 200 kg is attached to the other end of the rope and released from rest. Assume that there is no resistance to the motion of the car.

(a) Find the acceleration of the car.

(b) How long does the car take to travel the 30 m?

Solution:

(a)



Using $F = ma$ for 200 kg concrete weight; $200g - T$	$= 200a$
for 1200 kg car (in the direction of movement, i.e. up the slope); $T - 1200g \sin 5°$	$= 1200a$
Adding $200g - 1200g \sin 5°$	$= 1400a$
a	$= 0.66789$

$\therefore$ Acceleration is 0.668 m s^{-2}

(b) For time to travel 30 m,

∴ Time is 9.48 s.