

- 4 A metal block hangs vertically from one end of a spring. The other end of the spring is tied to a thread that passes over a pulley and is attached to a vibrator, as shown in Fig. 4.1.

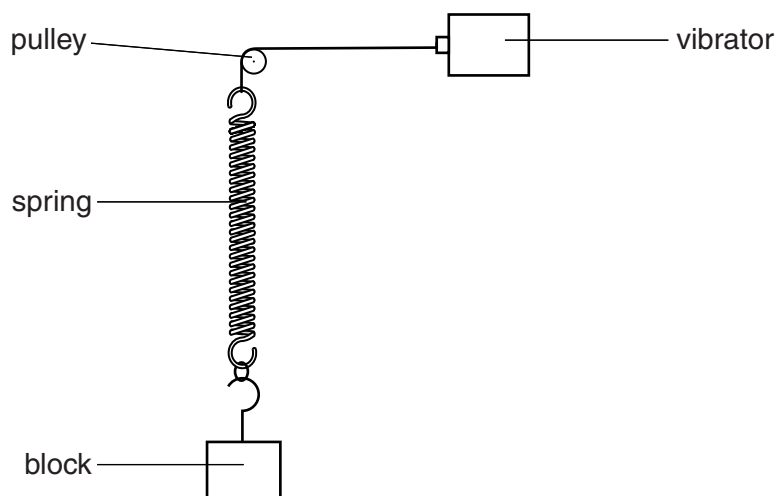


Fig. 4.1

- (a) The vibrator is switched off. The metal block of mass 120 g is displaced vertically and then released. The variation with time t of the displacement y of the block from its equilibrium position is shown in Fig. 4.2.

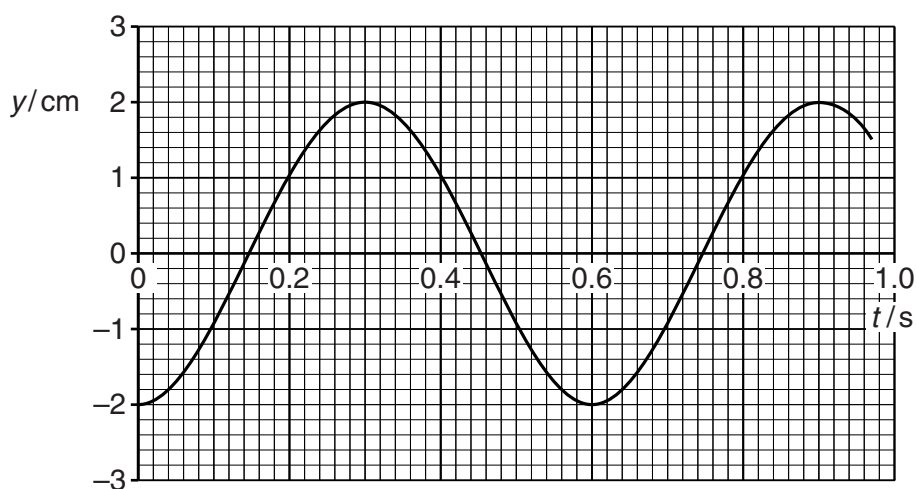


Fig. 4.2

For the vibrations of the block, calculate

- (i) the angular frequency ω ,

$$\omega = \dots\dots\dots \text{rad s}^{-1} \quad [2]$$

(ii) the energy of the vibrations.

energy =J [2]

(b) The vibrator is now switched on.

The frequency of vibration is varied from $0.7f$ to $1.3f$ where f is the frequency of vibration of the block in (a).

For the block, complete Fig. 4.3 to show the variation with frequency of the amplitude of vibration. Label this line A. [3]

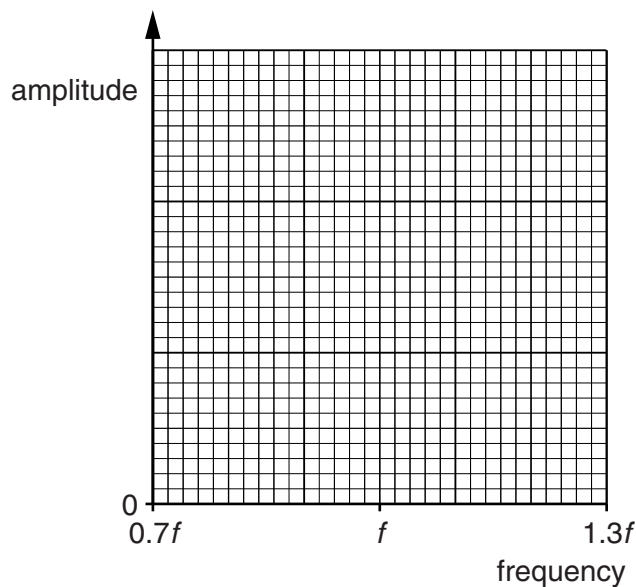


Fig. 4.3

(c) Some light feathers are now attached to the block in (b) to increase air resistance.

The frequency of vibration is once again varied from $0.7f$ to $1.3f$. The new amplitude of vibration is measured for each frequency.

On Fig. 4.3, draw a line to show the variation with frequency of the amplitude of vibration. Label this line B. [2]

[Total: 9]