3 A metal ball is suspended from a fixed point by means of a string, as illustrated in Fig. 3.1.

For Examiner's Use

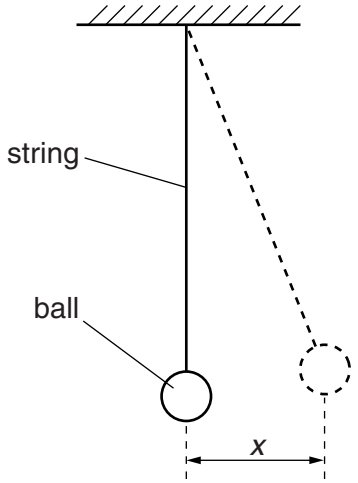

Fig. 3.1

The ball is given a small displacement and then released. The variation with time t of the displacement x of the ball is shown in Fig. 3.2.

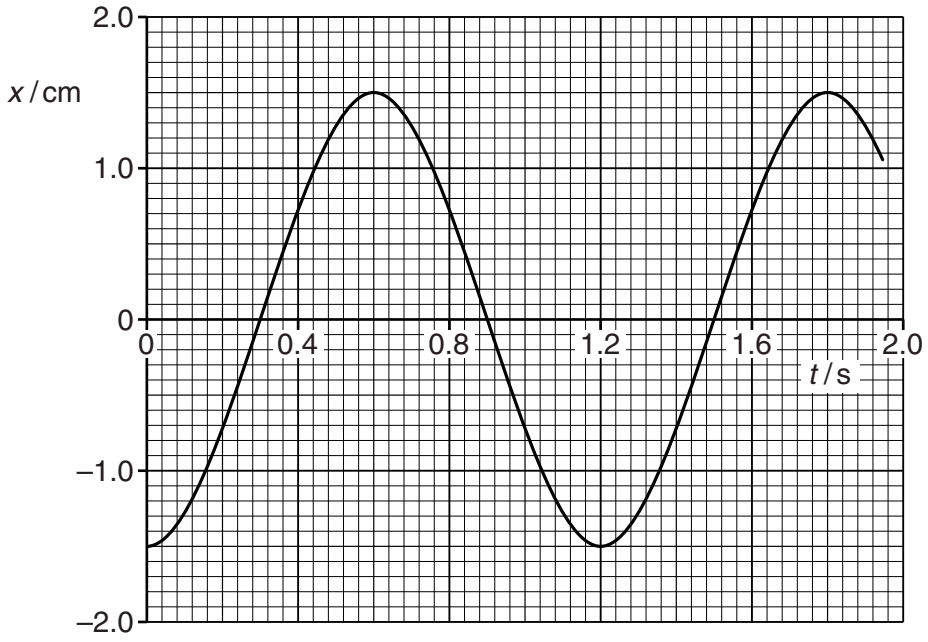

Fig. 3.2

(a) (i) State two times at which the speed of the ball is a maximum.

time = ... s and time = ... s [1]

(ii) Show that the maximum speed of the ball is approximately $0.08\,m\,s^{-1}$.

[2]

(b) The variation with displacement x of the potential energy E_P of the oscillations of the ball is shown in Fig. 3.3.

For Examiner's Use

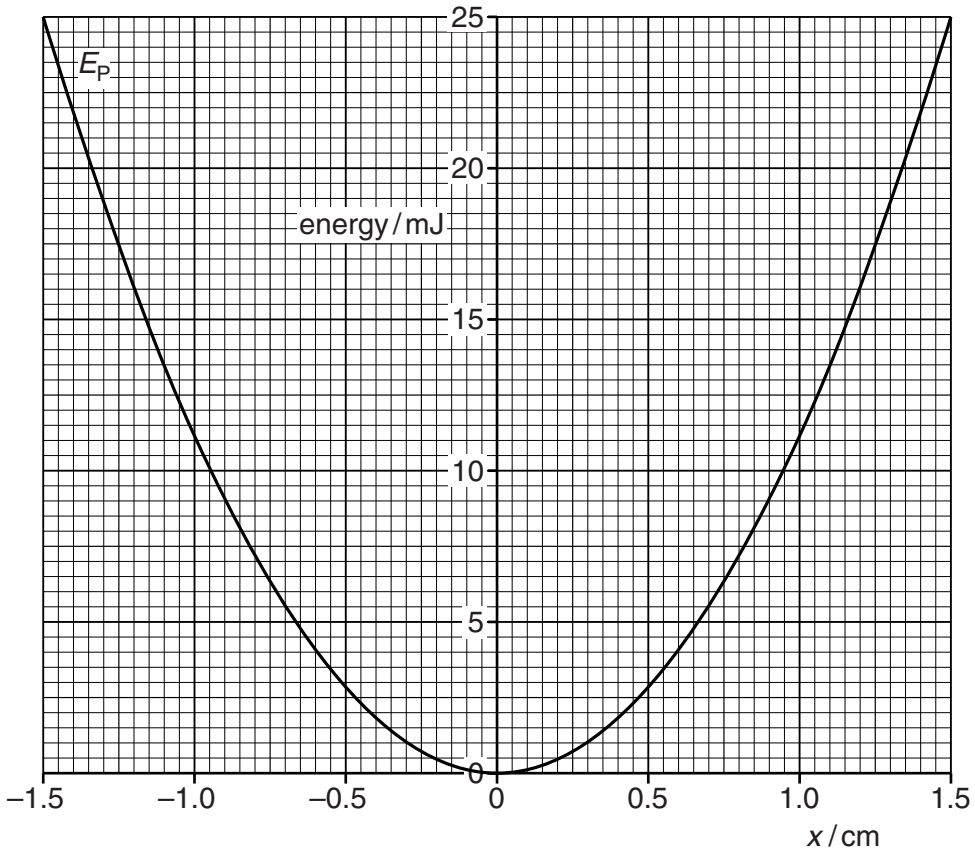

Fig. 3.3

(i) On the axes of Fig. 3.3, sketch a graph to show the variation with displacement x of the kinetic energy of the ball. [2]

(ii) The amplitude of the oscillations reduces over a long period of time.
After many oscillations, the amplitude of the oscillations is 0.60 cm.

Use Fig. 3.3 to determine the total energy of the oscillations of the ball for oscillations of amplitude 0.60 cm. Explain your working.

energy = ... J [2]

[Turn over