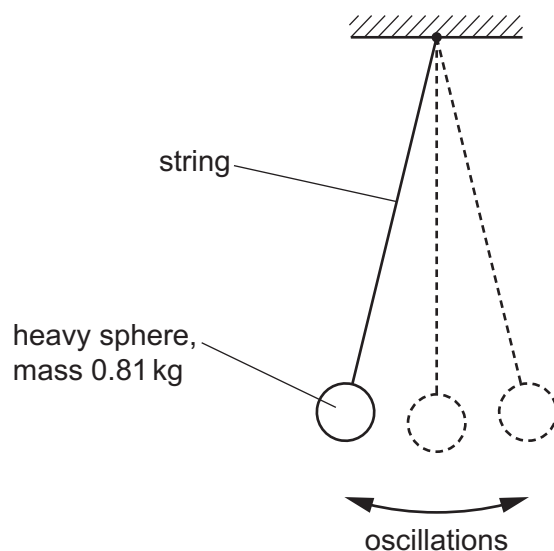


- 4 A heavy metal sphere of mass 0.81 kg is suspended from a string. The sphere is undergoing small oscillations from side to side, as shown in Fig. 4.1.



**Fig. 4.1**

The oscillations of the sphere may be considered to be simple harmonic with amplitude 0.036 m and period 3.0 s.

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

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

- (b) Calculate:

- (i) the angular frequency of the oscillations

angular frequency = .....  $\text{rad s}^{-1}$  [2]

(ii) the total energy of the oscillations.

total energy = ..... J [2]

- (c) The suspended sphere is now lowered into water. The sphere is given a sideways displacement of  $+0.036\text{ m}$  from its equilibrium position and is then released at time  $t = 0$ . The water causes the motion of the sphere to be critically damped.

On Fig. 4.2, sketch the variation of the displacement  $x$  of the sphere from its equilibrium position with  $t$  from  $t = 0$  to  $t = 6.0\text{ s}$ .

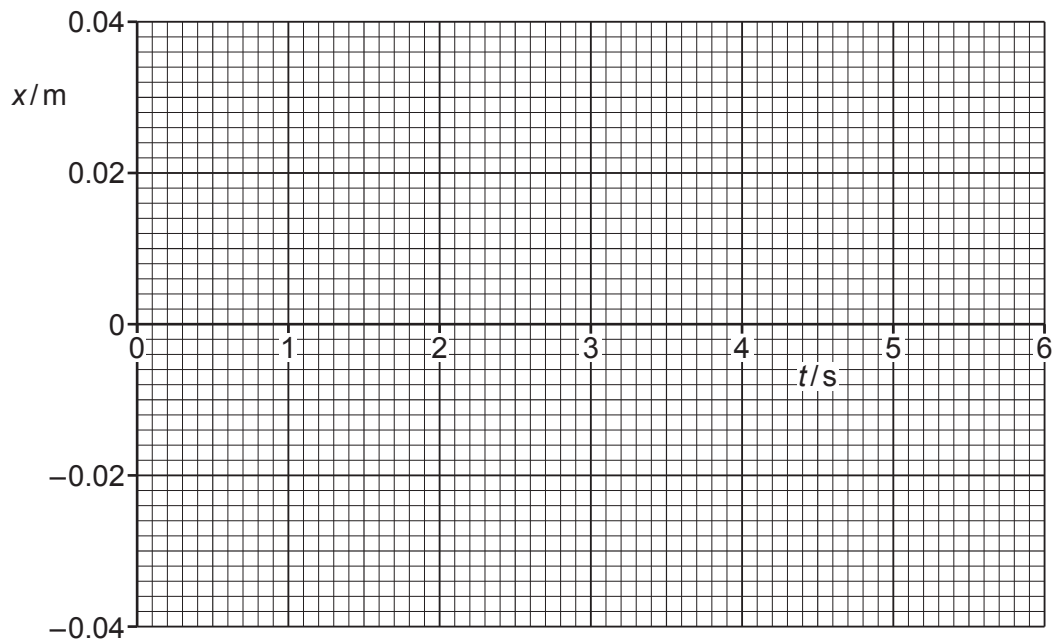


Fig. 4.2

[3]