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Exam Preparation and Free Resources

Name of the Student:_____

Max. Marks : 24 Marks   **Time : 24 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?

_____

_____

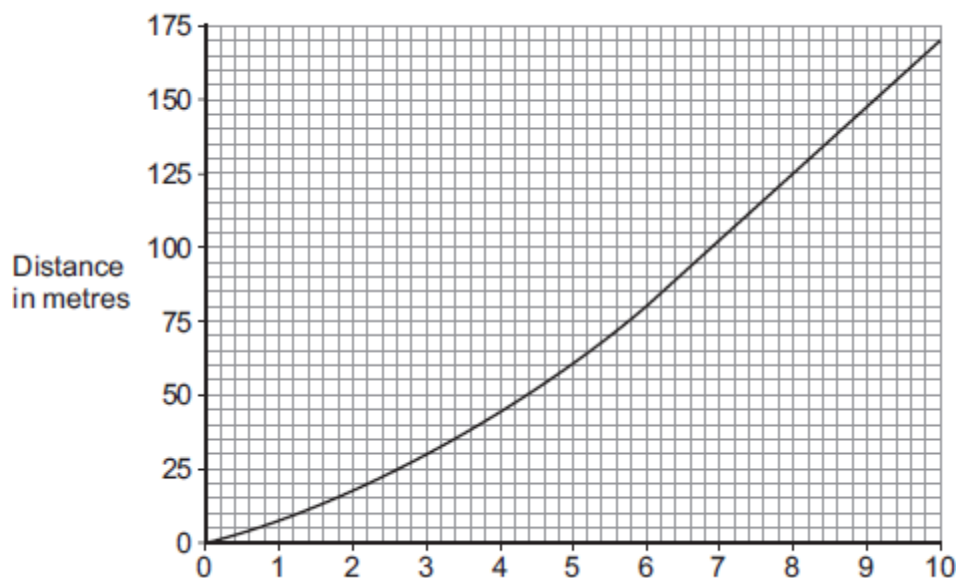**(1)**

(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.
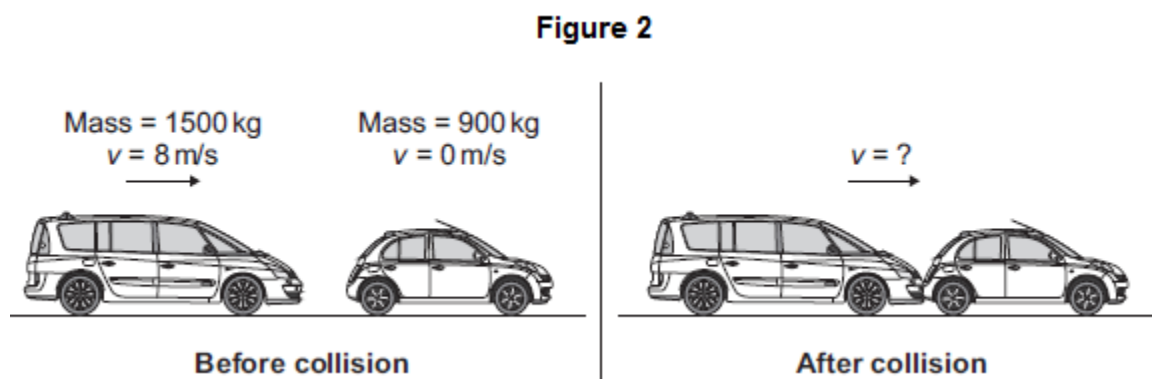Show clearly how you work out your answer.

_____

_____

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

Mass = 1500 kg
v = 8 m/s

Mass = 900 kg
v = 0 m/s

v = ?

Before collision

After collision

(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.

_____

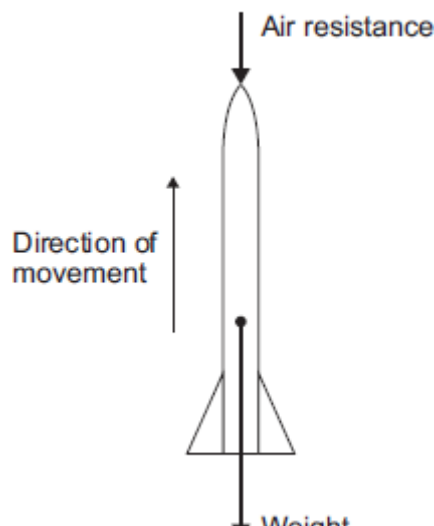_____

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(4)
(Total 13 marks)

Q2.

(a)   **Figure 1** shows the forces acting on a model air-powered rocket just after it has been launched vertically upwards.

Figure 1

(i) How does the velocity of the rocket change as the rocket moves **upwards**?

_____

Give a reason for your answer.

_____

_____

(2)

(ii) The velocity of the rocket is not the same as the speed of the rocket.

