Name of the Student:_____
Max. Marks : 27 Marks **Time : 27 Minutes**

Q1.

(a) A car driver sees the traffic in front is not moving and brakes to stop his car.

The stopping distance of a car is the thinking distance plus the braking distance.

(i) What is meant by the 'braking distance'?

_____

_____

(1)

(ii) The braking distance of a car depends on the speed of the car and the braking force.

State **one** other factor that affects braking distance.

_____

_____

(1)

(iii) How does the braking force needed to stop a car in a particular distance depend on the speed of the car?

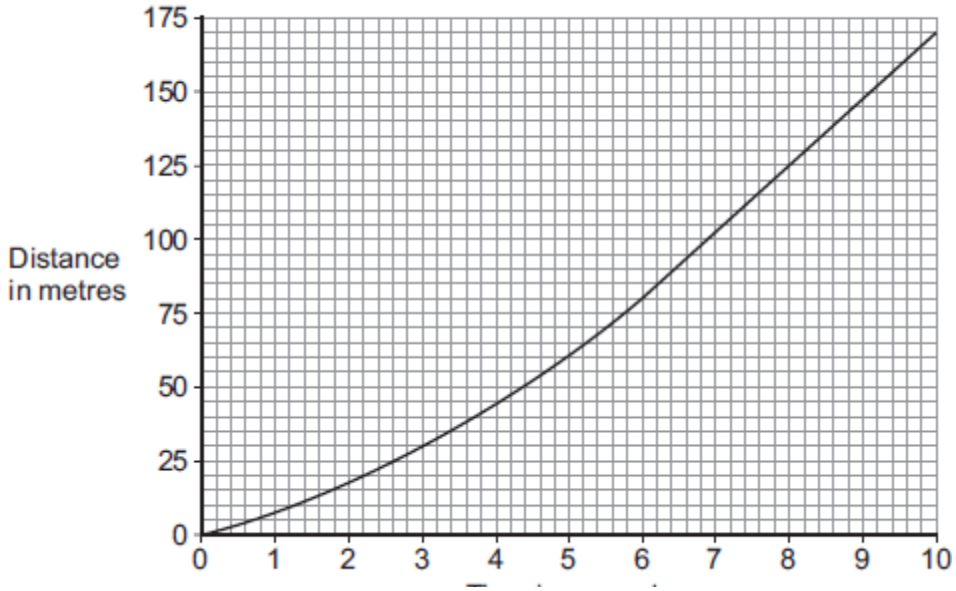
_____

_____

(1)

(b) **Figure 1** shows the distance−time graph for the car in the 10 seconds before the driver applied the brakes.

Figure 1



Use **Figure 1** to calculate the maximum speed the car was travelling at.
Show clearly how you work out your answer.

_____

_____

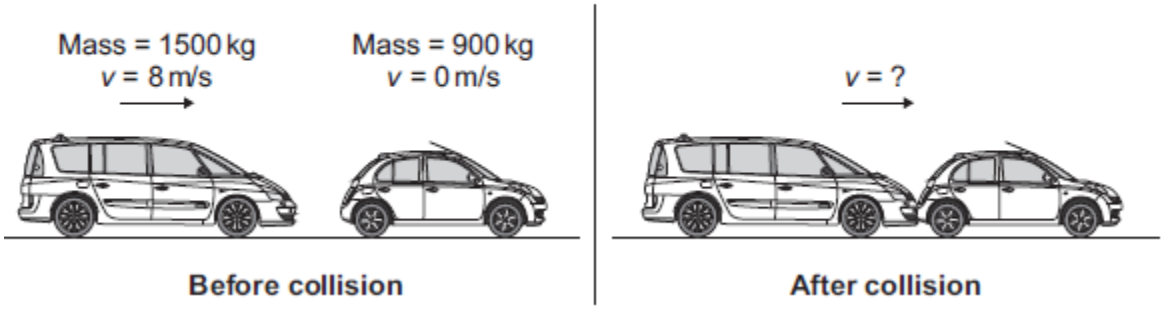
Maximum speed = _____ m / s

(2)

(c) The car did not stop in time. It collided with the stationary car in front, joining the two cars together.

Figure 2 shows both cars, just before and just after the collision.

Figure 2



(i) The momentum of the two cars was conserved.

What is meant by the statement 'momentum is conserved'?

_____

_____

(1)

(ii) Calculate the velocity of the two joined cars immediately after the collision.

_____

_____

_____

_____

_____

Velocity = _____ m/s

(3)

(d) Since 1965, all cars manufactured for use in the UK must have seat belts.

It is safer for a car driver to be wearing a seat belt, compared with not wearing a seat belt, if the car is involved in a collision.

Explain why.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 13 marks)

Q2.

Quantities in physics are either scalars or vectors.

(a) Use the correct answers from the box to complete the sentence.

acceleration	**direction**	**distance**	**speed**	**time**

Velocity is _____ in a given _____ .

(2)

(b) Complete the table to show which quantities are scalars and which quantities are vectors.

Put **one** tick (✓) in each row.

The first row has been completed for you.

Quantity	**Scalar**	**Vector**

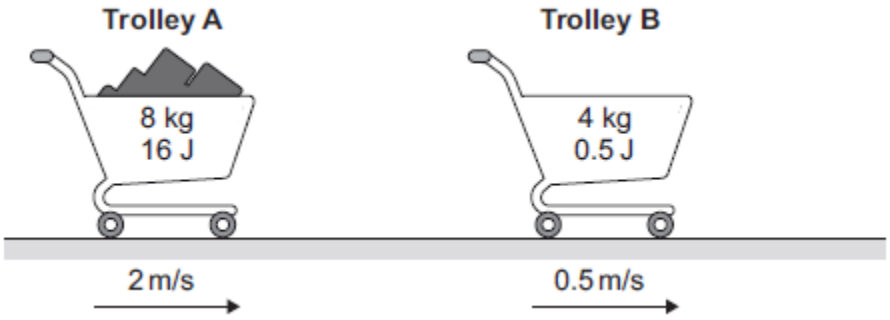
Momentum		✓
Acceleration		
Distance		
Force		
Time		

(3)

(c) The diagram shows two supermarket trolleys moving in the same direction.

Trolley **A** is full of shopping, has a total mass of 8 kg and is moving at a velocity of 2 m / s with a kinetic energy of 16 J.

Trolley **B** is empty, has a mass of 4 kg and is moving at a velocity of 0.5 m / s with a kinetic energy of 0.5 J.



(i) Calculate the momentum of both trolley **A** and trolley **B**.

Give the unit.

_____

_____

Momentum of trolley **A** = _____

Momentum of trolley **B** = _____

Unit _____

(4)

(ii) The trolleys in the diagram collide and join together. They move off together.

Calculate the velocity with which they move off together.

_____

_____

_____

_____

Velocity = _____ m / s

(3)

(iii) In a different situation, the trolleys in the digram move at the same speeds as before but now move towards each other.

Calculate the total momentum and the total kinetic energy of the two trolleys before they collide.

_____

_____

Total momentum = _____

_____

_____

Total kinetic energy = _____ J

(2)

(Total 14 marks)