7 Trolleys X and Y of masses m and $3m$ respectively are travelling at the same speed towards each other. The trolleys collide and move off together.

Which of the following statements is correct?

☐ A The force of X on Y during the collision is greater than the force of Y on X.

☐ B The force of X on Y during the collision is less than the force of Y on X.

☐ C The speed of X after the collision is greater than v.

☐ D The speed of X after the collision is less than v.

(Total for Question 7 = 1 mark)

10 Two objects, R and S, are falling vertically and accelerating due to gravity. Air resistance is negligible.

R has mass m and S has mass $2m$.

Initially, each object has momentum p.

After time t object R has momentum $2p$.

Which of the following gives the momentum of object S after time t?

☒ A $2p$

☒ B $3p$

☒ C $4p$

☒ D $5p$

(Total for Question 10 = 1 mark)

10: A toy train of mass $3m$ is moving with a speed v.
A toy truck of mass m is moving with a speed $2v$ in the opposite direction, as shown.

The train and truck collide and move off together.

Which of the following expressions gives the new speed of the train and truck?

☒ **A** $\dfrac{v}{4}$

☒ **B** $\dfrac{4v}{5}$

☒ **C** v

☒ **D** $\dfrac{5v}{4}$

(Total for Question 10 = 1 mark)

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8 A student uses a wooden bat to hit a stationary ball of mass m.

As the bat hits the ball, the momentum of the bat decreases by Δp.
The ball then moves with velocity v.

The student then uses the bat to hit a stationary ball of mass $3m$.
The momentum of the bat decreases by $2\Delta p$.

Which of the following expressions gives the velocity of the ball of mass $3m$ after being hit?

☒ **A** $\dfrac{1}{6}v$

☒ **B** $\dfrac{2}{3}v$

☒ **C** $\dfrac{3}{2}v$

☒ **D** $6v$

(Total for Question 8 = 1 mark)

14 Two rocks in outer space are moving at different speeds along the same path.

(a) State the principle of conservation of momentum.

(2)

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(b) Rock A has a mass of $43\,kg$ and a velocity of $7.8\,m\,s^{-1}$.

Rock B has a mass of $56\,kg$ and moves in the same direction as rock A. The kinetic energy of rock B is $4.1 \times 10^3\,J$.

Rock B collides with rock A. After the collision, rock B continues to move in the same direction with a momentum of $530\,kg\,m\,s^{-1}$.

Calculate the new velocity of rock A.

(4)

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New velocity of rock A = ...

(Total for Question 14 = 6 marks)