Revision: Momentum 1

1.

(a)   In any collision, the total momentum of the colliding objects is usually conserved.

(a)   (i)   What is meant by the term 'momentum is conserved'?
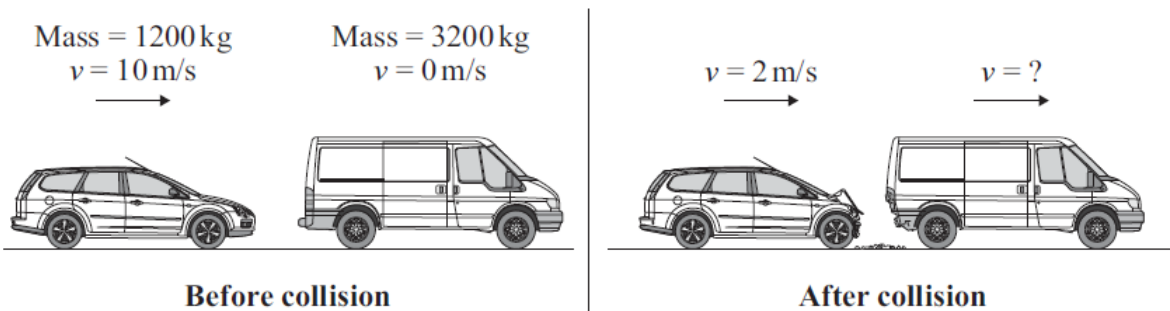
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(1 mark)

(a)   (ii)   In a collision, momentum is **not** always conserved.

Why?

....

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(1 mark)

(b)   The diagram shows a car and a van, just before and just after the car collided with the van.

Mass = 1200 kg   Mass = 3200 kg $v = 2$ m/s $v = ?$
$v = 10$ m/s $v = 0$ m/s

Before collision   **After collision**

(b)   (i)   Use the information in the diagram and the equation in the box to calculate the **change** in the momentum of the car.

momentum = mass × velocity

Show clearly how you work out your answer and give the unit.

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Change in momentum = ...

(3 marks)

(b) (ii) Use the idea of conservation of momentum to calculate the velocity of the van
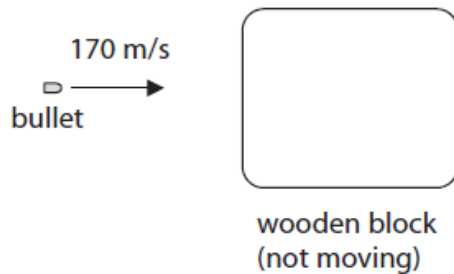when it is pushed forward by the collision.

Show clearly how you work out your answer.

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Velocity = ... m/s forward

(2 marks)

2.

The diagram shows a bullet moving towards a wooden block.

170 m/s

bullet

wooden block
(not moving)

(i) The bullet is moving with a velocity of 170 m/s.
The mass of the bullet is 0.030 kg.

Show that the momentum of the bullet is about 5.0 kg m/s.

(1)

(ii) The bullet collides with the wooden block and sticks in it.
The bullet and the wooden block move off together.
The mass of the wooden block is 0.80 kg.

Calculate the velocity of the wooden block and bullet immediately after the
collision.

(3)

velocity = ... m/s

3.

(a) A boy of mass 43.2 kg runs and jumps onto a stationary skateboard.

The boy lands on the skateboard with a horizontal velocity of 4.10 m/s.

(i) State the relationship between momentum, mass and velocity.

(1)

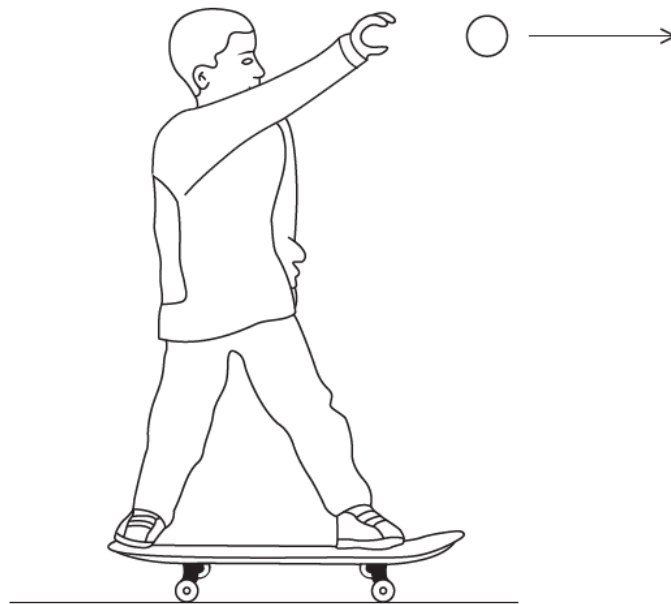(ii) The skateboard has a mass of 2.50 kg.

Using ideas about conservation of momentum, calculate the combined velocity of the boy and skateboard just after the boy lands on it.

(4)

combined velocity = ... m/s

(b) The boy holds a heavy ball as he stands on a stationary skateboard.

The boy throws the ball forwards while still standing on the skateboard.

Explain what happens to the boy and the skateboard.

(2)

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4.

A cannonball is fired from a cannon.

When the cannonball is fired, the cannon moves in the opposite direction, as shown in the diagram.

direction of cannon

direction of cannonball

Using ideas about momentum, explain why the cannon moves in the opposite direction to the cannonball.

(3)