

Solutionbank M1

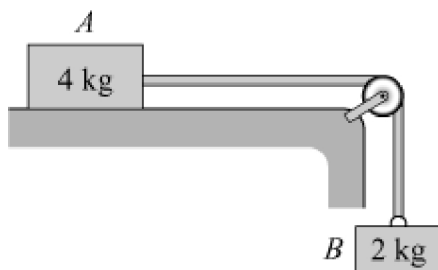
Heinemann Modular Maths for Edexcel AS and A-level

6 Connected particles

Exercise A, Question 9

Question:

Two bodies A and B of mass 4 kg and 2 kg, respectively, are attached by a light, inextensible string passing over a smooth pulley. A rests on a table and B hangs over the side. Resistance forces on A amount to 8 N. The system is released from rest. Calculate the acceleration of the system and the tension in the string. Find the speed of B when it has fallen 2 m.



Solution:

Using $F = ma$

for 2 kg body; $2g - T = 2a$ [1]

for 4 kg body (horizontally, as motion takes place horizontally); $T - 8 = 4a$ [2]

Adding [1] and [2] $2g - 8 = 6a$

$$a = 1.933\dots$$

Acceleration is 1.93 m s^{-2}

Substituting into [1] $2g - T = 2 \times 1.93$

$$T = 2g - 3.86$$

Tension is 15.7 N

To find the speed when B has fallen 2 m;
you know s , a , u and require v .

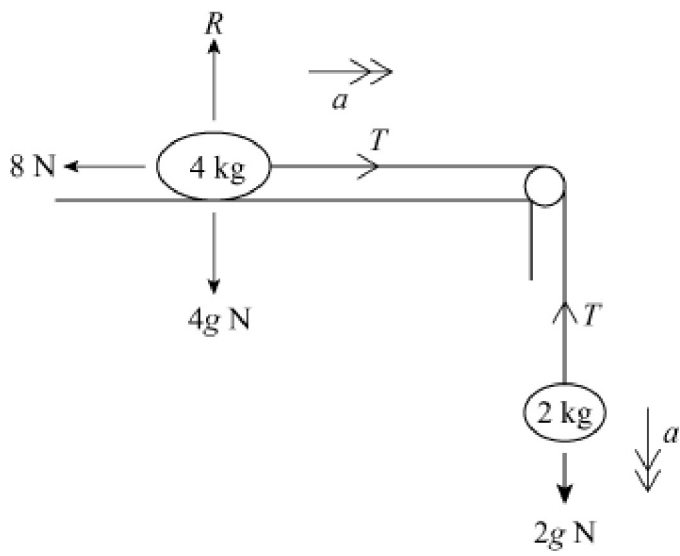
$$\therefore \text{Use } v^2 = u^2 + 2as$$

$$\therefore v^2 = 0 + 2 \times 1.93 \times 2$$

$$v^2 = 7.72$$

$$v = \sqrt{7.72} = 2.778\dots$$

Velocity is 2.78 m s^{-1}



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