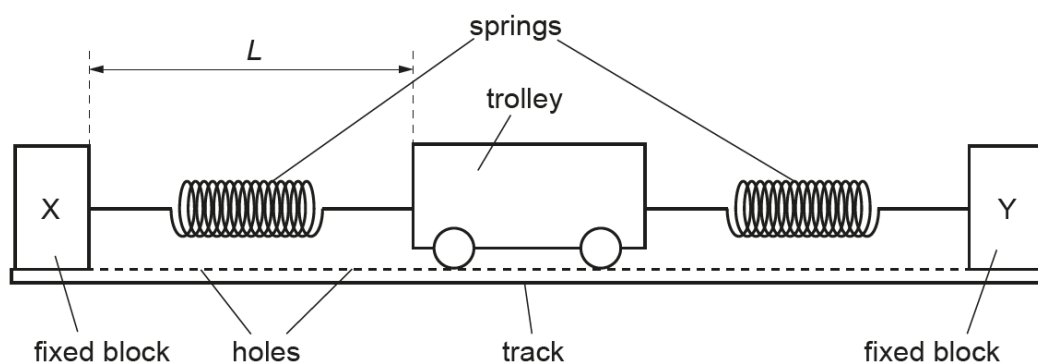
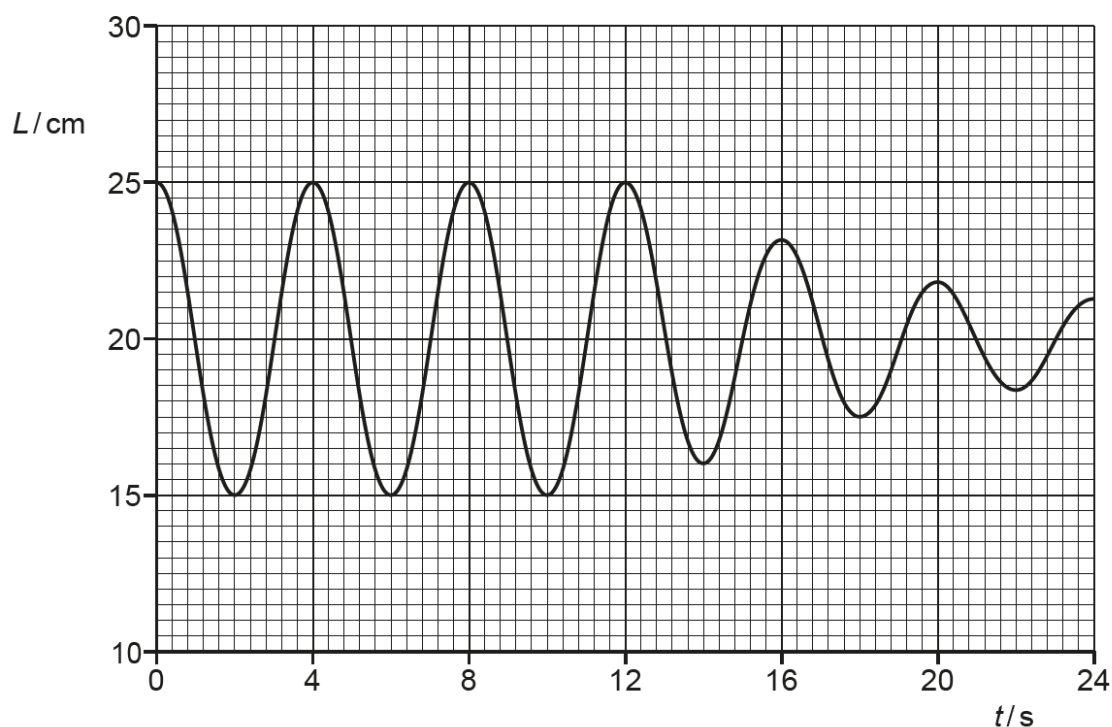


- 3 A trolley on a track is attached by springs to fixed blocks X and Y, as shown in Fig. 3.1. The track contains many small holes through which air is blown vertically upwards. This results in the trolley resting on a cushion of air rather than being in direct contact with the track.



**Fig. 3.1**

The trolley is pulled to one side of its equilibrium position and then released so that it oscillates initially with simple harmonic motion. After a short time, the air blower is switched off. The variation with time  $t$  of the distance  $L$  of the trolley from block X is shown in Fig. 3.2.



**Fig. 3.2**

- (a) Use Fig. 3.2 to determine:  
 (i) the initial amplitude of the oscillations,

amplitude = ..... cm [1]

- (ii) the angular frequency  $\omega$  of the oscillations,

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

- (iii) the maximum speed  $v_0$ , of the oscillating trolley.

$$v_0 = \dots\dots\dots \text{cm s}^{-1} [2]$$

- (b) Apart from the quantities in (a), describe what may be deduced from Fig. 3.2 about the motion of the trolley between time  $t = 0$  and time  $t = 24$  s. No calculations are required.

.....  
 .....  
 .....  
 .....  
 ..... [3]

- (c) On Fig. 3.3, sketch the variation with  $L$  of the velocity  $v$  of the trolley for its first complete oscillation.

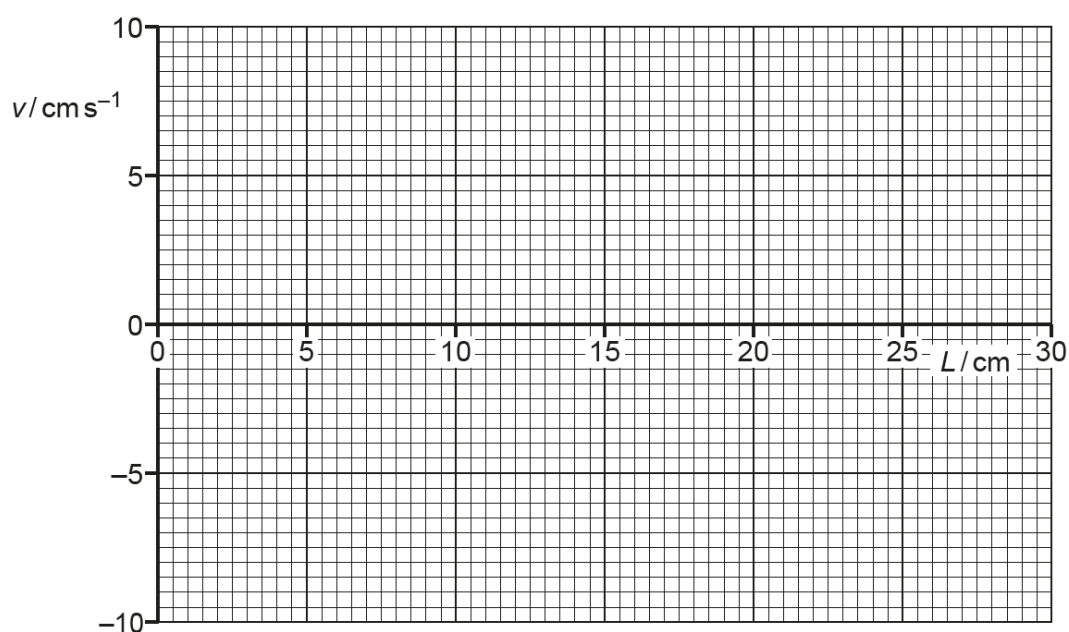


Fig. 3.3

[2]

[Total: 10]