3 Fig. 3.1 shows block A of mass 1.5 kg held against a massless spring with a force F. The spring is compressed by 2.0 cm.

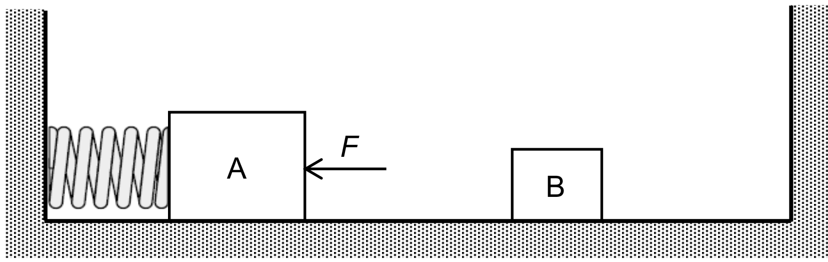

Fig. 3.1

Force F is then removed and the spring returns to its natural length. Block A loses contact with the spring with a speed of 0.50 m s^{-1} and approaches a stationary block B of mass 0.50 kg as shown in Fig. 3.2.

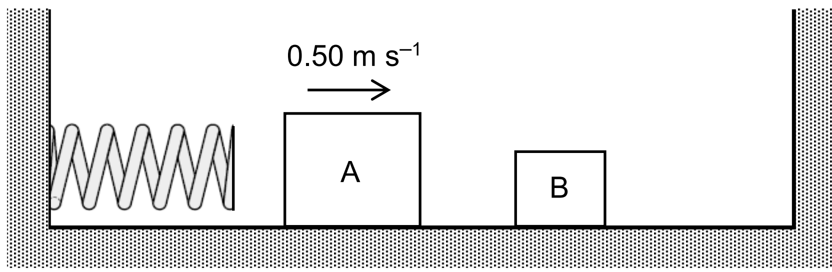

Fig. 3.2

Ignore all resistive forces.

(a) Determine the force constant k of the spring.

k = ... N m^{-1} [2]

(b) Block A collides elastically head-on with block B. Determine the final velocity of B.

final velocity of B = ... m s^{-1} [3]

(c) Fig 3.3 shows the variation with time of the force acting on block A during the collision with block B.

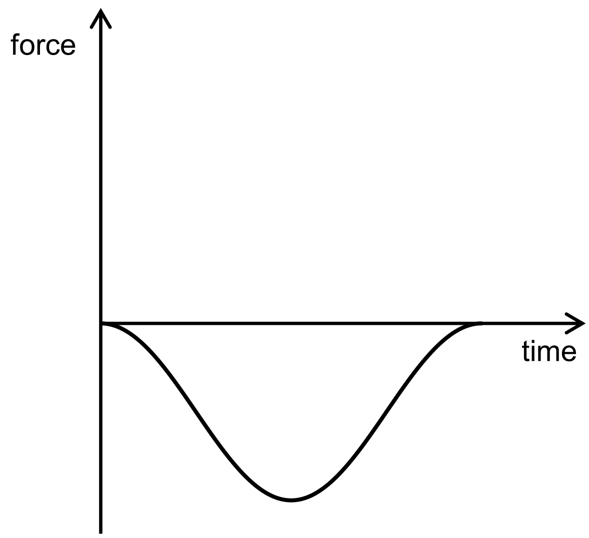

Fig. 3.3

(i) Sketch on Fig. 3.3, the corresponding graph of how the force on B varies with time during the duration of the collision. [1]

(ii) Explain how your graph is consistent with the principle of conservation of momentum.

....

....

....

.... [2]

(d) Block B hits the opposite wall elastically, rebounds and collides with block A. Block A compresses the spring again. State with reason whether the new compression of the spring will be more or less than 2.0 cm.

....

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....

....

.... [2]