7.

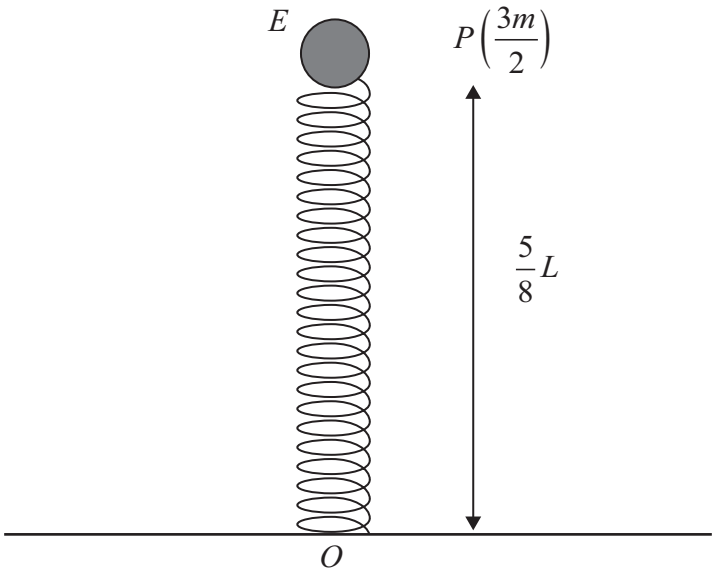


Figure 7

A light elastic spring has natural length L and modulus of elasticity $4mg$. One end of the spring is attached to a point O on a horizontal surface. The other end is attached to a particle P of mass $\frac{3m}{2}$. The particle is at rest in equilibrium at the point E, with the spring vertical and $OE = \frac{5}{8}L$, as shown in Figure 7.

The particle P is then pushed vertically downwards through a distance $\frac{1}{2}L$ and, at time $t = 0$, released from rest.

(a) Show that P then moves with simple harmonic motion about E, with period $\pi\sqrt{\frac{3L}{2g}}$

(6)

(b) Find the exact value of t at the instant when P is first moving upwards and decelerating with magnitude $\frac{2}{3}g$

(5)

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