2 Fig. 2.1 shows a mass *m* attached to a spring performing *simple harmonic motion* in the vertical *y* direction. The spring constant *k* of the spring is 61.4 N m^{-1}.

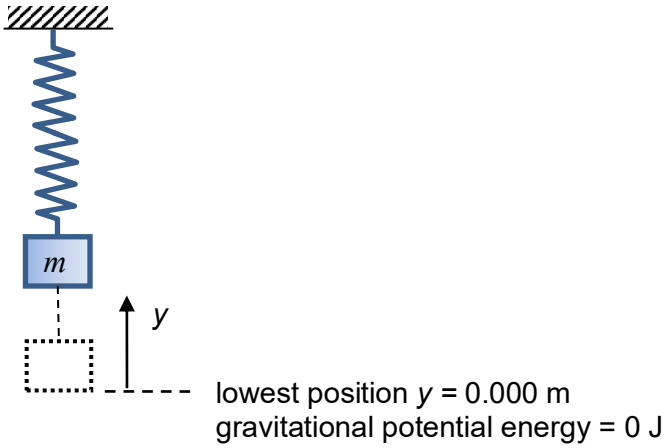

Fig. 2.1

At *y* = 0.000 m, the lowest point of the oscillation, the gravitational potential energy of the system is defined as 0 J.

As the system oscillates, its total energy is a constant and comprising kinetic energy, elastic potential energy and gravitational potential energy. At different positions *y* above the lowest position of oscillation, the kinetic energy and the elastic potential energy of the system vary as shown in Fig. 2.2.

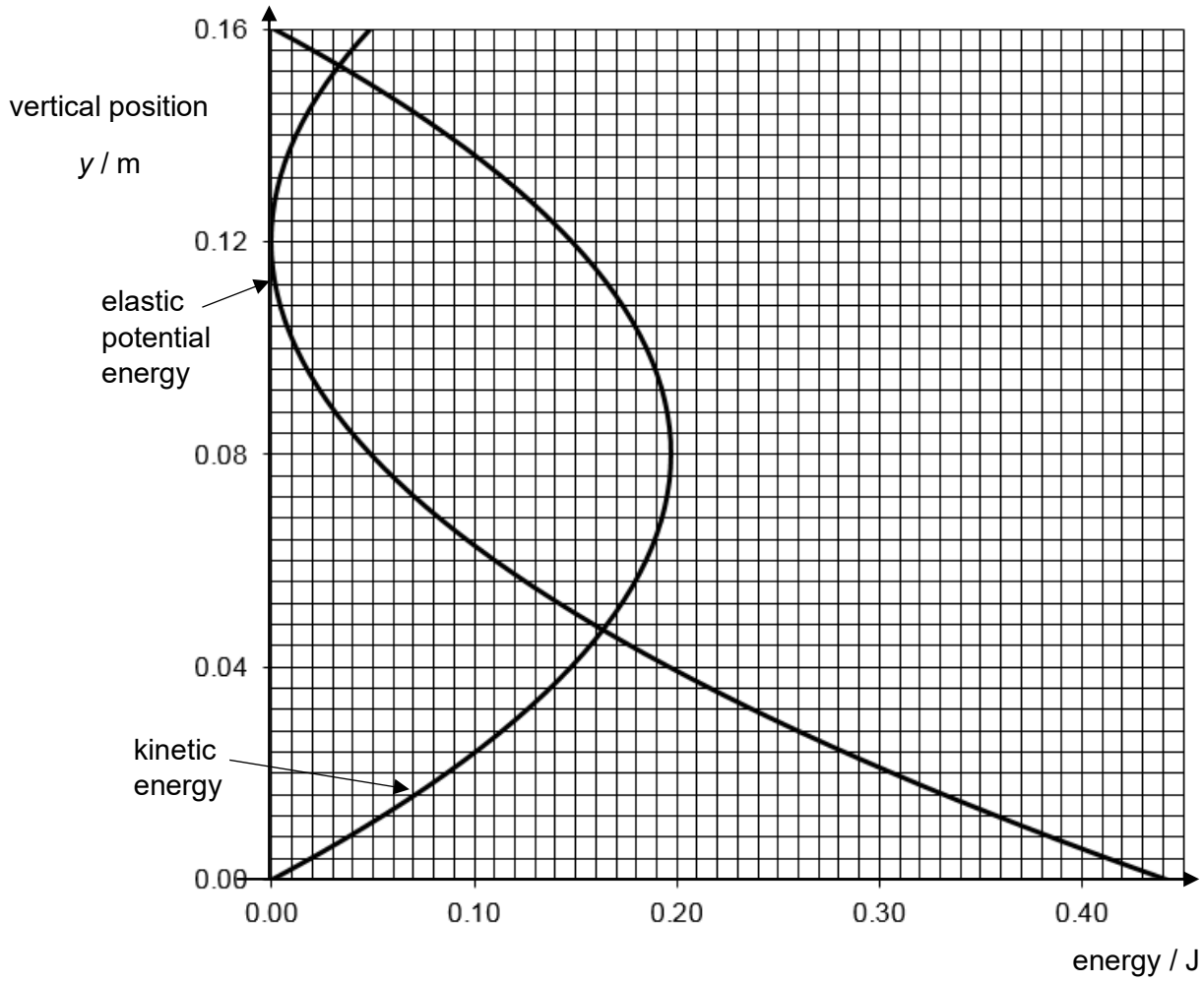

Fig. 2.2

(a) Define *simple harmonic motion*.

.....

.....

.....

.....[2]

(b) Determine the total energy of the system. Show your working clearly.

total energy = ...J [2]

(c) Sketch on Fig. 2.2 a graph showing the variation with y of the gravitational potential energy of the system. [2]

(d) Hence or otherwise, show that mass m is 0.250 kg.

m = ...kg [2]

(e) Find the period T of the oscillation.

T = ...s [2]