4 A 500 g mass is attached to a spring on a horizontal frictionless surface, and is set in simple harmonic motion by displacing the mass by a certain distance from the equilibrium position and releasing it from rest. The variation of the velocity *v* with the displacement *x* from the equilibrium position is shown in Fig. 4.1.

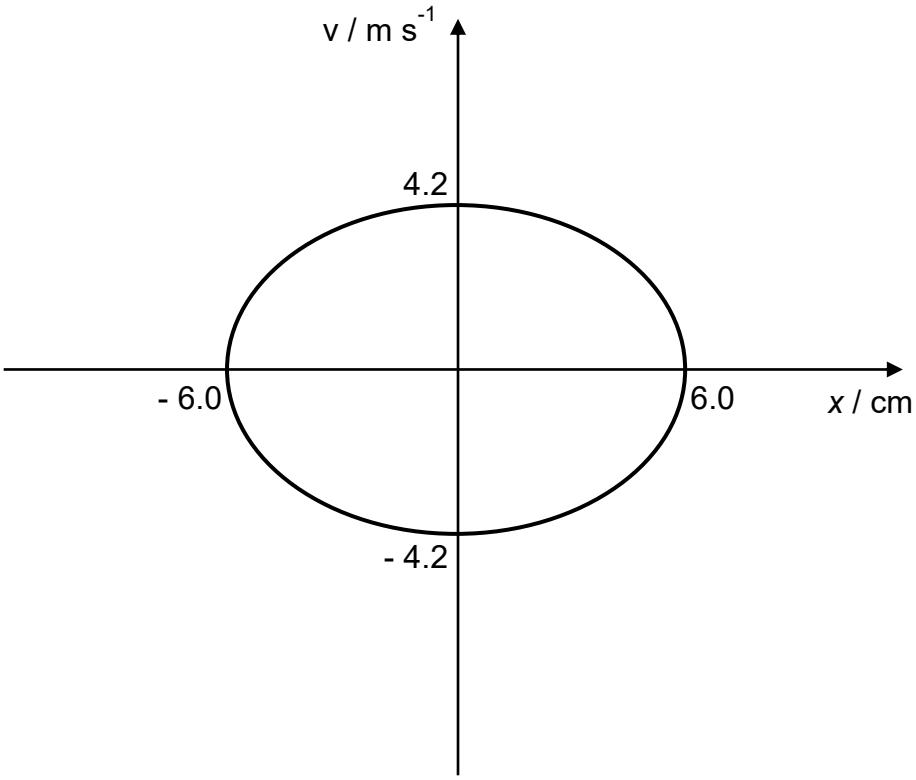

Fig. 4.1

(a) Using Fig. 4.1, determine

(i) the distance from the equilibrium position at which the mass was initially displaced before it was released,

[1]

distance = ……..…….. cm

(ii) the period of the oscillation,

[2]

period = ……..…….. s

(iii) the maximum kinetic energy of the object.

[2]

maximum kinetic energy = ……..…….. J

(b) The oscillation is repeated with the mass released at half the distance from the equilibrium as compared to the first oscillation.

Sketch the new curve representing the variation of velocity with the displacement from the equilibrium position on Fig. 4.1. Label the intercepts with the axes with the appropriate values. [2]

(c) The experimental setup is now modified with the same spring hung from the ceiling, and the same mass attached to the spring. The mass is displaced the same distance as in **(a)** from the new equilibrium position but in the vertical direction.

Suggest and explain whether the same curve as Fig. 4.1 will be obtained for the vertical setup.

……..…….……

……..……

[2]

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