2 Two blocks, A and B, are on a horizontal frictionless surface. The blocks are joined together by a spring, as shown in Fig. 2.1.

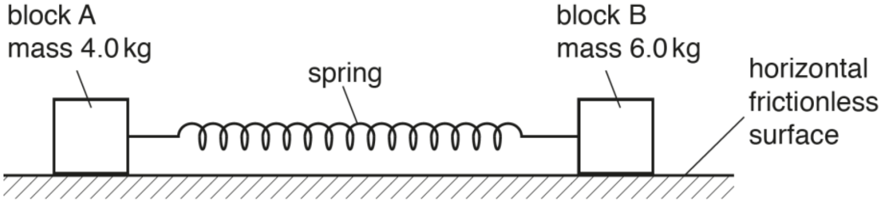

Fig. 2.1

Block A has mass 4.0 kg and block B has mass 6.0 kg.

The variation of the tension F with the extension x of the spring is shown in Fig. 2.2.

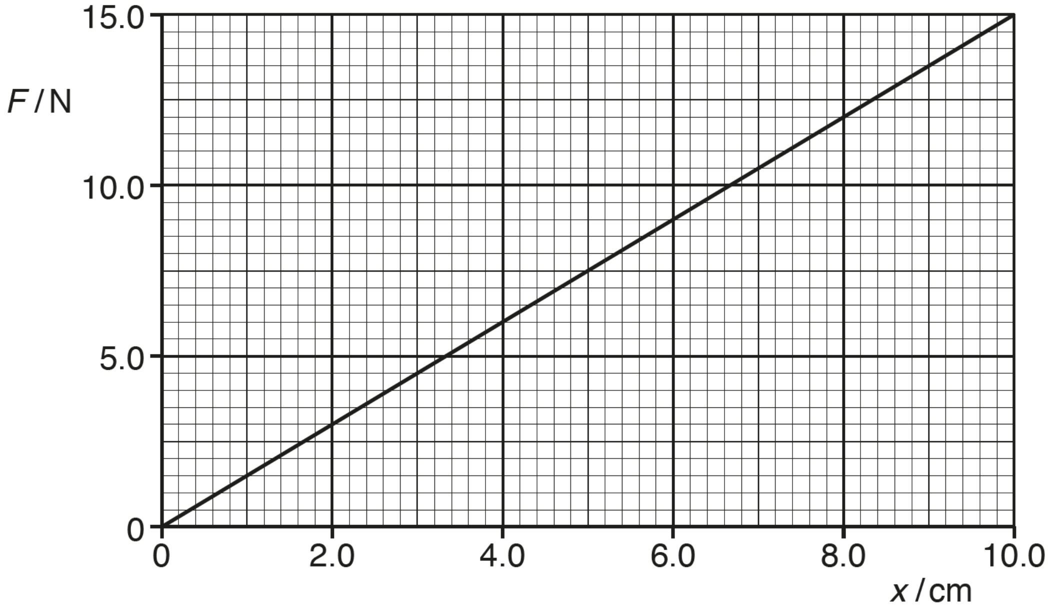

Fig. 2.2

The two blocks are held apart so that the spring has an extension of 8.0 cm.

(a) Use Fig. 2.2 to explain whether the spring obeys Hooke's law for this range of extensions.

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………………………………………………………………………………………… …………[1]

(b) Show that the elastic potential energy of the spring at an extension of 8.0 cm is 0.48 J.

[1]

(c) The blocks are released from rest at the same instant. When the extension of the spring becomes zero, block A has speed v_A and block B has speed v_B. It may be assumed that the mass of the spring is negligible.

For the instant when the extension of the spring becomes zero,

(i) determine the ratio of $\dfrac{\text{kinetic energy of block A}}{\text{kinetic energy of block B}}$,

ratio = ………………………… [3]

(ii) Hence or otherwise, determine the speed v_A of block A.

v_A = ………………………… m s^{-1} [2]

(d) The blocks are released at time t = 0.

On Fig. 2.3, sketch a graph to show how the speed of block A varies with time t until the extension of the spring becomes zero.

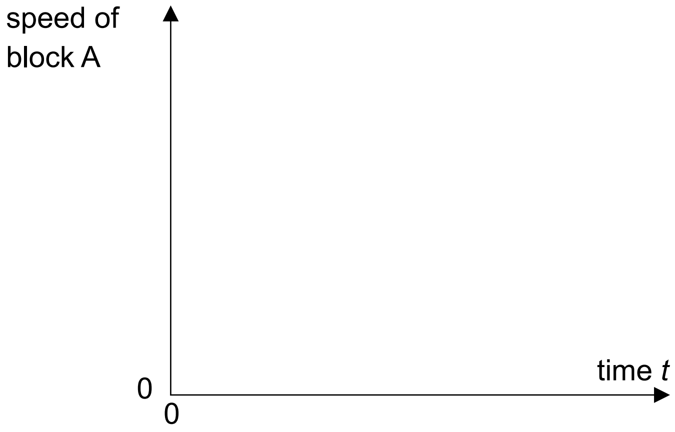

Fig. 2.3

[2]

(e) State and explain whether the two blocks of different masses oscillate with the same frequency of vibration.

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.[2]