

- 3 (a) Derive using Newton's laws of motion, the conservation of momentum for a system of two colliding bodies.

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[3]

- (b) Two identical blocks of mass 0.17 kg and length 0.050 m are travelling towards each other along a straight line on a smooth floor as shown in Fig. 3.1. The initial distance between the centres of the blocks is 0.90 m and both blocks are moving at a speed of 0.18 m s^{-1} .

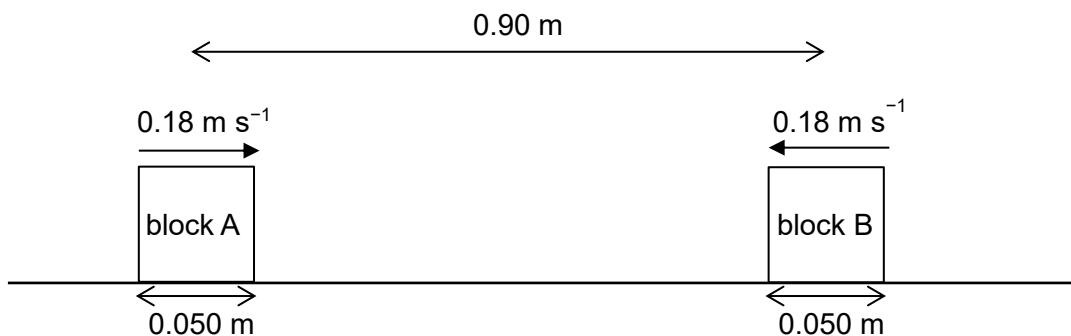


Fig. 3.1

- (i) Calculate the time taken for the blocks to come into contact with each other.

time taken = s [2]

- (ii) As a result of the collision, the blocks reverse their direction of motion and travel at the same speed as each other. During the collision, 20% of the kinetic energy of the blocks is given off as thermal energy to the surrounding.

Calculate the final speed of the blocks.

final speed = m s^{-1} [2]

- (iii) Fig. 3.2 shows how the force that block A exerts on block B is assumed to vary with time.

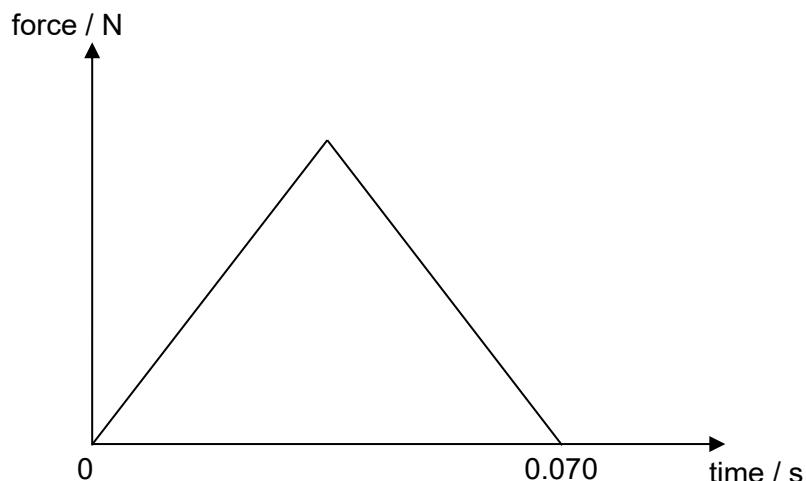


Fig. 3.2

The duration of the collision between the blocks is 0.070 s.

Determine the maximum force one block exerted on the other.

maximum force = N [3]