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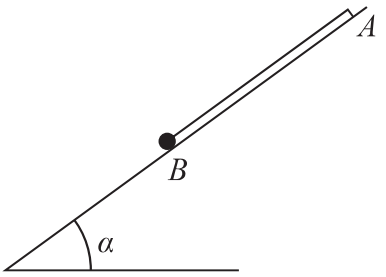


Figure 4

A particle P of mass m is attached to one end of a light elastic string, of natural length l and modulus of elasticity λ. The other end of the string is attached to a fixed point A on a smooth plane which is inclined to the horizontal at angle α, where $\sin\alpha = \frac{3}{5}$. The particle rests in equilibrium on the plane at the point B with the string lying along a line of greatest slope of the plane, as shown in Figure 4.

Given that $AB = \frac{7}{5}l$

(a) show that $\lambda = \frac{3}{2}mg$

(3)

The particle is now pulled down the line of greatest slope to the point C, where $BC = \frac{4}{5}l$, and released from rest.

(b) (i) Show that, while the string remains taut, P moves with simple harmonic motion with centre B.

(ii) Explain briefly why the centre of the motion is at B.

(5)

(c) Find the time taken by P to travel directly from C to B.

(2)

The particle comes to instantaneous rest for the first time at the point D.

(d) Find, in terms of l and g, the time taken by P to travel directly from C to D.

(6)

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