7

(a)

A spring that has an unstretched length of 0.500 m is attached to a fixed point. A mass of 0.400 kg is attached to the spring and gently lowered until equilibrium is reached. The spring has then stretched elastically by a distance of 0.150 m.

Calculate, for the stretching of the spring

(i)

the loss in gravitational potential energy of the mass,

loss = …… J

[1]

(ii)

the elastic potential energy gained by the spring.

gain = …… J

[1]

(b)

Explain why the two answers to **(a)** are different

……..

……..

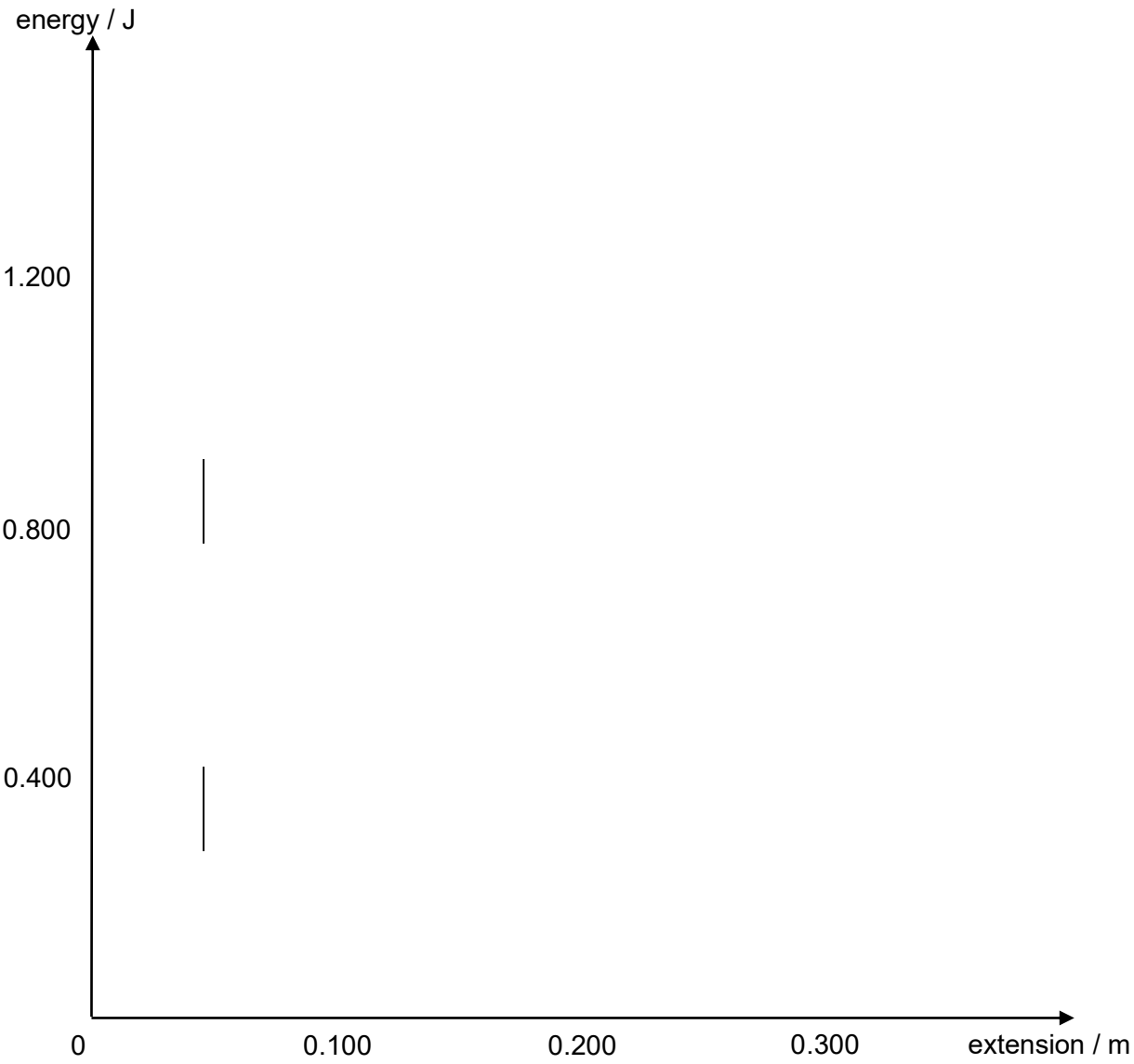
……..

