2 **(a)** State Newton's second law of motion.

.....

.....[1]

(b) A constant resultant force F acts on an object A. The variation with time t of the velocity v for the motion of A is shown in Fig. 2.1.

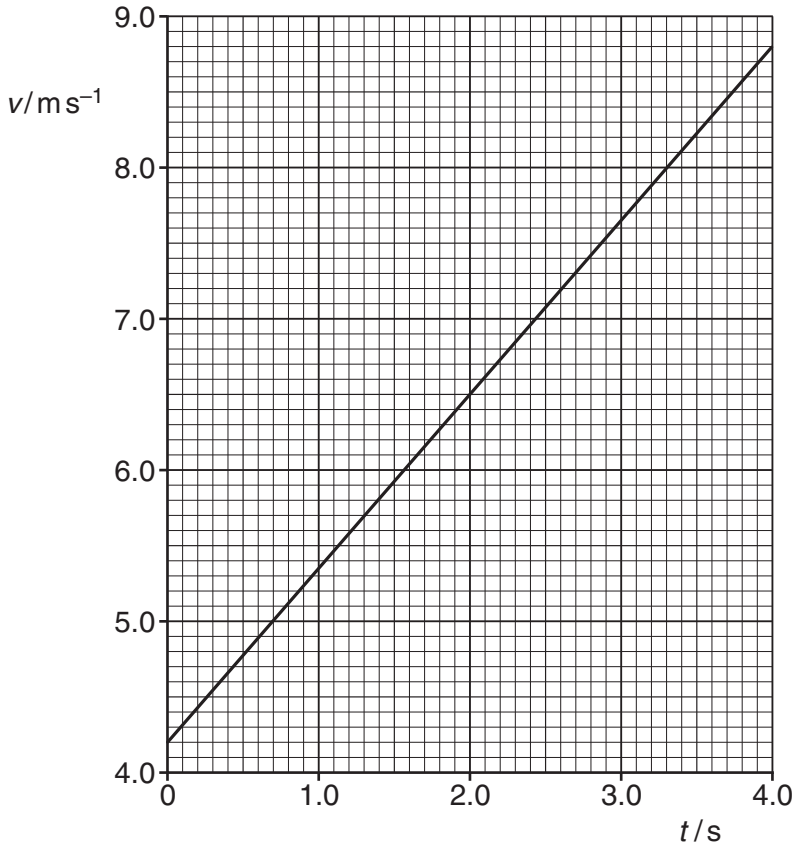

Fig. 2.1

The mass of A is 840 g.

Calculate, for the time $t = 0$ to $t = 4.0$ s,

(i) the change in momentum of A,

change in momentum = ... kg m s^{-1} [2]

(ii) the force F.

F = ... N [1]

(c) The force F is removed at $t = 4.0\,s$. Object A continues at constant velocity before colliding with an object B, as illustrated in Fig. 2.2.

Fig. 2.2

Object B is initially at rest. The mass of B is 730 g.
The objects A and B join together and have a velocity of $4.7\,m\,s^{-1}$.

(i) By calculation, show that the changes in momentum of A and of B during the collision are equal and opposite.

[2]

(ii) Explain how the answers obtained in **(i)** support Newton's third law.

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.....

.....[2]

(iii) By reference to the speeds of A and B, explain whether the collision is elastic.

.....

.....[1]

[Total: 9]