3 A student sets out to investigate the oscillation of a mass suspended from the free end of a spring, as illustrated in Fig. 3.1.

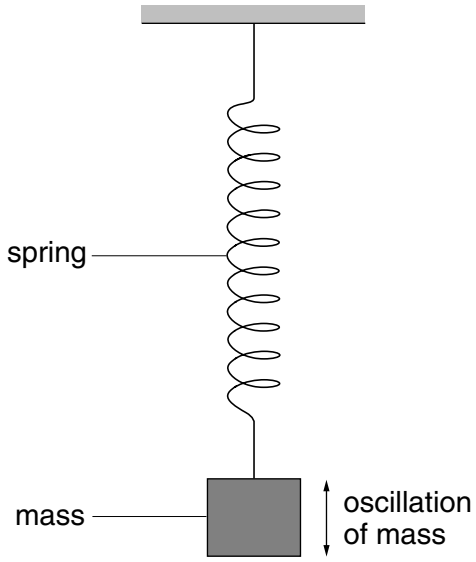

Fig. 3.1

The mass is pulled downwards and then released. The variation with time *t* of the displacement *y* of the mass is shown in Fig. 3.2.

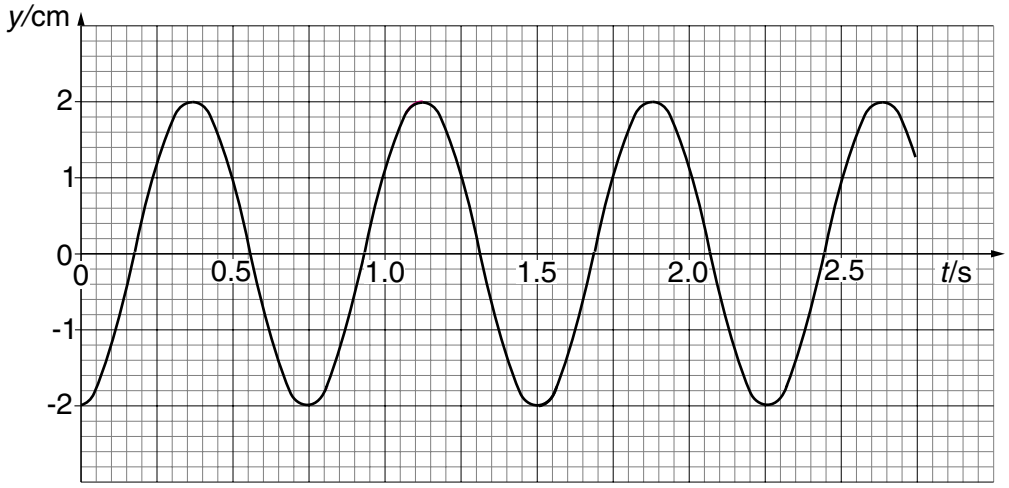

Fig. 3.2

(a) Use information from Fig. 3.2

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

.....

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

angular frequency = ... rad s^{-1}

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

speed = ... m s^{-1}
[6]

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

f_0 = ... Hz

(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.

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.....

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[3]

[Turn over