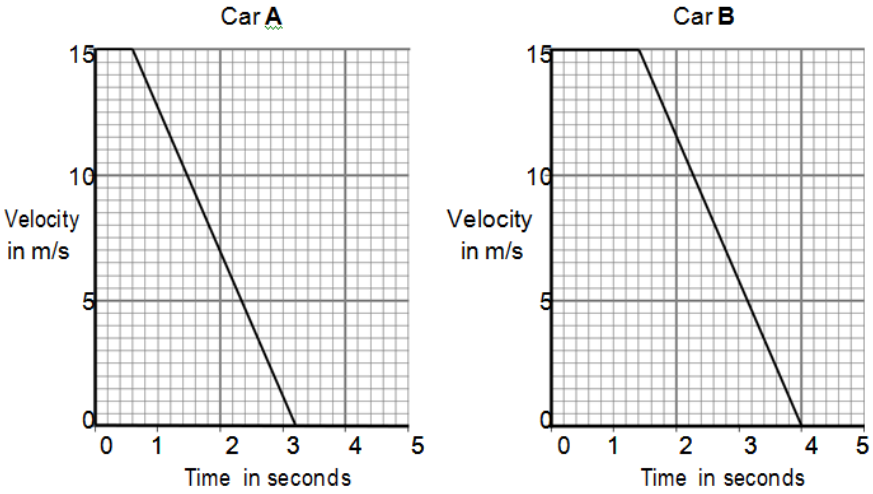
VELOCITY DISPLACEMENT ACCELERATION 2

Q:1 The graphs show how the velocity of two cars, A and B, change from the moment the car drivers see an obstacle blocking the road.



One of the car drivers has been drinking alcohol. The other driver is wide awake and alert.

(a) (i) How does a comparison of the two graphs suggest that the driver of car B is the one who has been drinking alcohol?

_____

_____

(1 mark)

(a) (ii) How do the graphs show that the two cars have the same deceleration?

_____

_____

(1 mark)

(a) (iii) Use the graphs to calculate how much further car B travels before stopping compared to car A.

Show clearly how you work out your answer.

_____

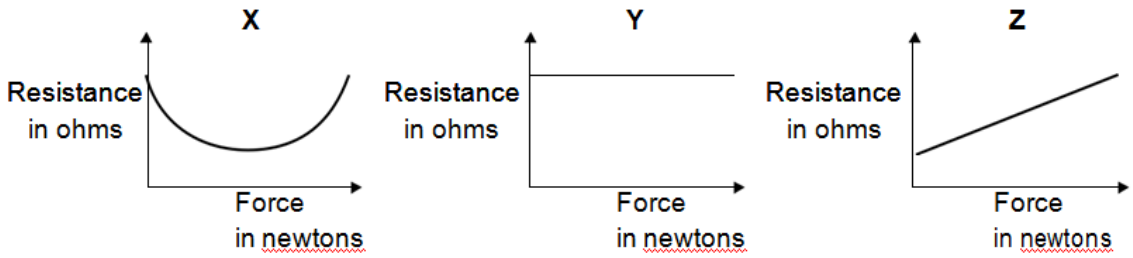
_____

_____

Additional stopping distance = _____ m

(3 marks)

(b) In a crash test laboratory, scientists use sensors to measure the forces exerted in collisions. The graphs show how the electrical resistance of 3 experimental types of sensor, X, Y and Z, change with the force applied to the sensor.



Which of the sensors, X, Y or Z, would be the best one to use as a force sensor?

_____

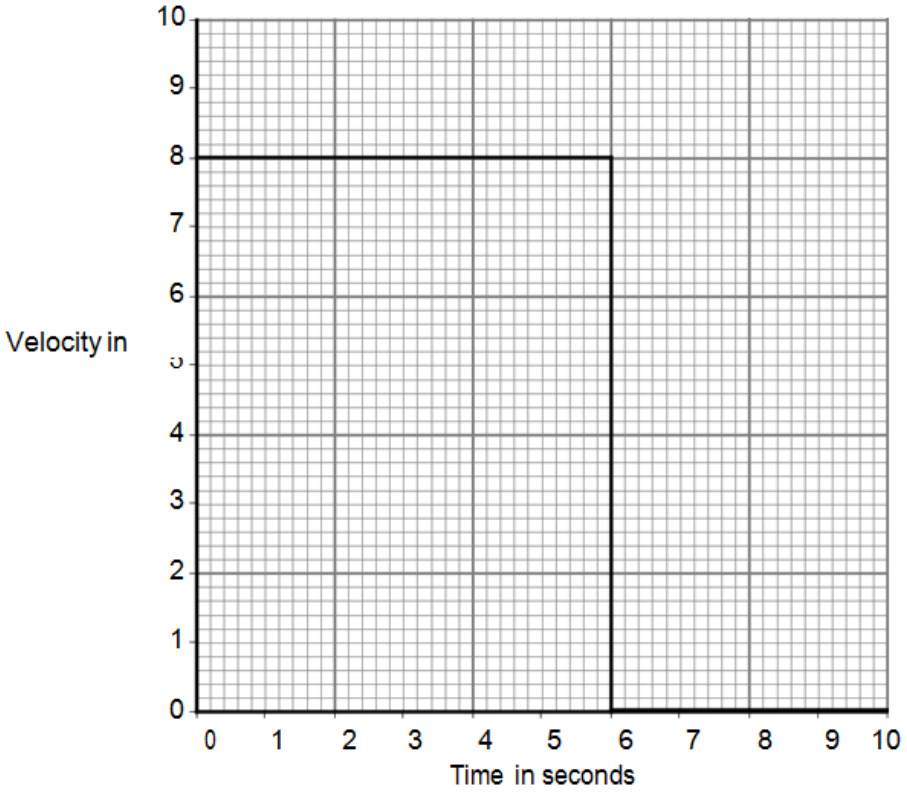
Give a reason for your answer.