What is the difference between the velocity of an object and the speed of an object?

_____

_____

_____

(1)

(b) The speed of the rocket just after being launched is 12 m / s.
The mass of the rocket is 0.05 kg.

(i) Calculate the kinetic energy of the rocket just after being launched.

_____

_____

_____

Kinetic energy = _____ J

(2)

(ii) As the rocket moves upwards, it gains gravitational potential energy.

State the maximum gravitational potential energy gained by the rocket.

Ignore the effect of air resistance.

Maximum gravitational potential energy = _____ J

(1)

(iii) Calculate the maximum height the rocket will reach.

Ignore the effect of air resistance.
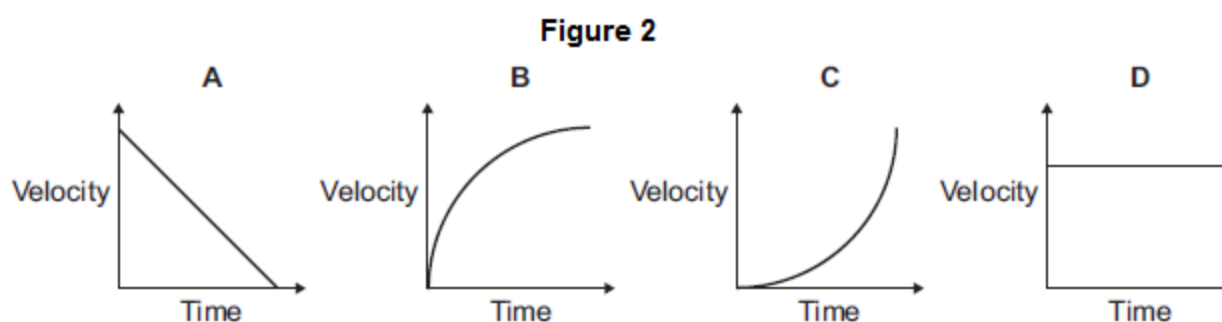
Gravitational field strength = 10 N/kg.

_____

_____

_____

Maximum height = _____ m

(2)

(iv) **Figure 2** shows four velocity−time graphs.

Figure 2

Taking air resistance into account, which graph, **A**, **B**, **C** or **D**, shows how the velocity of the rocket changes as it **falls** from the maximum height it reached until it just hits the ground?
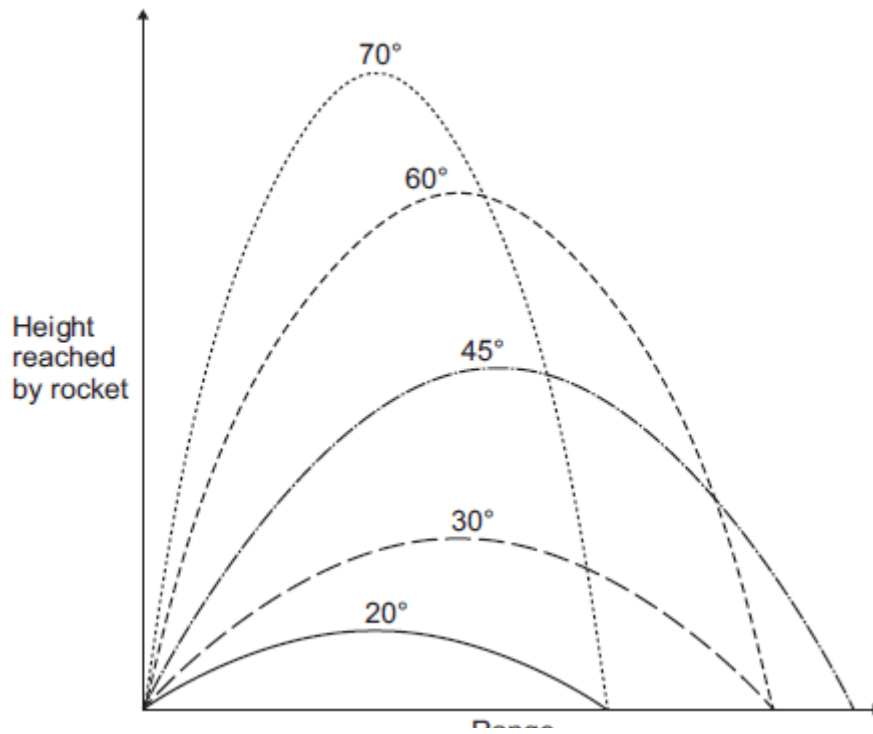
Write the correct answer in the box.

(1)

(c) The rocket can be launched at different angles to the horizontal.
The horizontal distance the rocket travels is called the range.

Figure 3 shows the paths taken by the rocket when launched at different angles.
Air resistance has been ignored.

Figure 3

What pattern links the angle at which the rocket is launched and the range of the rocket?

_____

_____

_____

_____

(2)
(Total 11 marks)