4 A 1.2 kg sphere resting on a smooth surface is connected to the side of the wall via a spring with spring constant of 65 N m^{-1} as shown in Fig. 4.1.
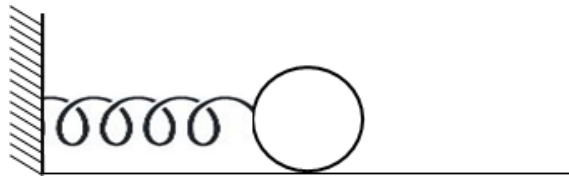

Fig. 4.1

A horizontal force of 8.0 N is exerted on the sphere and the spring is extended by x m.

(a) Determine x.

$x =$ ……………………… m [2]

(b) The force is now removed and the sphere is observed to move in simple harmonic motion.

    (i) Determine the maximum kinetic energy of the sphere.

maximum kinetic energy = ……………………… J [2]

    (ii) Hence or otherwise, determine the period of the oscillation.

period = ……………………… s [2]

(iii) On Fig 4.2, sketch the variation with time of the kinetic energy of the sphere.

energy / J

time / s

Fig. 4.2

[2]

(iv) Sketch, on Fig 4.3, the variation with displacement of the kinetic energy of the sphere.

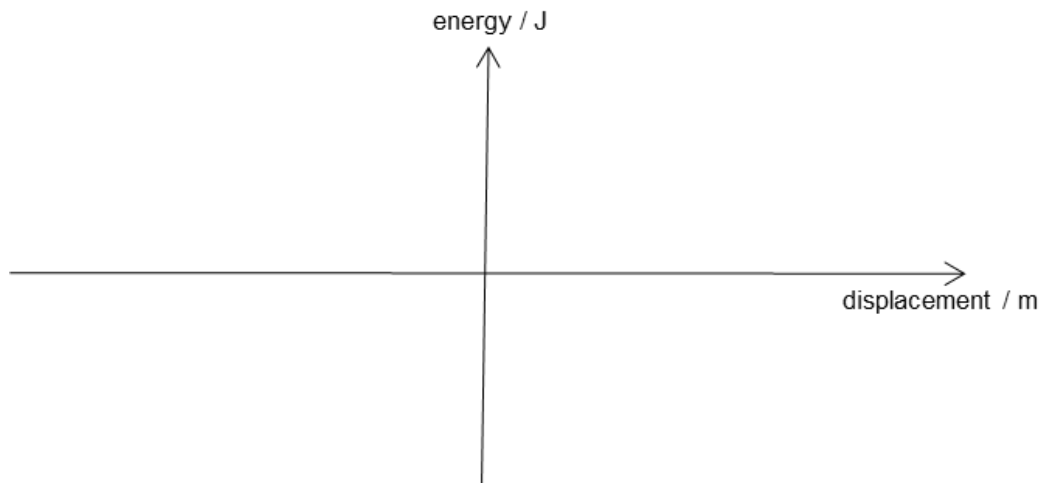energy / J

displacement / m

Fig. 4.3

[2]

(v) Sketch on Fig. 4.3, the variation with displacement of the kinetic energy of the sphere if the experiment is repeated on a rough surface. Label this graph as **A**.

[2]

[Total: 12]