0 1

A crash test car of mass 2000 kg which is travelling at 40 m/s collides with a strong brick wall. The car is brought to rest in a time of 400 ms.

0 1 . 1

Determine the average force exerted on the car as it decelerates to rest.

Force = _____ N

[3 marks]

0 1 . 2

Calculate the momentum transferred to the wall in this collision.

Momentum = _____ kg m/s

[3 marks]

0 1 . 3

The brick wall did not appear to be damaged by the collision. Explain then what happened after the collision to the momentum which was initially possessed by the moving car.

_____

_____

[1 mark]

0 1 . 4

The safety of modern cars has been improved greatly by the development of seatbelts, air bags and crumple zones. Explain how safety devices such as these help protect the occupants of a car in the event of a crash.

_____

_____

[2 marks]

0 2

Two cars are involved in a head-on collision, as shown below.

0 2 . 1

Calculate the magnitude and direction of the **total momentum** of both cars before the collision.

Momentum = _____ kg m/s Direction = _____

[4 marks]

0 2 . 2

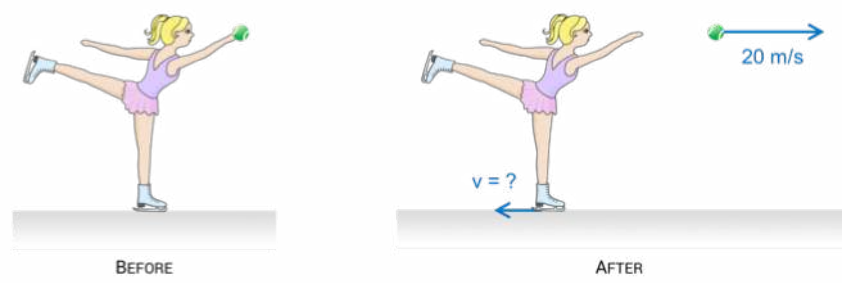
Both cars lock together during the collision. Assuming this to be a closed system, calculate the velocity of and direction in which they together after the collision.

Velocity = _____ m/s Direction = _____

[3 marks]

0 3

An ice skater of mass 60 kg is initially balancing at rest on an ice rink, as shown below. She then throws a 60 g tennis ball at 20 m/s.



0 3 . 1

Calculate the velocity at which she moves backwards upon throwing the tennis ball.

Velocity = _____ m/s

[3 marks]

0 3 . 2

After throwing the tennis ball, she will eventually decelerate to rest. Explain why.

_____

[1 mark]