3   A ball is held between two fixed points A and B by means of two stretched springs, as shown in Fig. 3.1.
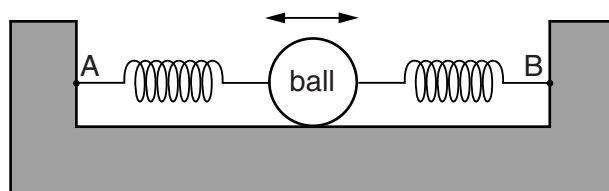
Fig. 3.1

The ball is free to oscillate along the straight line AB. The springs remain stretched and the motion of the ball is simple harmonic.

The variation with time t of the displacement x of the ball from its equilibrium position is shown in Fig. 3.2.
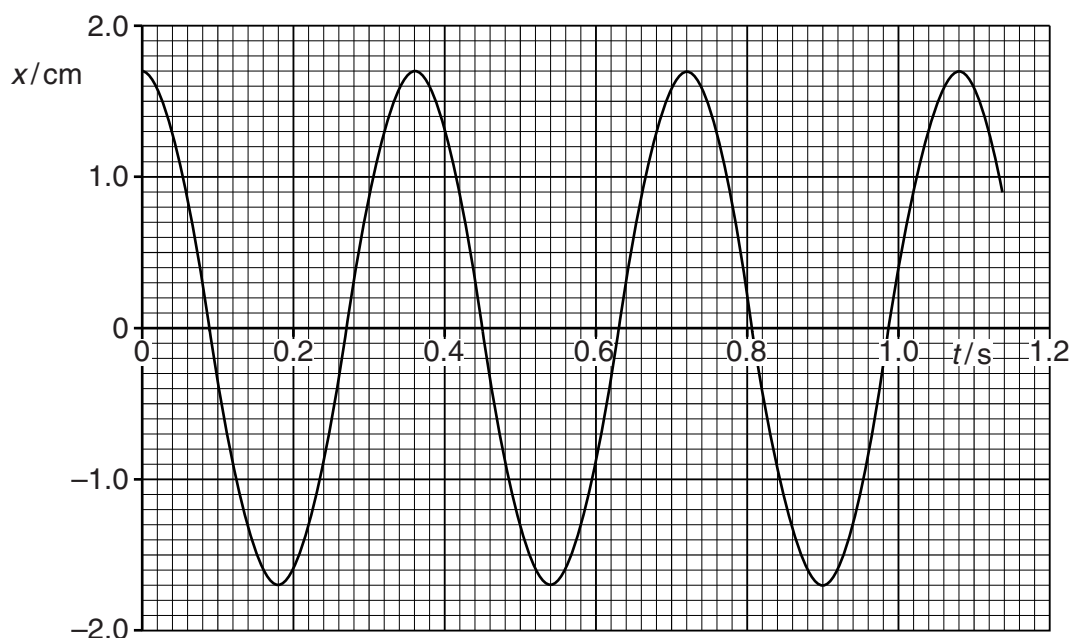

Fig. 3.2

(a) (i)   Use Fig. 3.2 to determine, for the oscillations of the ball,

  1.   the amplitude,

amplitude = ... cm [1]

  2.   the frequency.

frequency = ... Hz [2]

(ii) Show that the maximum acceleration of the ball is $5.2\,\mathrm{m\,s^{-2}}$.

[2]

(b) Use your answers in **(a)** to plot, on the axes of Fig. 3.3, the variation with displacement x of the acceleration a of the ball.

$a/\mathrm{m\,s^{-2}}$

$x/10^{-2}\,\mathrm{m}$

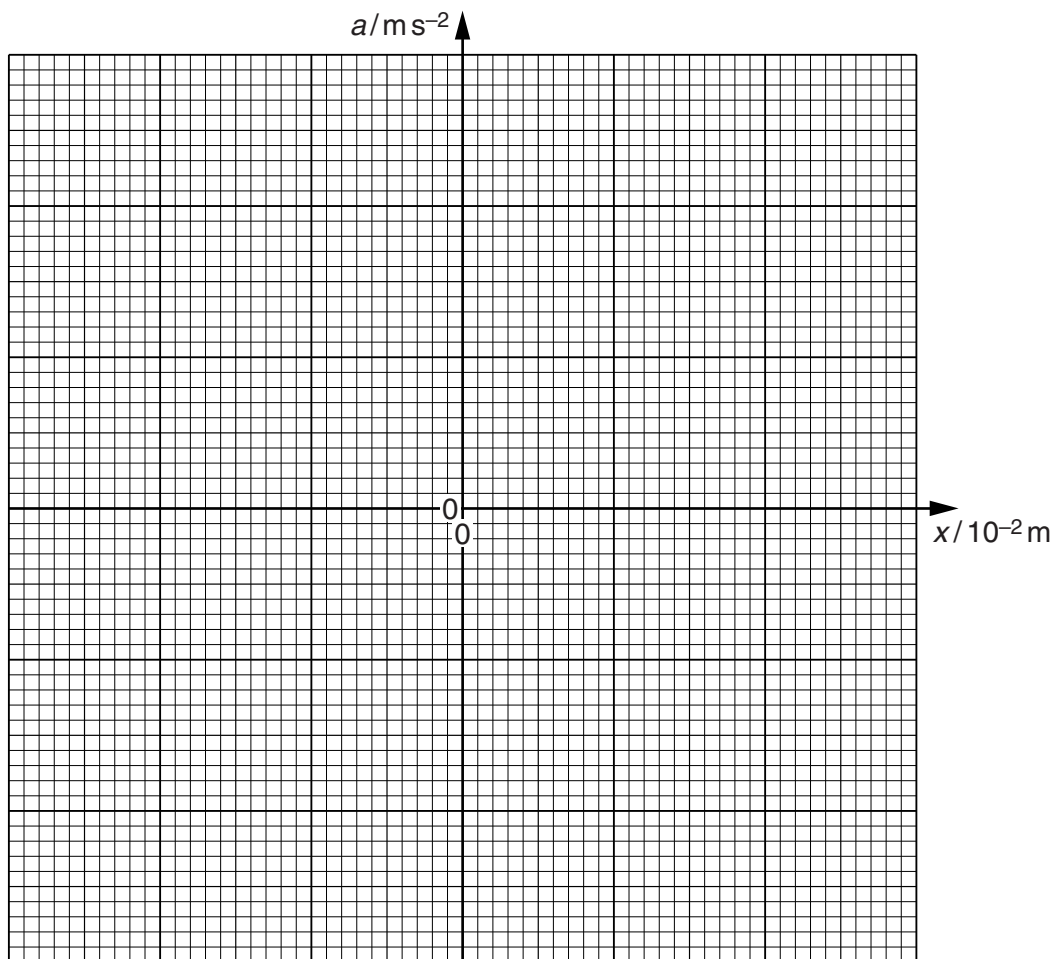**Fig. 3.3**

[2]

(c) Calculate the displacement of the ball at which its kinetic energy is equal to one half of the maximum kinetic energy.

displacement = ... cm [3]