

- 2 A student sets out to investigate the oscillation of a mass suspended from the free end of a spring, as illustrated in Fig. 2.1.

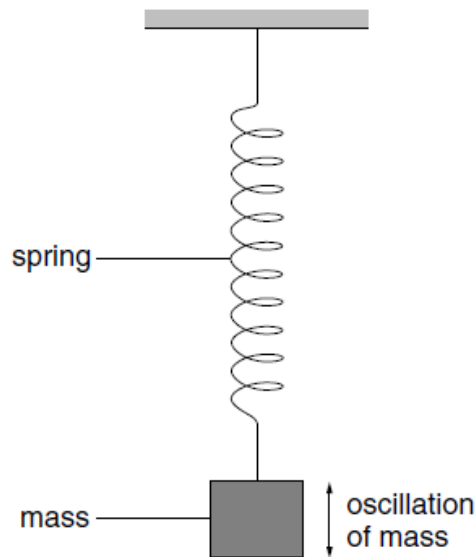


Fig. 2.1

The mass is pulled downwards and then released. The variation with time  $t$  of the displacement  $y$  of the mass is shown in Fig. 2.2.

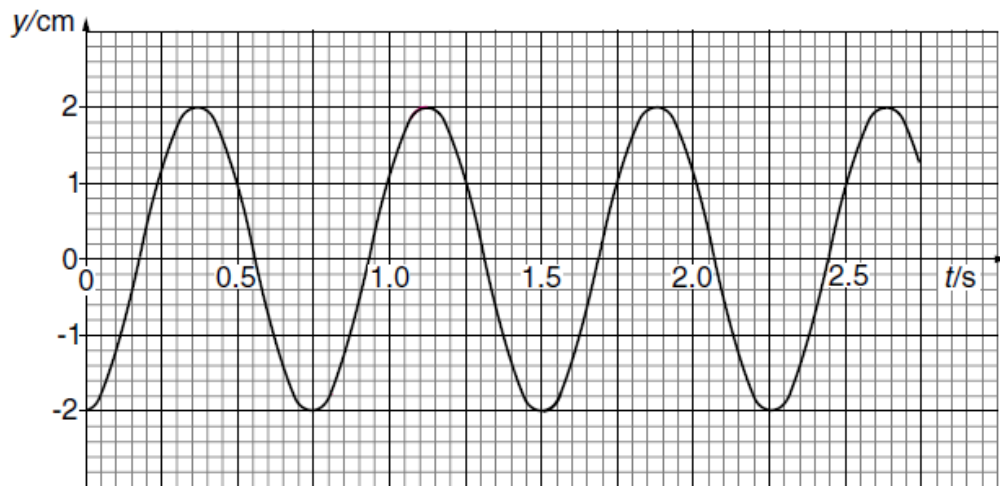


Fig. 2.2

(a) Use information from Fig. 2.2

- (i) to explain why the graph suggests that the oscillations are undamped,

..... [1]

- (ii) to calculate the angular frequency of the oscillations,

angular frequency = .....  $\text{rad s}^{-1}$  [2]

- (iii) to determine the maximum speed of the oscillating mass.

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

- (b) (i) Determine the resonant frequency  $f_0$  of the mass-spring system.

$f_0$  = ..... Hz [1]

- (ii) The student finds that if short impulsive forces of frequency  $\frac{1}{2} f_0$  are impressed on the mass-spring system, a large amplitude of oscillation is obtained. Explain this observation.

.....  
 .....  
 ..... [2]

[Total: 8]