[2]

(c)

The load on the spring is now set into simple harmonic motion of amplitude 0.150 m.

Show that the angular frequency of the oscillation is 8.09 rad s^{-1}.



[3]

(d)

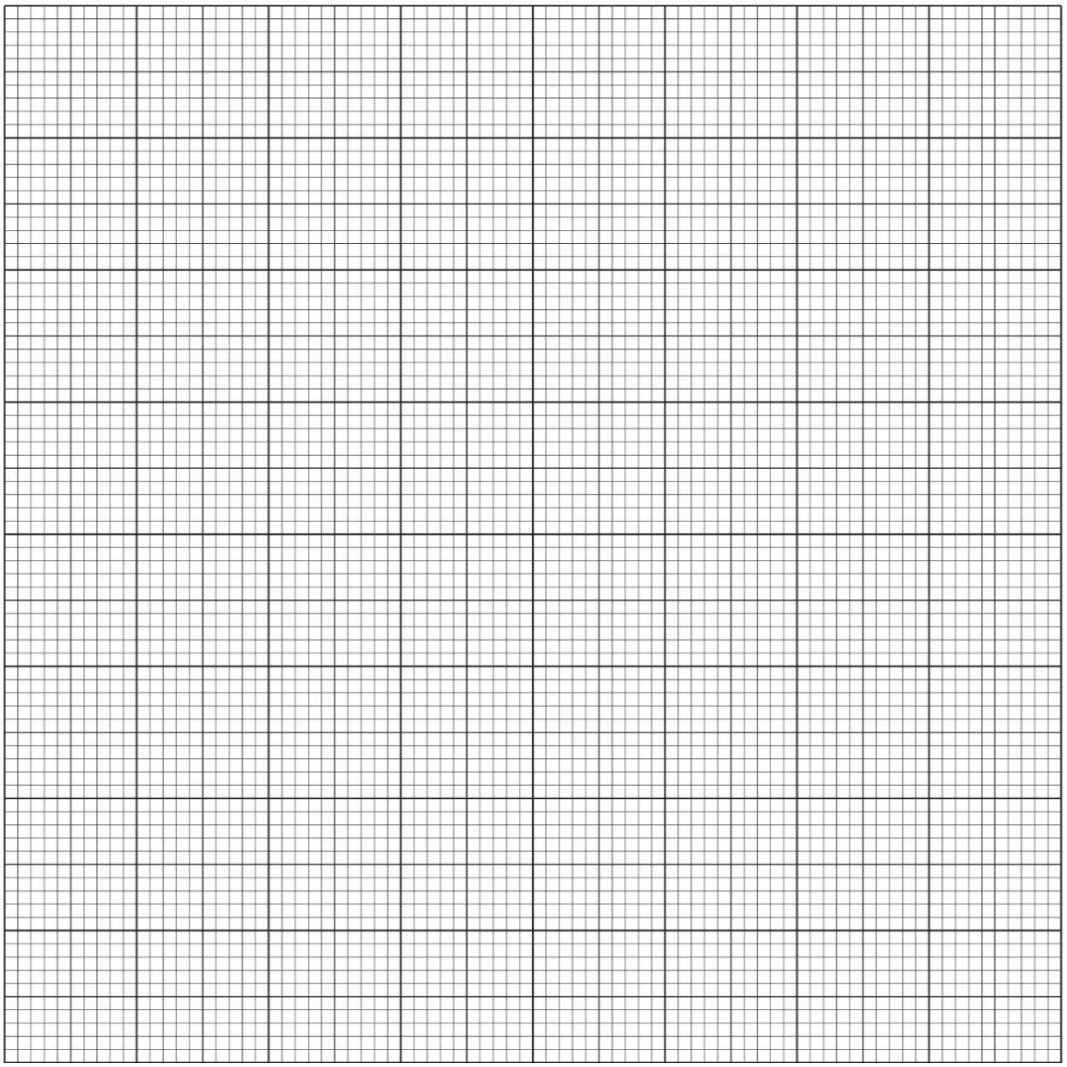


Fig. 7.1

The gravitational potential energy of the mass is 0 J when the spring is fully extended to the lowest point of the oscillation of the mass.

On Fig. 7.1, sketch the variation with extension of the spring, the kinetic energy and total potential energy for the oscillating mass. Label the graph for kinetic energy **T** and the graph for total potential energy **V**.

[3]

[Total: 10]