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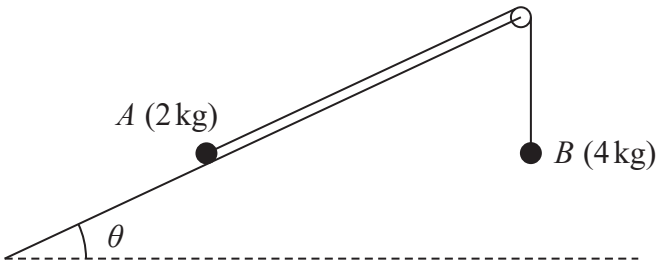


Figure 1

A particle A of mass 2 kg is attached to one end of a light inextensible string. A particle B of mass 4 kg is attached to the other end of the string. The string passes over a small smooth pulley. The pulley is fixed at the top of a fixed rough plane, which is inclined to the horizontal at an angle θ, where $\tan\theta = \frac{3}{4}$. Initially the particles are held at rest with A on the plane, B hanging freely below the pulley and the string taut, as shown in Figure 1. The part of the string from A to the pulley lies along a line of greatest slope of the plane. The coefficient of friction between A and the plane is $\frac{1}{5}$.

At time $t = 0$, the particles are released from rest, with A more than 1.5 m from the pulley and B more than 1.5 m above the ground.

At time $t = T$ seconds, the speed of B is v m s^{-1} and B is 1.5 m below its initial position.

(a) Find the total potential energy lost by the system in the interval $0 \leqslant t \leqslant T$.

(3)

(b) Find the work done against friction in the interval $0 \leqslant t \leqslant T$.

(3)

(c) Use the work-energy principle to find the value of v.

(3)

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