_____

_____

(2 marks)

Q:2 The diagram shows the velocity-time graph for an object over a 10 second period.



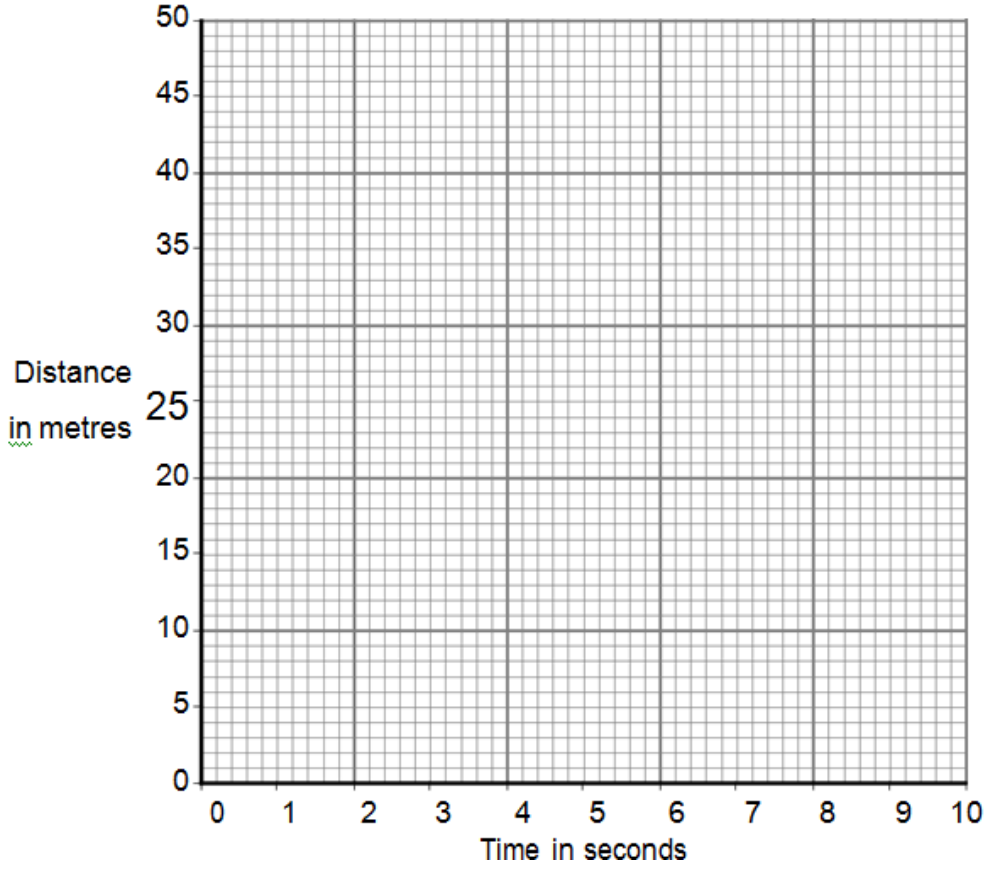
a) Use the graph to calculate the distance travelled by the object in 10 seconds.

Show clearly how you work out your answer.

Distance = _____ m

(2 marks)

(b) Complete the distance-time graph for the object over the same 10 seconds.



(2 marks)

Q:3 A high-speed train accelerates at a constant rate in a straight line. The velocity of the train increases from 30 m/s to 42 m/s in 60 seconds.

(a) (i) Calculate the change in the velocity of the train.

_____

Change in velocity = _____ m/s

(1 mark)

(a) (ii) Use the equation in the box to calculate the acceleration of the train.

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken for change}}$$

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

Choose the unit from the list below.

