

- 3 A pendulum consists of a metal sphere P suspended from a fixed point by means of a thread, as illustrated in Fig. 3.1.

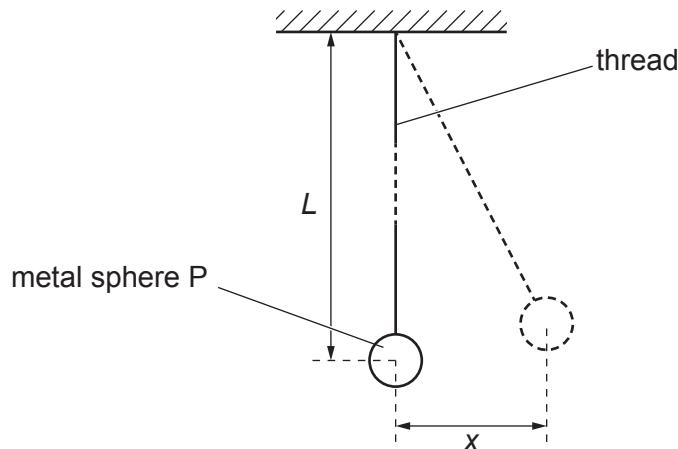


Fig. 3.1

The centre of gravity of sphere P is a distance L from the fixed point.

The sphere is pulled to one side and then released so that it oscillates. The sphere may be assumed to oscillate with simple harmonic motion.

- (a) State what is meant by *simple harmonic motion*.

.....
.....
..... [2]

- (b) The variation of the velocity v of sphere P with the displacement x from its mean position is shown in Fig. 3.2.

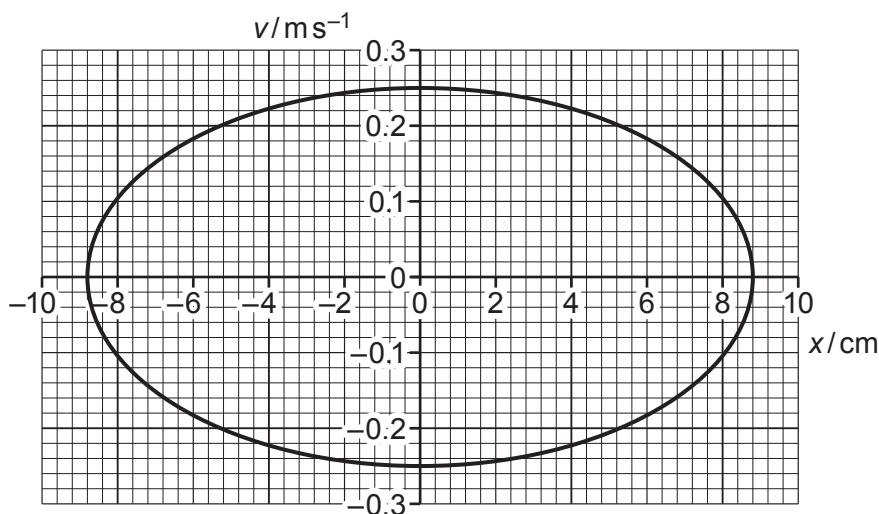


Fig. 3.2

Use Fig. 3.2 to determine the frequency f of the oscillations of sphere P.

$$f = \dots \text{ Hz} [3]$$

- (c) The period T of the oscillations of sphere P is given by the expression

$$T = 2\pi \sqrt{\left(\frac{L}{g}\right)}$$

where g is the acceleration of free fall.

Use your answer in (b) to determine the length L .

$$L = \dots \text{ m} [2]$$

- (d) Another pendulum consists of a sphere Q suspended by a thread. Spheres P and Q are identical. The thread attached to sphere Q is longer than the thread attached to sphere P.

Sphere Q is displaced and then released. The oscillations of sphere Q have the same amplitude as the oscillations of sphere P.

On Fig. 3.2, sketch the variation of the velocity v with displacement x for sphere Q. [2]