Tutor Zone

Your Step To Success

Name

Percentage	
Grade	

GCSE Physics

Speed and Acceleration

Duration: 50 min

Total Marks: 49

Information for Candidates:

- Use black or blue ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional paper is used, the question number(s) must be clearly shown
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

Do not write in this table	
Question	Mark
TOTAL	

Answer **all** questions in the spaces provided.

1 A car has an oil leak. Every 5 seconds an oil drop falls from the bottom of the car onto the road.

1 (a) What force causes the oil drop to fall towards the road?

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(1 mark)

1 (b) The diagram shows the spacing of the oil drops left on the road during part of a journey from A to B.

Describe the motion of the car as it moves from **A** to **B**.

....

Explain the reason for your answer.

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....

(3 marks)

1 (c) When the brakes are applied, a braking force slows down and stops the car.

1 (c) (i) The size of the braking force affects the braking distance of the car.

State **one** other factor that affects the braking distance of the car.

....

(1 mark)

1 (c) (ii) A braking force of 3 kN is used to slow down and stop the car in a distance of 25 m.

Calculate the work done by the brakes to stop the car and give the unit.

Use the correct equation from the Physics Equations Sheet.

....

....

....

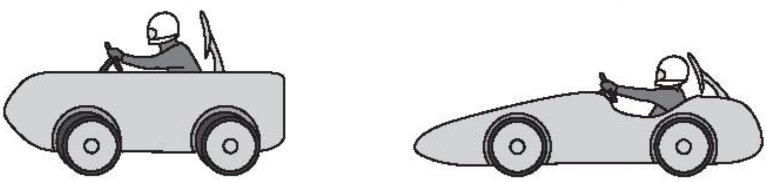
Work done = ...

(3 marks)

8

Turn over for the next question

5 (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.



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.

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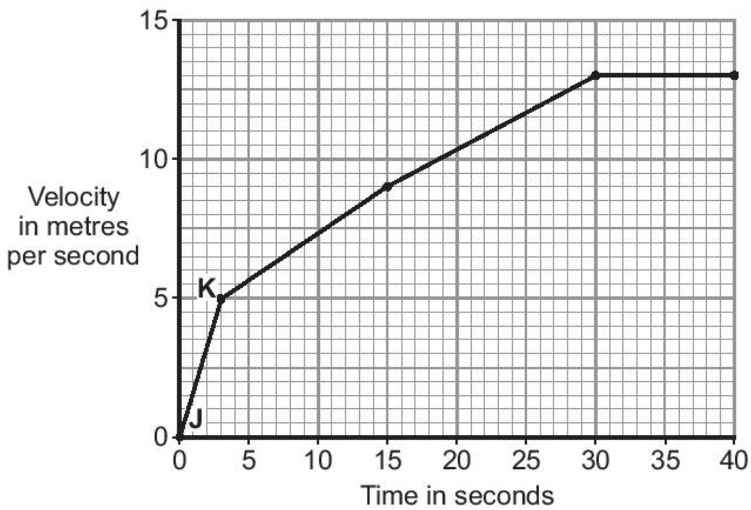
(3 marks)

5 (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.



5 (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.

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....

....

Acceleration = ... m/s^2
(2 marks)

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

....

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Distance = ... m
(2 marks)

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

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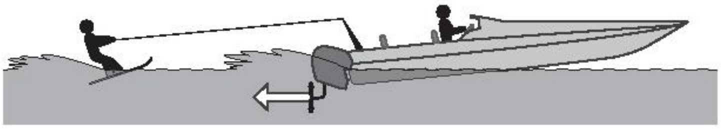
(1 mark)

8

Turn over for the next question

Answer **all** questions in the spaces provided.

1 The diagram shows a boat pulling a water skier.



1 (a) The arrow represents the force on the water produced by the engine propeller.
This force causes the boat to move.

Explain why.

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(2 marks)

1 (b) The boat accelerates at a constant rate in a straight line. This causes the velocity of the water skier to increase from 4.0 m/s to 16.0 m/s in 8.0 seconds.

1 (b) (i) Calculate the acceleration of the water skier and give the unit.

Use the correct equation from the Physics Equations Sheet.

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....

Acceleration = ...

(3 marks)

1 (b) (ii) The water skier has a mass of 68 kg.

Calculate the resultant force acting on the water skier while accelerating.

Use the correct equation from the Physics Equations Sheet.

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....

Resultant force = ... N

(2 marks)

1 (b) (iii) Draw a ring around the correct answer to complete the sentence.

The force from the boat pulling the water skier forwards

	less than	
will be	the same as	the answer to part **(b)(ii)**.
	greater than	

Give the reason for your answer.

....

....

(2 marks)

9

Turn over for the next question

7 A student investigates how the average speed of the trolley varies with starting height.

Figure 9 shows the trolley and runway.

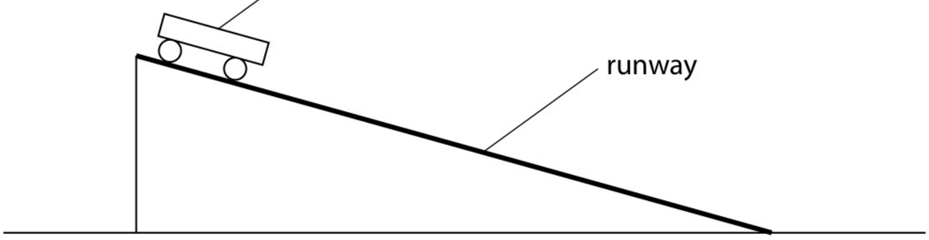

Figure 9

(a) Describe how the student can determine the average speed of the trolley.

