3 (a) State, by reference to displacement, what is meant by *simple harmonic motion*.

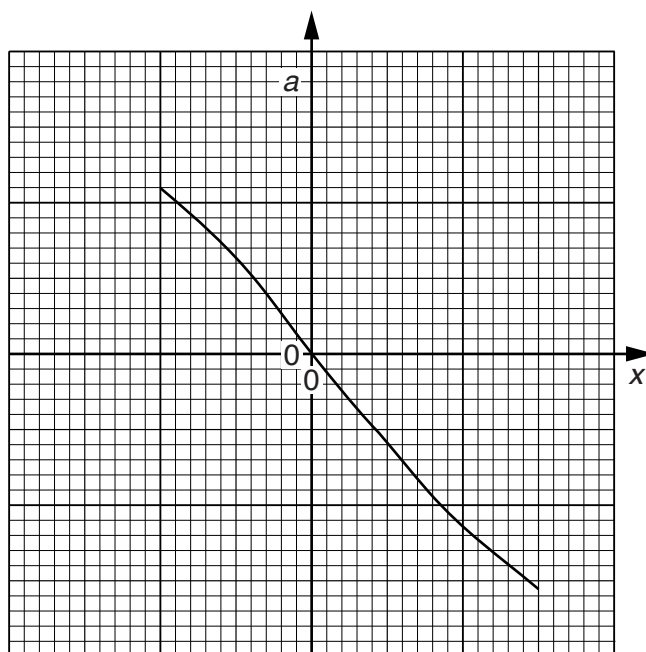...

....

....

.... [2]

(b) A mass is undergoing oscillations in a vertical plane.

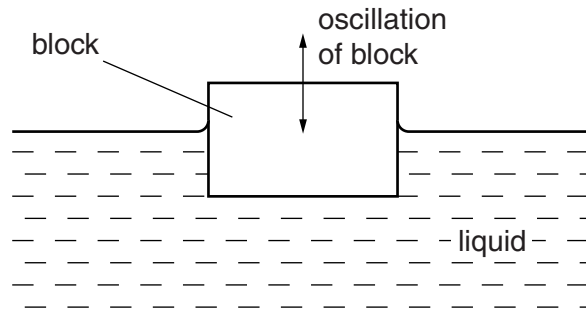The variation with displacement x of the acceleration a of the mass is shown in Fig. 3.1.

Fig. 3.1

State two reasons why the motion of the mass is not simple harmonic.

1. ....

....

2. ....

....
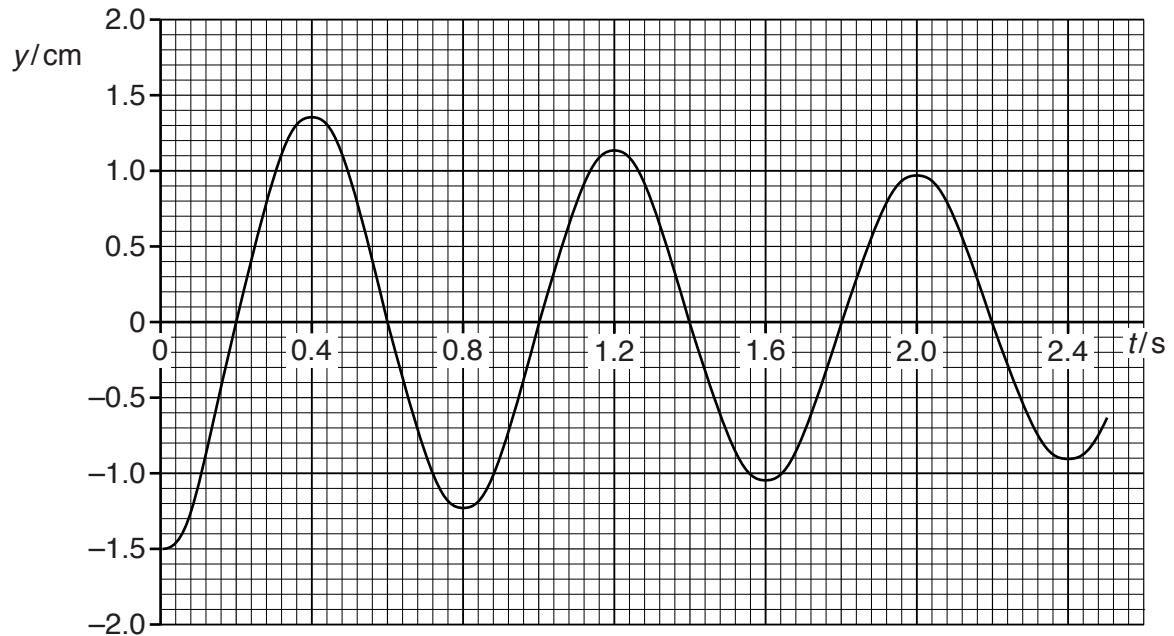
[2]

(c) A block of wood is floating in a liquid, as shown in Fig. 3.2.

Fig. 3.2

The block 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. 3.3.

Fig. 3.3

Use data from Fig. 3.3 to determine

(i) the angular frequency ω of the oscillations,

$\omega =$ .... $\text{rad}\,\text{s}^{-1}$ [2]

(ii) the maximum vertical acceleration of the block.

maximum acceleration = ... m s^{-2} [2]

(iii) The block has mass 120 g.

The oscillations of the block are damped. Calculate the loss in energy of the oscillations of the block during the first three complete periods of its oscillations.

energy loss = ...J [3]

[Total: 11]