

- 3 (a) A ball is held between two fixed points A and B by means of two stretched springs as shown in Fig. 3.1.

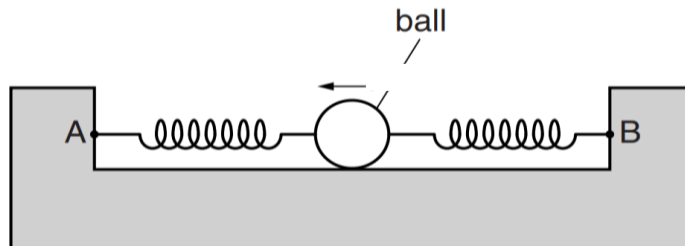


Fig. 3.1

The ball is free to oscillate horizontally on the smooth horizontal table. The variation of the acceleration a of the ball with its displacement x from its equilibrium position is shown in Fig. 3.2.

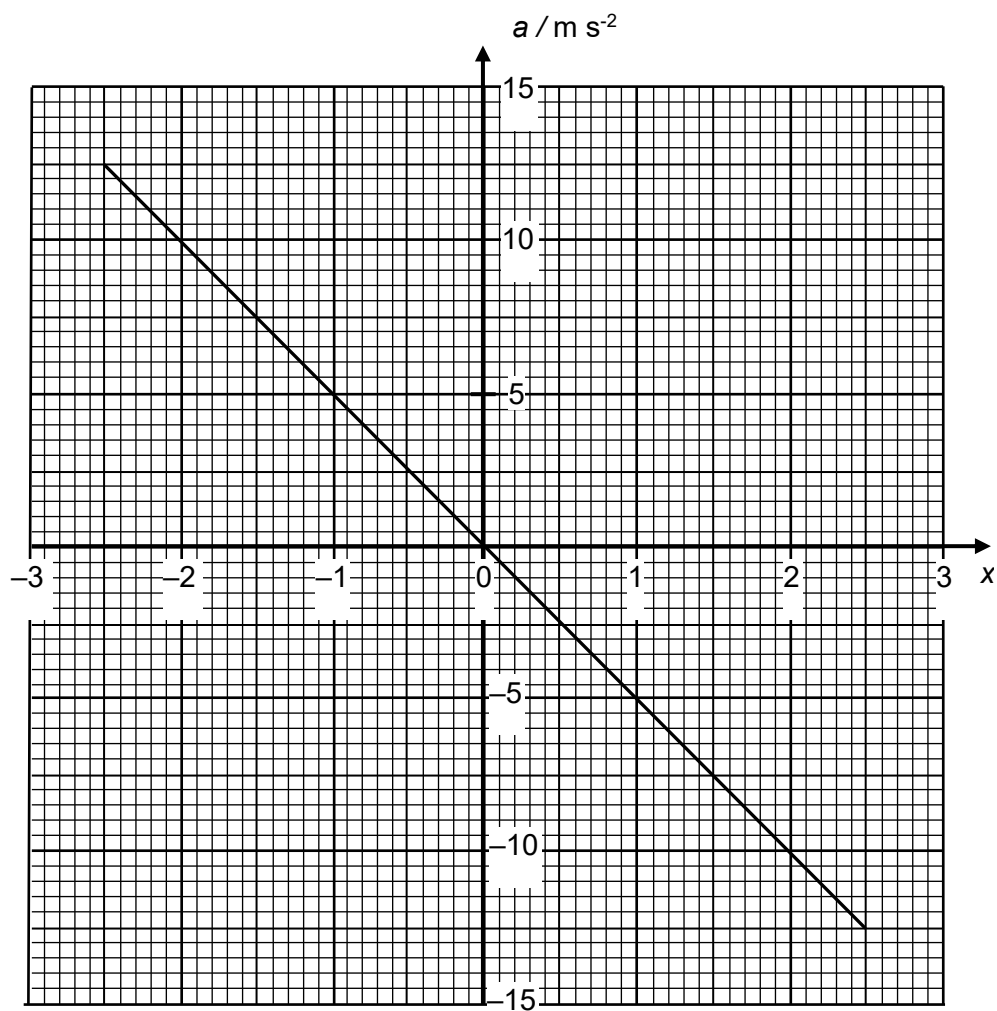


Fig. 3.2

- (i) State and explain the features of Fig. 3.2 which indicate that the moving ball is exhibiting simple harmonic motion.

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..... [2]

- (ii) On Fig. 3.3, sketch the variation of the velocity v of the ball with x . Include the values of the horizontal and vertical intercepts of the graph.

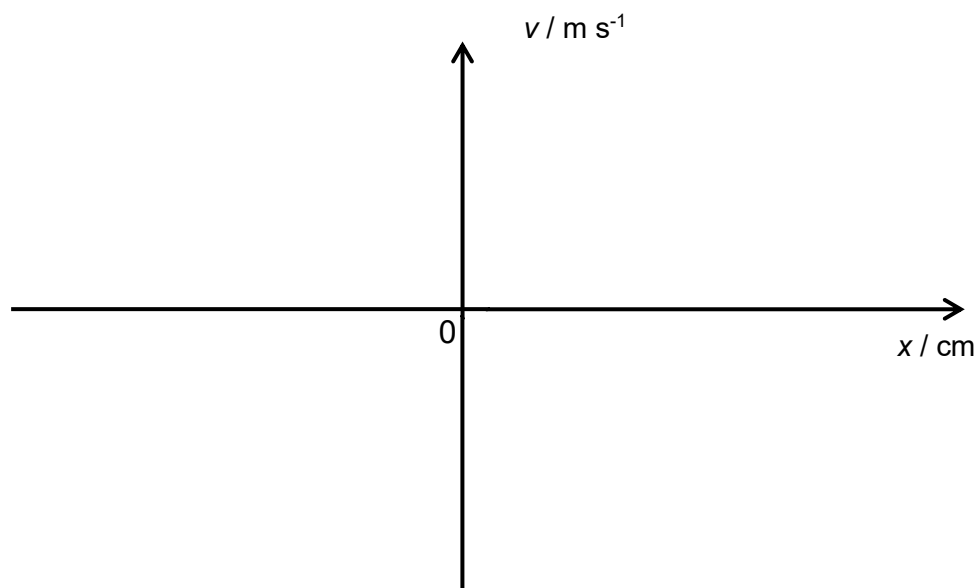


Fig. 3.3

[3]

