

- 3 A spring is hung from a fixed point. A mass of 130 g is hung from the free end of the spring, as shown in Fig. 3.1.

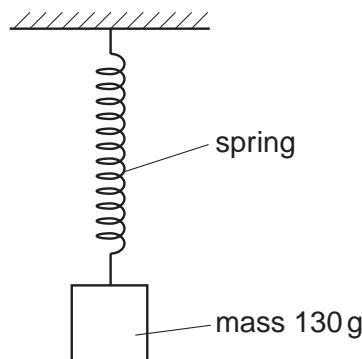


Fig. 3.1

The mass is pulled downwards from its equilibrium position through a small distance d and is released. The mass undergoes simple harmonic motion.

Fig. 3.2 shows the variation with displacement x from the equilibrium position of the kinetic energy of the mass.

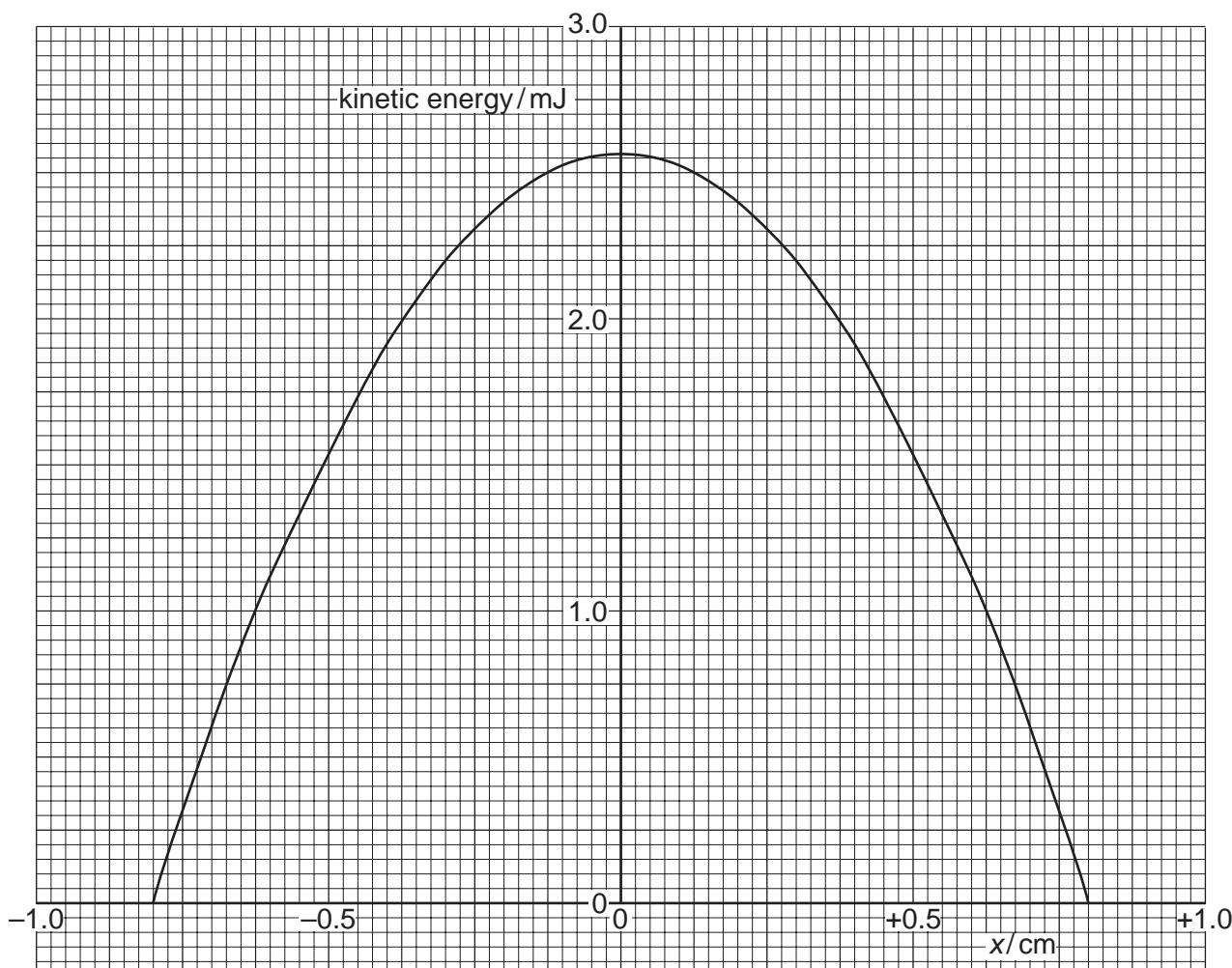


Fig. 3.2

(a) Use Fig. 3.2 to

- (i) determine the distance d through which the mass was displaced initially,

$$d = \dots \text{ cm} [1]$$

- (ii) show that the frequency of oscillation of the mass is approximately 4.0 Hz.

[6]

(b) (i) On Fig. 3.2, draw a line to represent the total energy of the oscillating mass. [1]

- (ii) After many oscillations, damping reduces the total energy of the mass to 1.0 mJ.
For the oscillations with reduced energy,

1. state the frequency,

$$\text{frequency} = \dots \text{ Hz}$$

2. using the graph, or otherwise, state the amplitude.

$$\text{amplitude} = \dots \text{ cm} [2]$$