

- 3 One end of a spring is fixed to a support. A mass is attached to the other end of the spring. The arrangement is shown in Fig. 3.1.

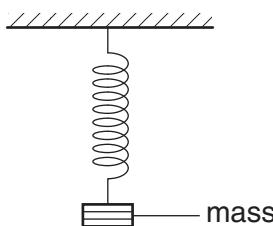


Fig. 3.1

- (a) The mass is in equilibrium. Explain, by reference to the forces acting on the mass, what is meant by equilibrium.

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..... [2]

- (b) The mass is pulled down and then released at time $t = 0$. The mass oscillates up and down. The variation with t of the displacement of the mass d is shown in Fig. 3.2.

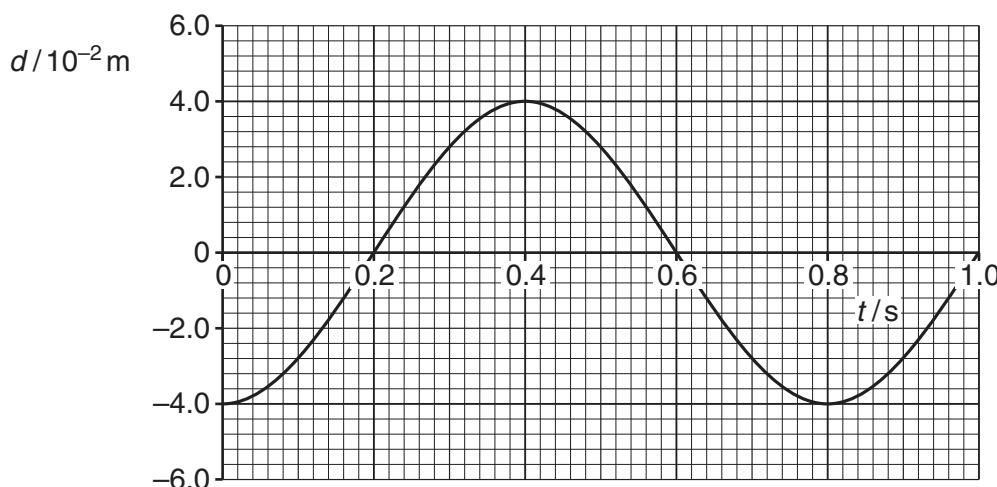


Fig. 3.2

Use Fig. 3.2 to state a time, one in each case, when

- (i) the mass is at maximum speed,

time = s [1]

- (ii) the elastic potential energy stored in the spring is a maximum,

time = s [1]

- (iii) the mass is in equilibrium.

time = s [1]

- (c) The arrangement shown in Fig. 3.3 is used to determine the length l of a spring when different masses M are attached to the spring.

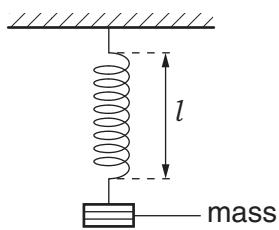


Fig. 3.3

The variation with mass M of l is shown in Fig. 3.4.

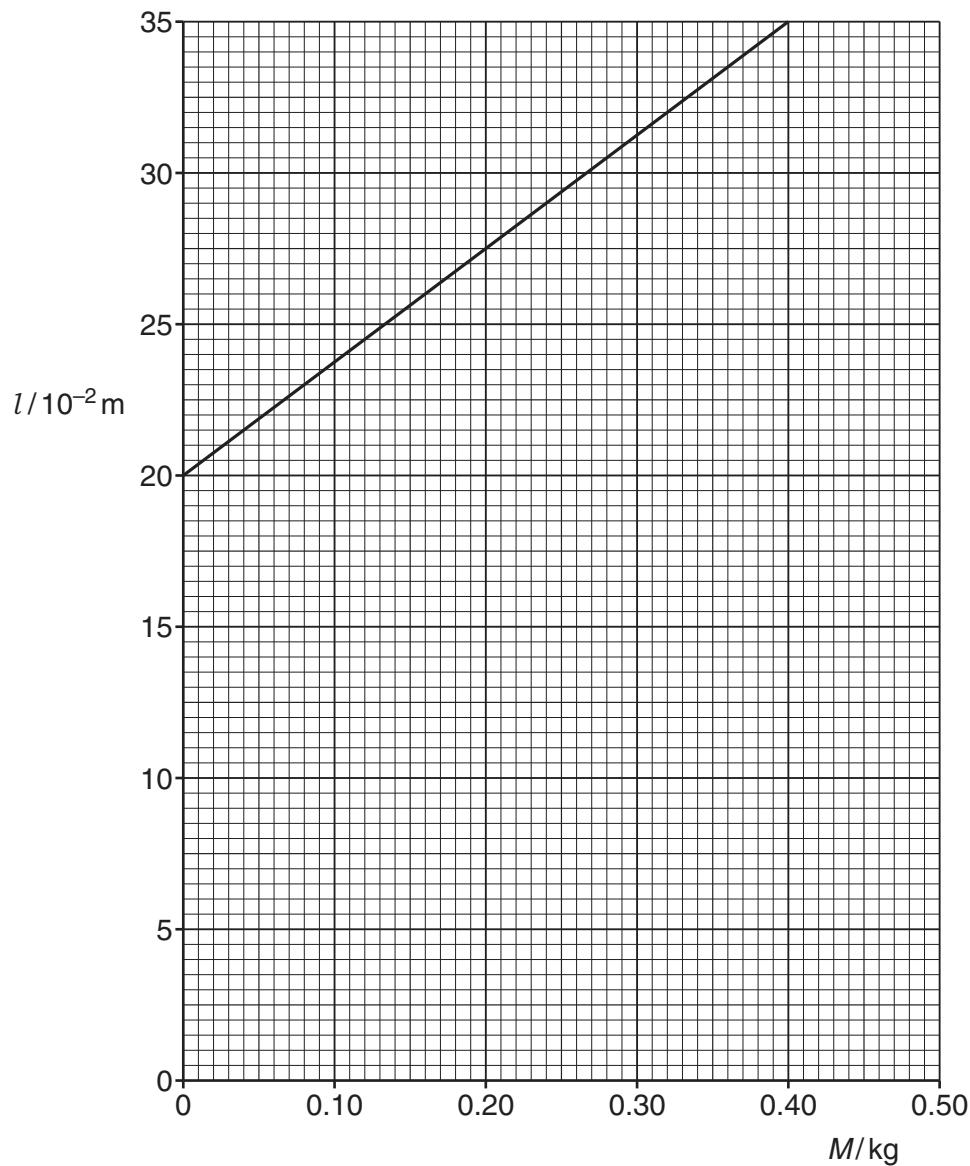


Fig. 3.4

- (i) State and explain whether the spring obeys Hooke's law.

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[2]

- (ii) Show that the force constant of the spring is 26 N m^{-1} .

[2]

- (iii) A mass of 0.40kg is attached to the spring. Calculate the energy stored in the spring.

energy = J [3]