4:

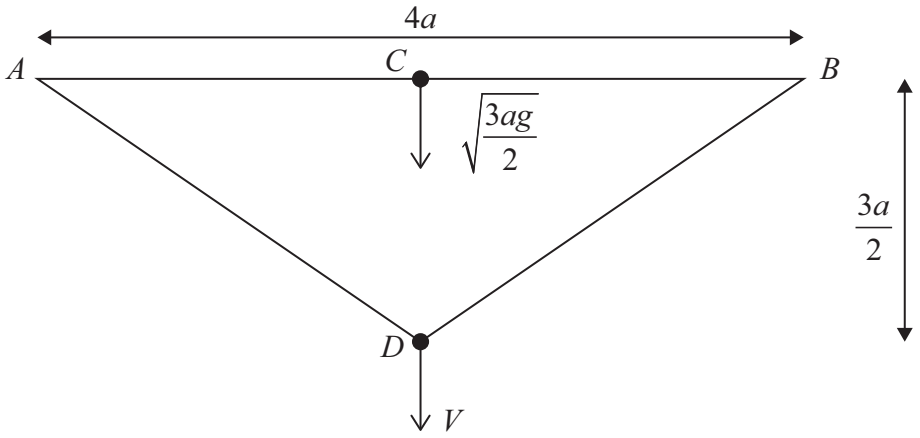


Figure 3

A light elastic string has natural length $3a$ and modulus of elasticity mg.
One end of the string is attached to the point A and the other end is attached to the point B, where AB is horizontal and $AB = 4a$.

A particle P of mass m is attached to the midpoint of the string.
The particle P is held at rest at C, the midpoint of AB.

The particle P is then projected **vertically downwards from C** with speed $\sqrt{\frac{3ag}{2}}$

At the instant when P reaches the point D, where $CD = \frac{3a}{2}$, the speed of P is V, as shown in Figure 3.

(a) Show that the elastic energy stored in the string increases by $\frac{1}{2}mga$, as P moves downwards from C to D.

(3)

Air resistance is modelled as a constant force of magnitude $\frac{1}{5}mg$

Using the model and the work-energy principle,

(b) find V in terms of a and g.

(5)

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Question 4 continued

(Total for Question 4 is 8 marks)