4.

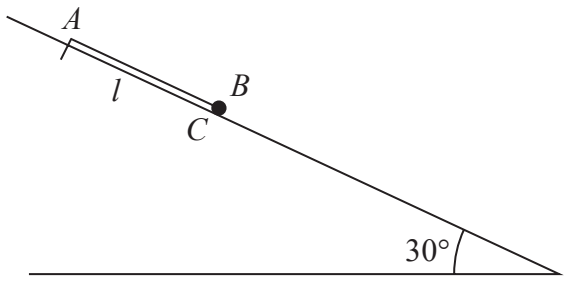


Figure 2

One end of a light elastic string, of natural length l and modulus of elasticity λ, is fixed to a point A on a smooth plane. The plane is inclined at 30° to the horizontal.

A small ball B of mass m is attached to the other end of the elastic string. Initially, B is held at rest at the point C on the plane with the elastic string lying along a line of greatest slope of the plane.

The point C is below A and $AC = l$, as shown in Figure 2.

The ball is released and comes to instantaneous rest at a point D on the plane.

The points A, C and D all lie along a line of greatest slope of the plane and $AD = \frac{5l}{4}$

The ball is modelled as a particle and air resistance is modelled as being negligible.

Using the model,

(a) show that $\lambda = 4mg$

(4)

(b) find, in terms of g and l, the greatest speed of B as it moves from C to D

(7)

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Question 4 continued

(Total for Question 4 is 11 marks)