

- 4 A mass hangs vertically from a fixed point by means of a spring, as shown in Fig. 4.1.

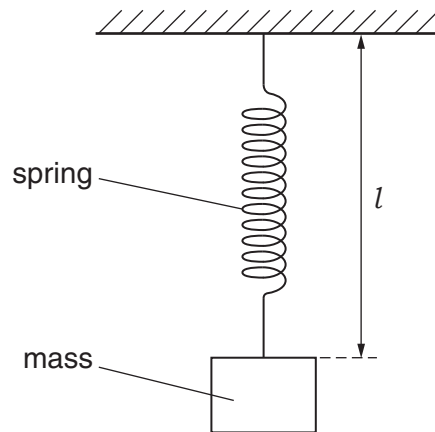


Fig. 4.1

The mass is displaced vertically and then released. The subsequent oscillations of the mass are simple harmonic.

The variation with time t of the length l of the spring is shown in Fig. 4.2.

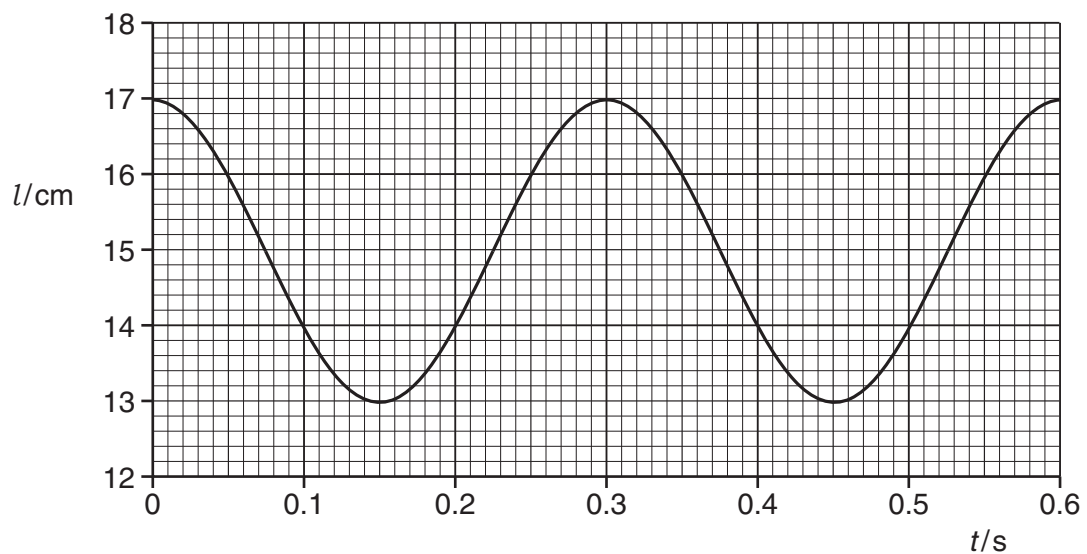


Fig. 4.2

(a) Use Fig. 4.2 to

- (i) state two values of t at which the mass is moving downwards with maximum speed,

$t = \dots\dots\dots$ s and $t = \dots\dots\dots$ s [1]

- (ii) determine, for these oscillations, the angular frequency ω ,

$$\omega = \dots\dots\dots \text{ rad s}^{-1} \quad [2]$$

- (iii) show that the maximum speed of the mass is 0.42 m s^{-1} .

[2]

- (b) Use data from Fig. 4.2 and (a)(iii) to sketch, on the axes of Fig. 4.3, the variation with displacement x from the equilibrium position of the velocity v of the mass.

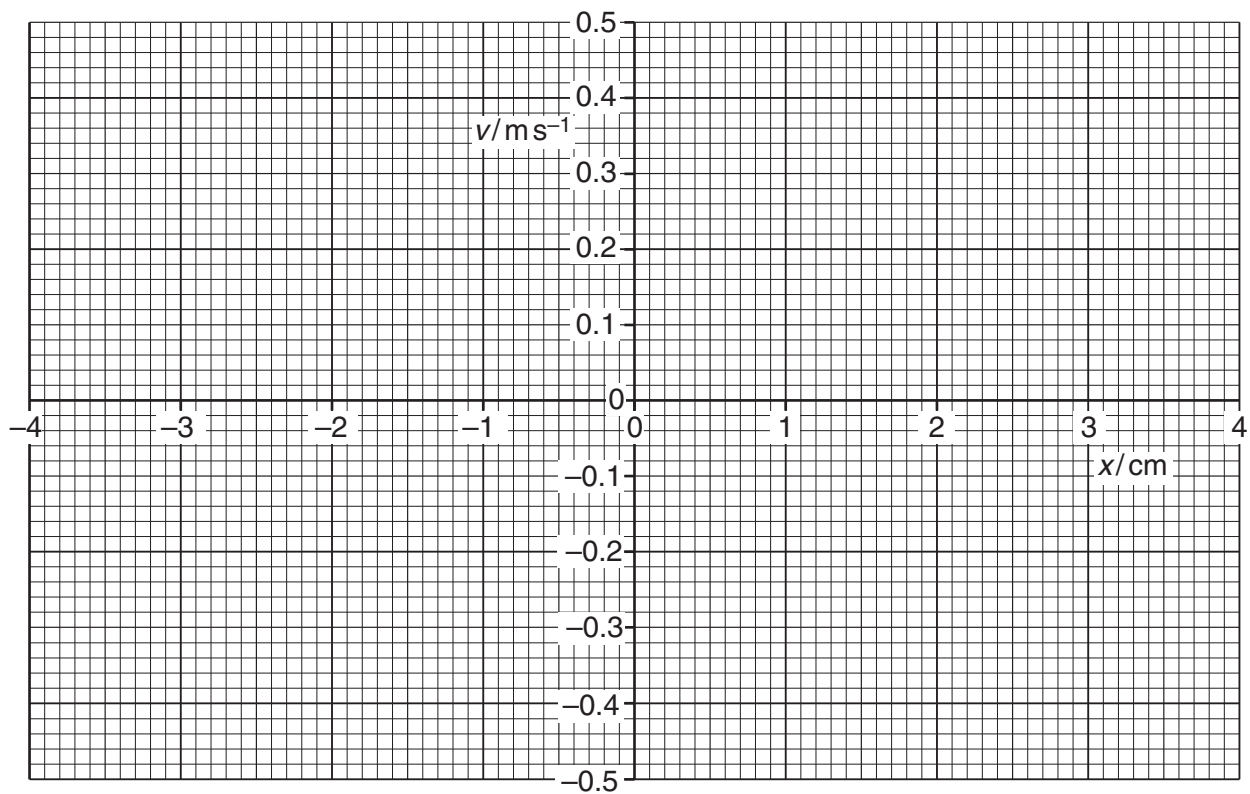


Fig. 4.3

[3]

[Total: 8]