- (b) A ball is attached to the apparatus illustrated in Fig. 3.4 in order to investigate its vertical oscillations on a spring. The amplitude of the vibrations produced by the oscillator is constant.

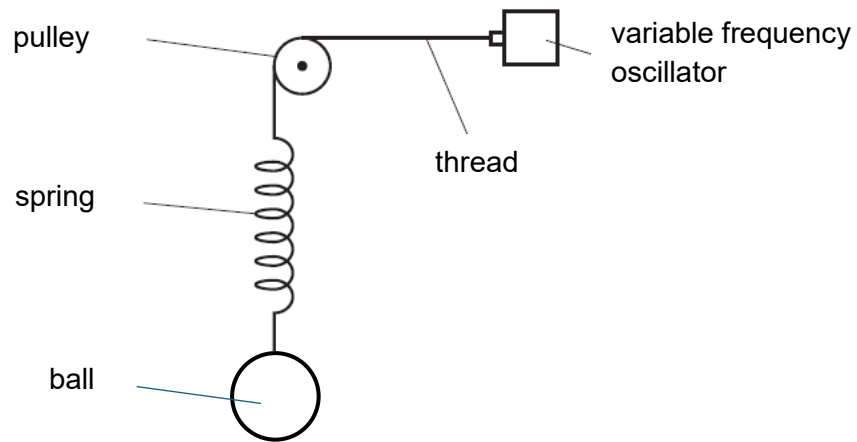


Fig. 3.4

The variation of the amplitude of the oscillations of the ball with the frequency f of the oscillator is shown in Fig. 3.5. The oscillations are assumed to be simple harmonic.

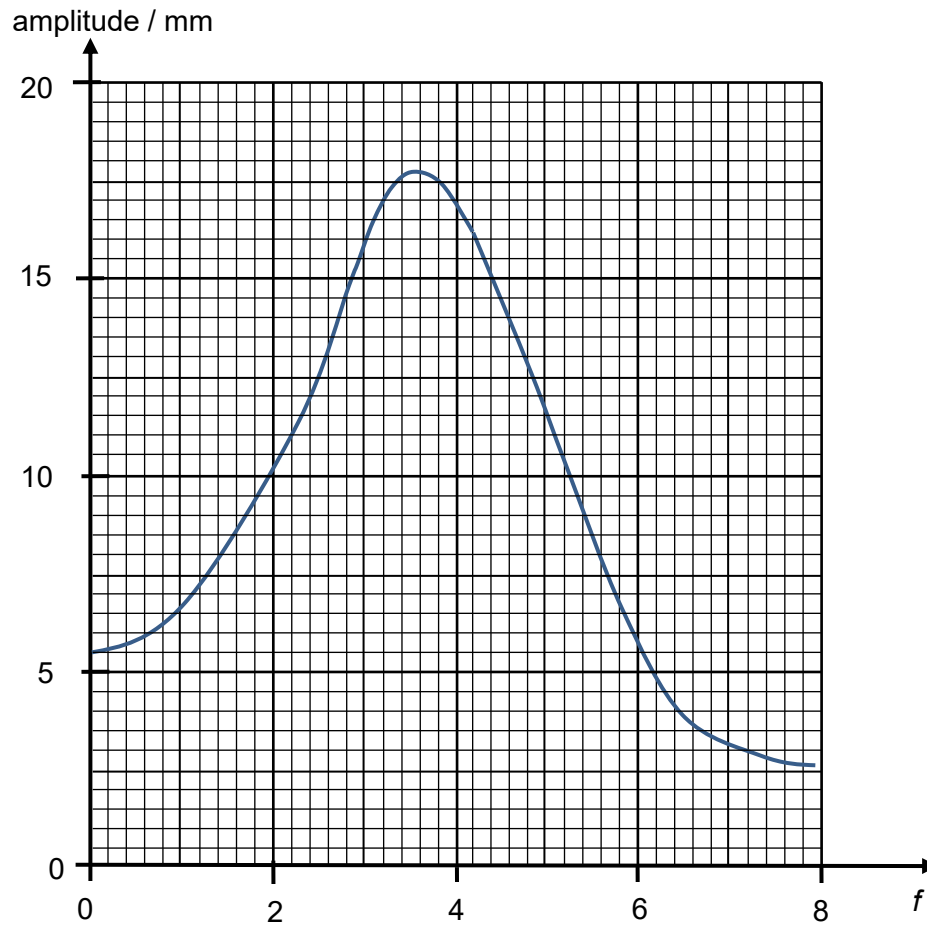


Fig. 3.5

- (i) State the natural frequency of the oscillations.

natural frequency = Hz [1]

- (ii) Explain why Fig. 3.5 shows that the oscillations are damped.

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..... [1]

- (iii) On Fig. 3.5, sketch a possible variation of the amplitude of the oscillations of the ball with f if the oscillations are damped with a greater resistive force. [3]