3 To demonstrate simple harmonic motion, a student attaches a trolley to two similar stretched springs, as shown in Fig. 3.1.

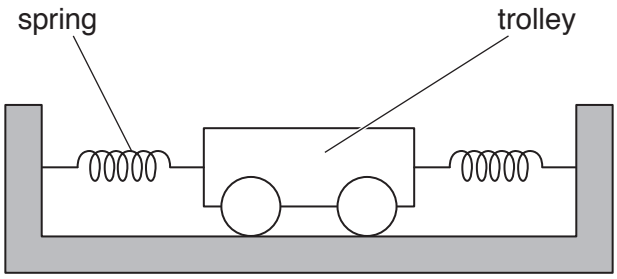

Fig. 3.1

The trolley has mass m of 810 g.

The trolley is displaced along the line of the two springs and then released. The subsequent acceleration a of the trolley is given by the expression

$$a = -\frac{2kx}{m}$$

where the spring constant k for each of the springs is 64 N m^{-1} and x is the displacement of the trolley.

(a) Show that the frequency of oscillation of the trolley is 2.0 Hz.

[3]

(b) The maximum displacement of the trolley is 1.6 cm.
Calculate the maximum speed of the trolley.

speed = ... m s^{-1} [2]

(c) The mass of the trolley is increased. The initial displacement of the trolley remains unchanged.

Suggest the change, if any, that occurs in the frequency and in the maximum speed of the oscillations of the trolley.

frequency: .....

maximum speed: .....
[2]

[Total: 7]

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