3 A spring hangs vertically from a fixed point.
A mass of 1.2 kg is attached to the free end of the spring, as shown in Fig. 3.1.

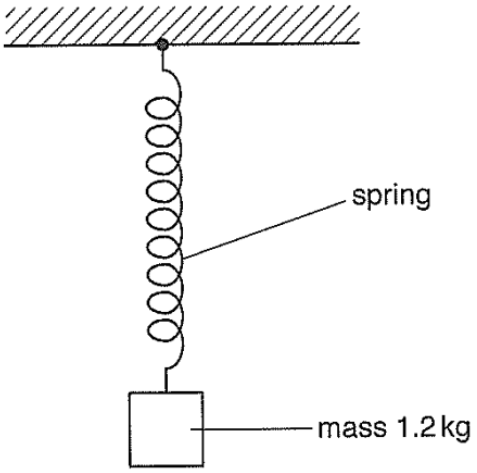

Fig. 3.1

The mass is at the maximum displacement below the equilibrium position at t = 0 s.
It undergoes vertical oscillations with frequency 2.5 Hz and amplitude 3.4 cm.
Take upwards as positive.

(a) The variation with the vertical displacement x of the velocity v of the mass on the spring is shown in Fig. 3.2.
On Fig. 3.2.

(i) indicate the values where the graph cuts the axes,

(ii) mark the starting position at t = 0 s and label this point **A**.

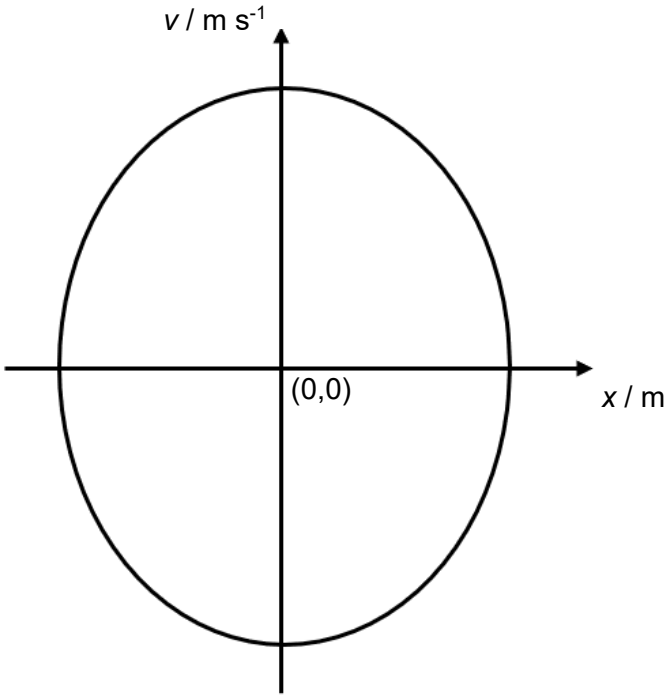

Fig. 3.2

[2]

(b) For the oscillations of the mass, determine the total energy E_T.

E_T = ... J [2]

(c) **(i)** On Fig. 3.2, mark the position where the potential energy E_P is equal to the kinetic energy E_K for the first time upon releasing the mass. Label this point **B**. [1]

(ii) Determine the displacement d of the mass at **B**.

d = ... m [2]

(d) Calculate the phase difference between the positions **A** and **B**.

phase difference = ... rad [2]

[Total: 9]