3 **(a)** Explain what is meant by

(i) a free oscillation,

……

…… [1]

(ii) the natural frequency of an oscillating body.

……

…… [1]

(b) A strip of metal is clamped to the edge of a bench and a mass is hung from its free end as shown in Figure 3.1.

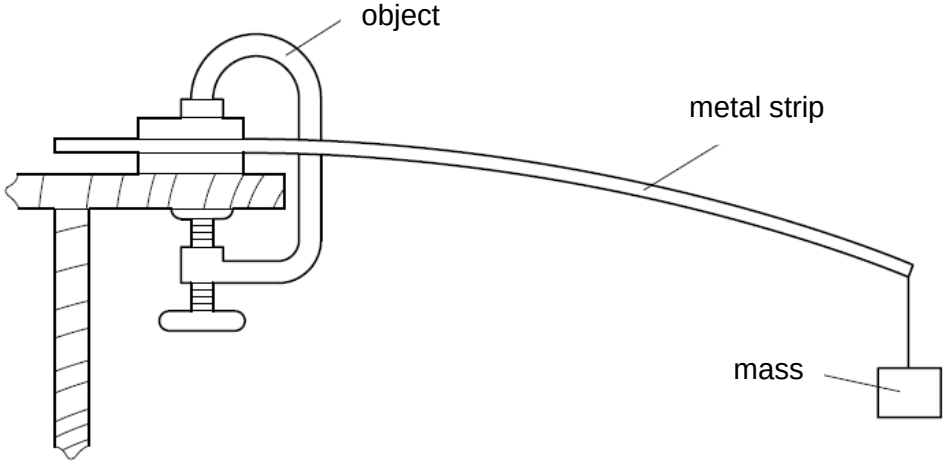

Fig. 3.1

The end of the strip is pulled downwards by 2.0×10^{-3} m and then released.

Fig. 3.2 shows the variation with time t of the displacement y of the end of the strip.

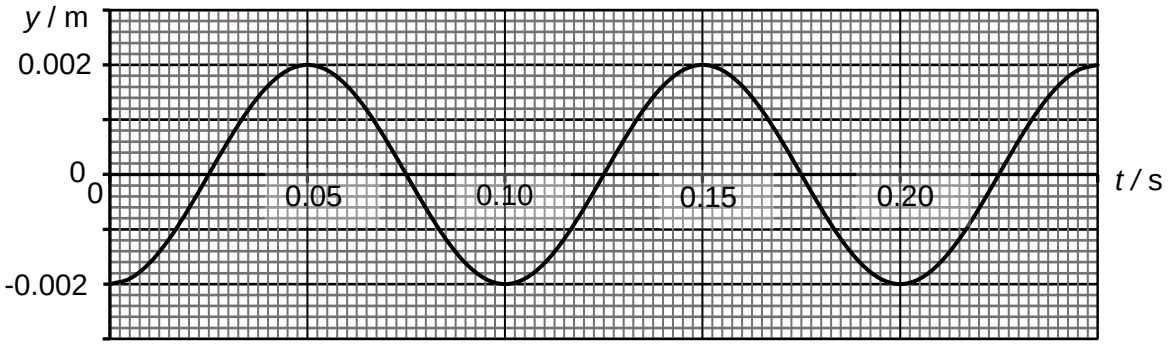

Fig. 3.2

(i) On Fig. 3.3, show the corresponding variation with time t of the potential energy E_P of the vibrating system from $t = 0$ to $t = 0.20$ s. Assume the vibrating system to have a mass of 200 g.

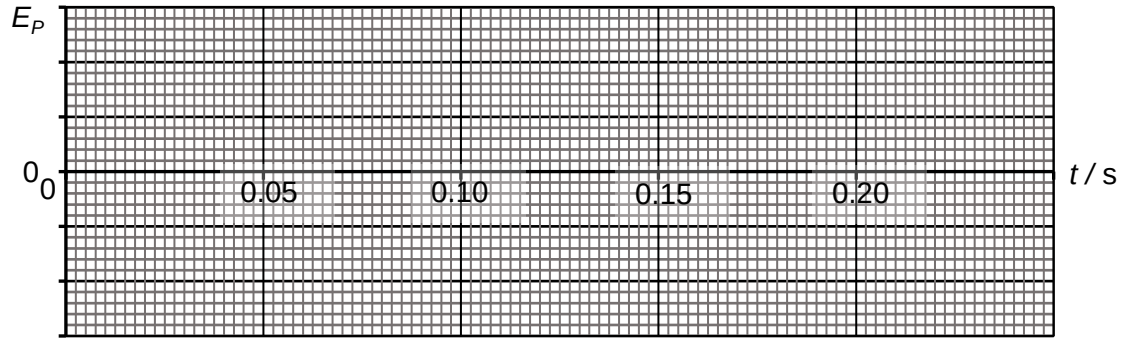

Fig 3.3

[3]

(ii) On Fig. 3.4, sketch the variation with displacement *y* of the velocity *v* of the end of the strip.

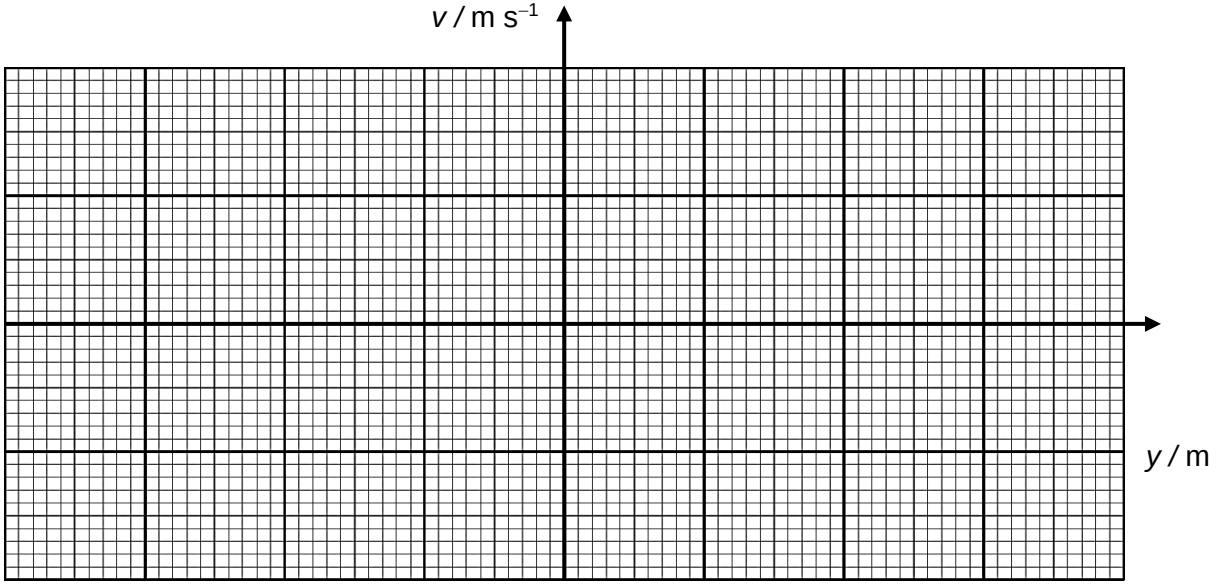

Fig 3.4

[3]

(ii) The string supporting the mass breaks when the end of the strip is at its lowest point in an oscillation.

1. State what change, if any, will occur in the period of the subsequent motion of the end of the strip.

period: ……

2. State and **explain** the change, if any, on the amplitude of the subsequent motion of the end of the strip.

amplitude: ……

…… [2]

[Total: 10]