4 A mass is suspended vertically from a fixed point by means of a spring, as illustrated in Fig. 4.1.

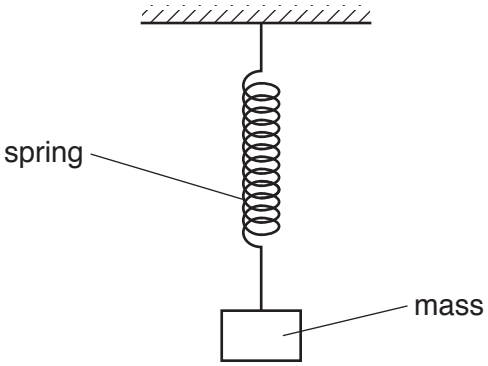

Fig. 4.1

The mass is oscillating vertically. The variation with displacement x of the acceleration a of the mass is shown in Fig. 4.2.

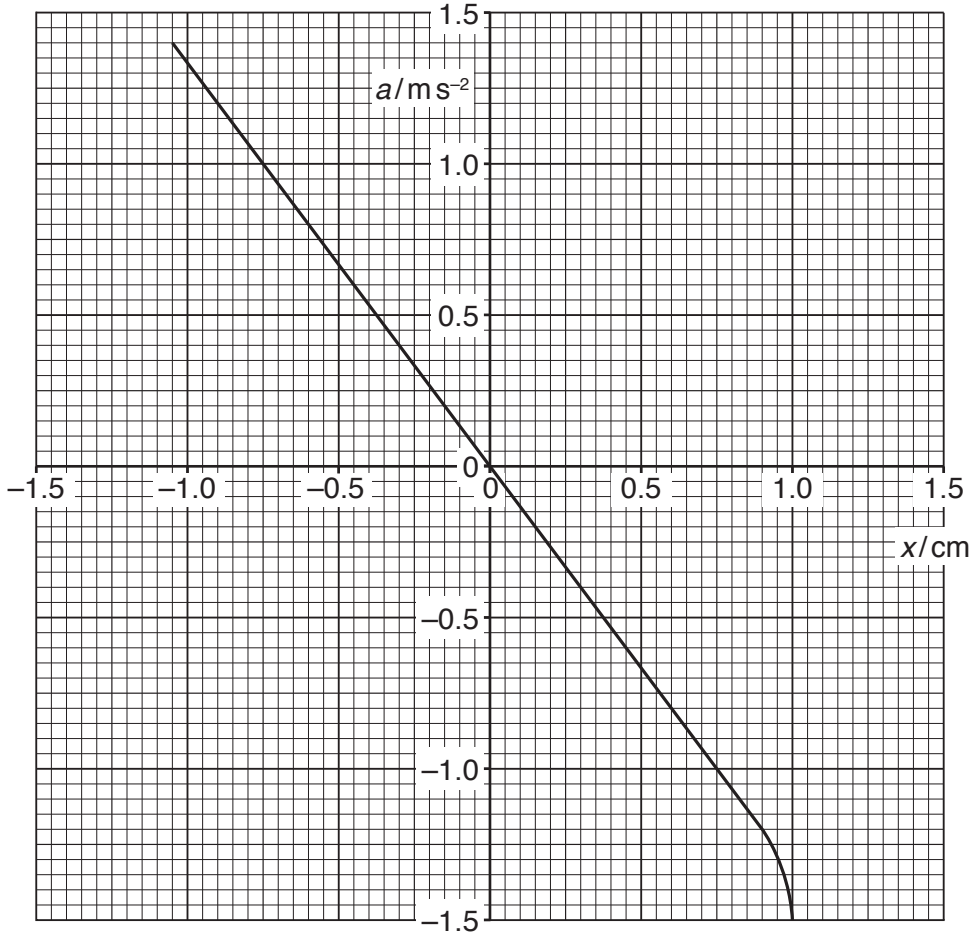

Fig. 4.2

(a) (i) State what is meant by the *displacement* of the mass on the spring.

.....

..... [1]

(ii) Suggest how Fig. 4.2 shows that the mass is not performing simple harmonic motion.

.....

..... [1]

(b) (i) The amplitude of oscillation of the mass may be changed.

State the maximum amplitude x_0 for which the oscillations are simple harmonic.

x_0 = ... cm [1]

(ii) For the simple harmonic oscillations of the mass, use Fig. 4.2 to determine the frequency of the oscillations.

frequency = ... Hz [3]

(c) The maximum speed of the mass when oscillating with simple harmonic motion of amplitude x_0 is v_0.

On Fig. 4.3, show the variation with displacement x of the velocity v of the mass for displacements from $+x_0$ to $-x_0$.

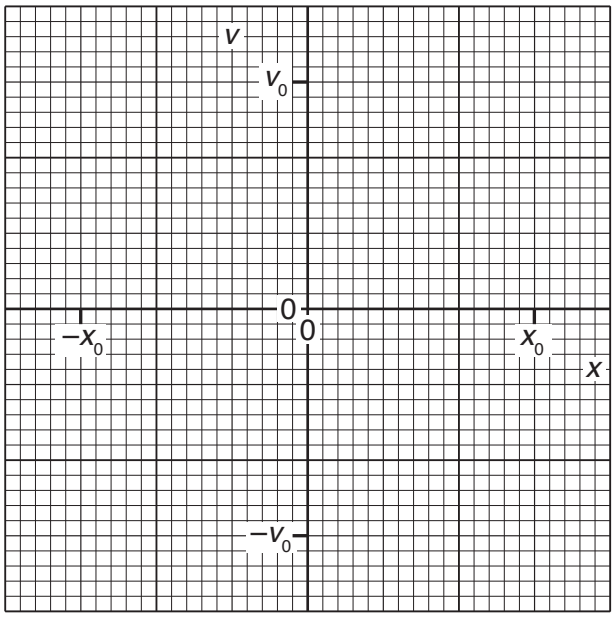

Fig. 4.3

[2]

[Total: 8]

[Turn over