6 **(a)** Distinguish between *frequency* and *angular frequency* for a body undergoing simple harmonic motion.

.....

.....

.....[2]

(b) A spring that has an unstretched length of 0.650 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 0.200 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 [2]

(c) Explain why the two answers to **(b)** are different.

.....

.....

.....[2]

(d) The load on the spring is now set into simple harmonic motion of amplitude 0.200 m.

Calculate

(i) the resultant force on the load at the lowest point of its movement,

resultant force = ... N [2]

(ii) the angular frequency of the oscillation,

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

(iii) the maximum speed of the mass.

maximum speed = ... m s^{-1} [1]

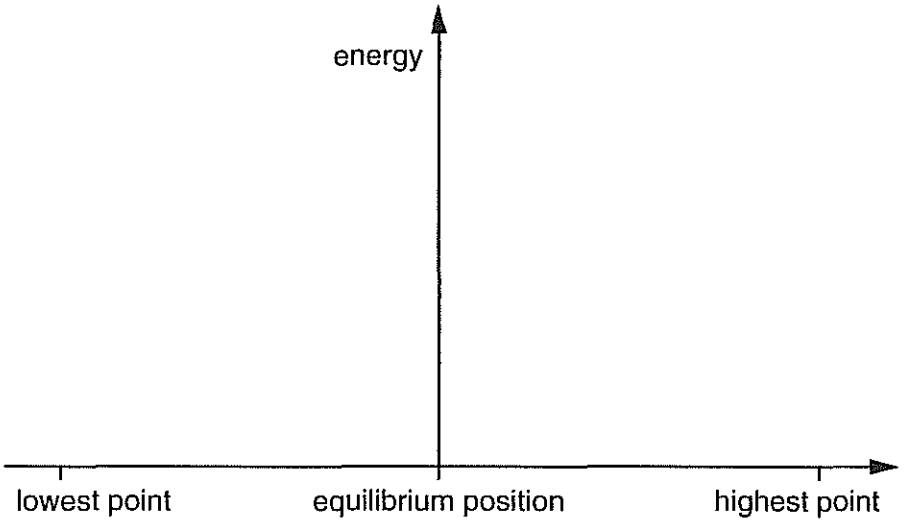
(e) Fig. 6.1 is a table of the energies of the simple harmonic motion. Complete the table.

	gravitational potential energy/J	elastic potential energy/J	kinetic energy/J	total energy/J
lowest point	0			
equilibrium position				
highest point				

Fig. 6.1

[5]

(f) On the axes of Fig. 6.2 below, sketch four graphs to show the shape of the variation with position of the four energies. Label each graph.



[3]

Fig. 6.2