7:

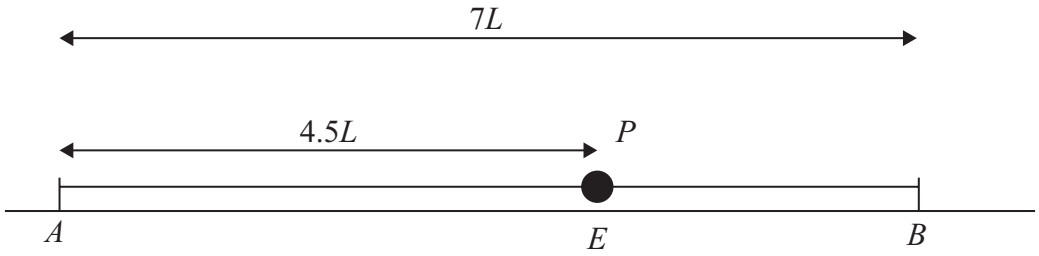


Figure 7

A particle P of mass m lies at rest on a smooth horizontal table.

One end of a light elastic string, of natural length $3L$ and modulus of elasticity mg, is attached to P. The other end is attached to a point A on the table.

One end of a second light elastic string, of natural length $2L$ and modulus of elasticity $2mg$, is also attached to P. The other end is attached to a point B on the table where $AB = 7L$.

The particle P rests in equilibrium on the table at the point E, where AEB is a straight line and $AE = 4.5L$, as shown in Figure 7.

The particle P is now held at the point C on AB, where $AC = 5L$, and released.

(a) Show that P moves with simple harmonic motion with centre E and period $\pi\sqrt{\frac{3L}{g}}$

(7)

(b) Find, in terms of L and g, the maximum speed of P.

(3)

(c) Find, in terms of L and g, the exact amount of time, in any one oscillation, for which the speed of P is less than or equal to $\sqrt{\frac{gL}{12}}$

(6)

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