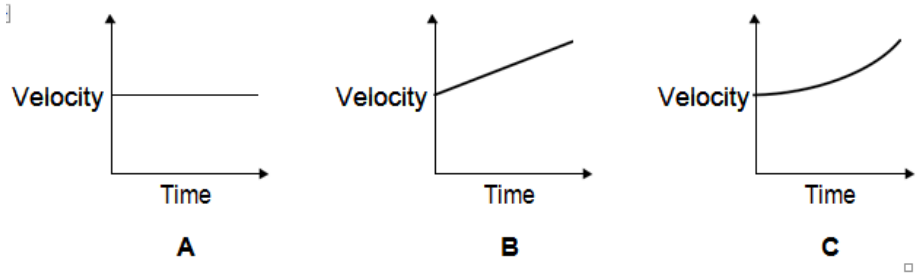
m/s m/s2 N/kg Nm

Acceleration = _____

(2 marks)

(b) Which one of the graphs, A, B or C, shows how the velocity of the train changes as it accelerates?

Write your answer, A, B or C, in the box.

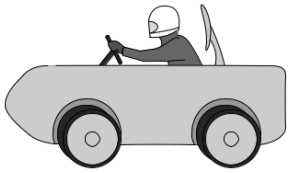


Graph ☐

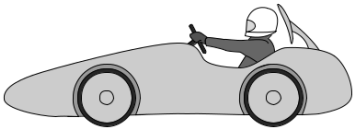
(1 mark)

Q:4 **(a)**Some students have designed and built an electric-powered go-kart. After testing, the students decided to make changes to the design of their go-kart.

First design X



Final design Y



The go-kart always had the same mass and used the same motor.

The change in shape from the first design (X) to the final design (Y) will affect the top speed of the go-kart.

Explain why.

_____

_____

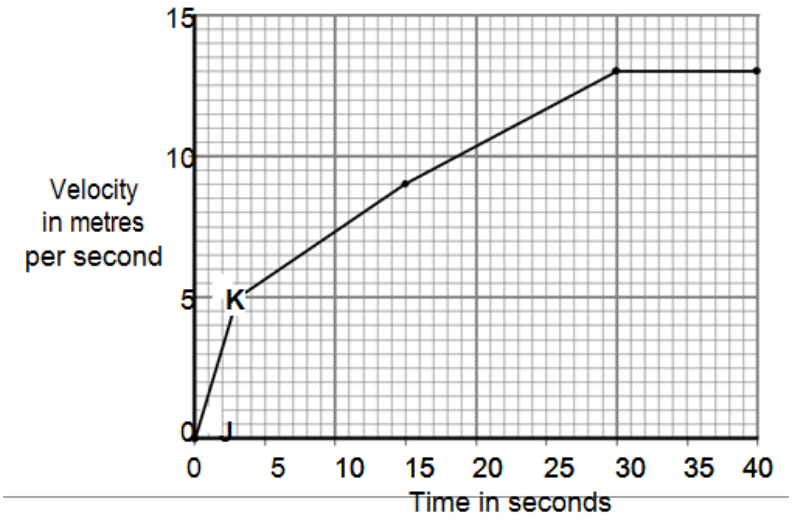
_____

_____

(3 marks)

(b) The final design go-kart, Y, is entered into a race.

The graph shows how the velocity of the go-kart changes during the first 40 seconds of the race.



b) (i) Use the graph to calculate the acceleration of the go-kart between points J and K.

Give your answer to two significant figures.

_____

_____

_____

Acceleration =_____ m/s2

(2 marks)

(b) (ii) Use the graph to calculate the distance the go-kart travels between points J and K.

_____

_____

Distance =_____ m

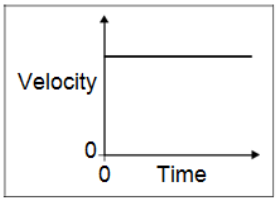
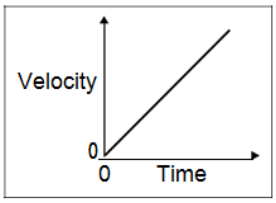
(2 marks)

(b) (iii) What causes most of the resistive forces acting on the go-kart?

_____

(1 mark)

Q:5 (**a)**Draw one line from each velocity–time graph to the statement describing the motion shown by the graph.

Velocity–time graph	Motion shown by graph
	Constant acceleration
	Not moving
	Constant deceleration
	Constant velocity

(2 marks)

(b) Use the correct answer from the box to complete the sentence.

energy	momentum	speed

The velocity of an object includes both the _____ of the object

and the direction the object is moving.

(1 mark)

(c) At the start of a race, a horse accelerates from a velocity of 0 m/s to a velocity of 9 m/s in 4 seconds.

(c) (i) Calculate the acceleration of the horse.

Use the correct equation from the Physics Equations Sheet.

_____

_____

Acceleration = _____ m/s2

(2 marks)

(c) (ii) When the horse accelerates, what, if anything, happens to the air resistance acting against the horse?

Tick (☒) one box.

The air resistance decreases. ☐

The air resistance is constant. ☐

The air resistance increases. ☐

(1 mark)

(d) A horse and a pony walk across a field at the same constant speed.

The horse has 4000 joules of kinetic energy.

The pony is half the mass of the horse.

What is the kinetic energy of the pony?

Draw a ring around the correct answer.

2000 J 4000 J 8000 J

Give a reason for your answer.

_____

_____

(2 marks)

TOTAL MARKS=31 MARKS