4 A strip of steel is clamped at one end so that the strip is horizontal.
A mass M is attached to the other end, causing the strip to bend, as illustrated in Fig. 4.1.

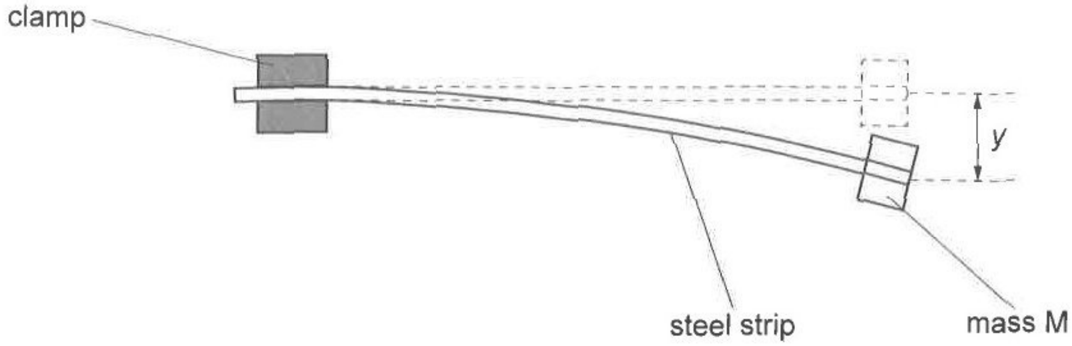

Fig. 4.1

The mass M is given a further vertical displacement and is then released. The subsequent motion of the mass on the end of the steel strip is simple harmonic.

The variation with time t of the total vertical displacement y of the mass M is shown in Fig. 4.2.

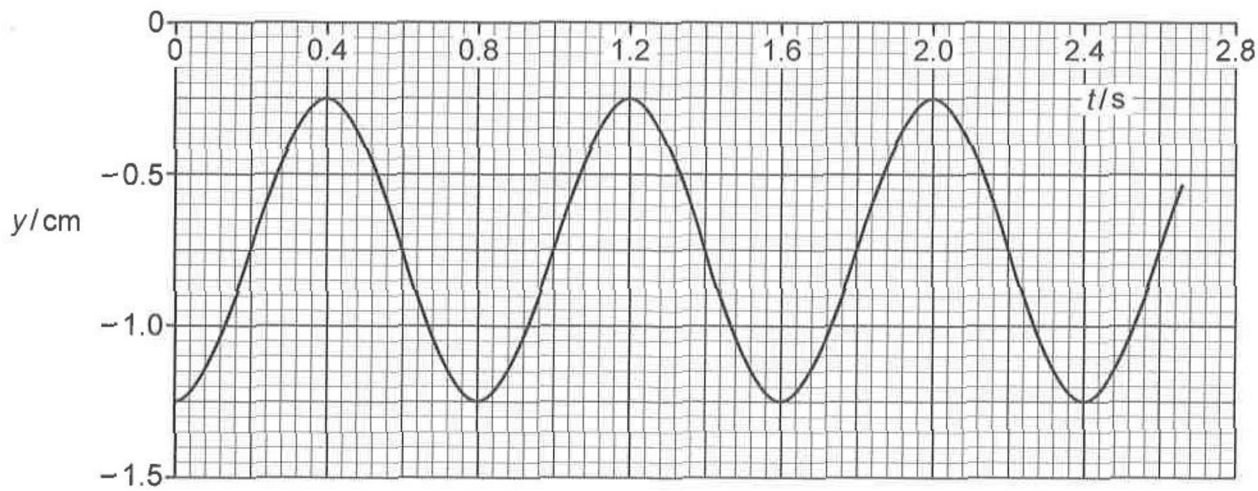

Fig. 4.2

(a) Use Fig. 4.2 to determine, for the oscillations of the mass M:

(i) the amplitude x_0

x_0 = ... cm [1]

(ii) the angular frequency ω

ω = ... rad s^{-1} [2]

(iii) the maximum speed v_0 of the mass.

v_0 = ... $cm\,s^{-1}$ [2]

(b) A light piece of card is now fixed to the mass M, as shown in Fig. 4.3.

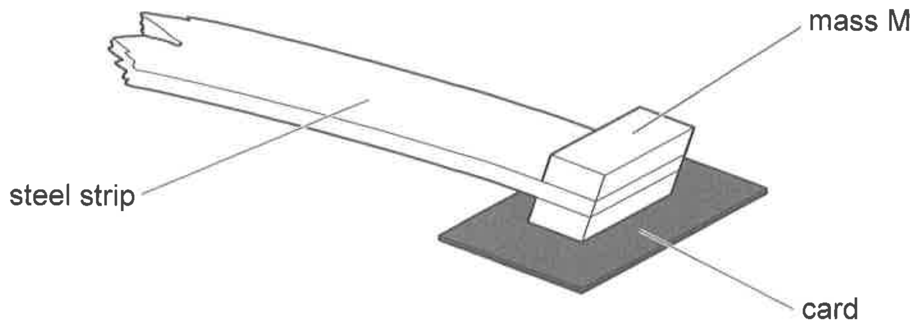

Fig. 4.3

The mass of the card is negligible when compared to the mass of M.

The mass M is again displaced and then released. Its initial displacement is the same as that shown in Fig. 4.2.

On Fig. 4.2, sketch the variation with time t of the total vertical displacement y of mass M for **three** complete, lightly damped oscillations of the mass. [3]

[Total: 8]