(4)

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(b) Figure 10 shows his results.

starting height / m	**v / ms^{-1}**
0.01	0.22
0.02	0.31
0.04	0.44
0.09	0.66
0.12	0.77
0.14	0.83
0.18	0.94

Figure 10

Figure 11 shows the student's graph.

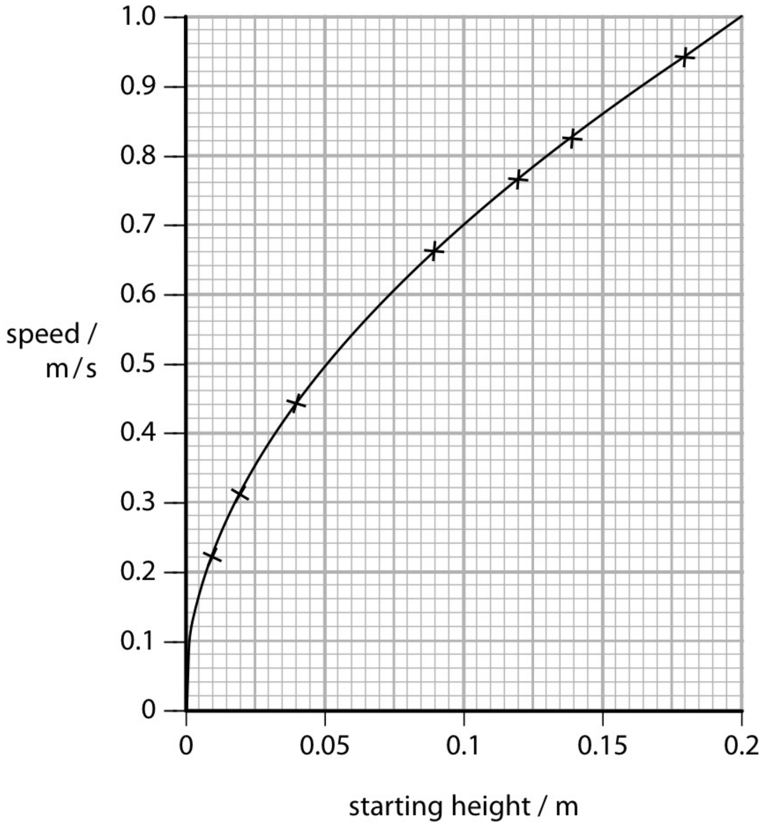

Figure 11

(i) The trolley has a mass of 650 g.

Calculate the average kinetic energy of the trolley which had a starting height of 0.075 m.

(2)

average kinetic energy= .... J

(ii) Determine the gradient of the graph when the height is 0.1 m.

(2)

gradient = ...

(iii) Describe how the speed of the trolley varies with the changes in height made by the student between 0.04 m and 0.12 m.

(2)

....

....

....

....

(c) The student wants to change his experiment to investigate how different surfaces of the runway affect the speed of the trolley down the slope.

Devise an experiment that would allow him to investigate the effect of different surfaces on the average speed of the trolley.

(3)

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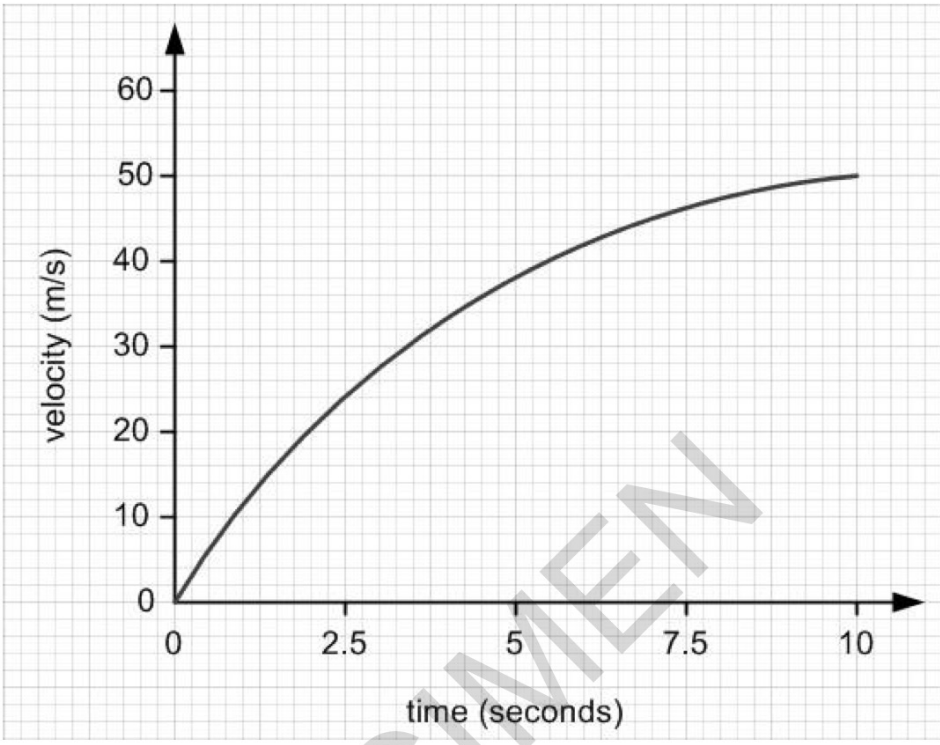
(Total for Question 7 = 13 marks)

24 A free-fall skydiver falls from a plane and reaches terminal velocity after 15 seconds.

Look at the graph of her motion.



(a) Use the graph to find the acceleration at 5 seconds.

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....

....

answer: .... m/s^2 **[3]**

(b) Use the graph to find the distance travelled between 0 and 2.5 seconds.

....

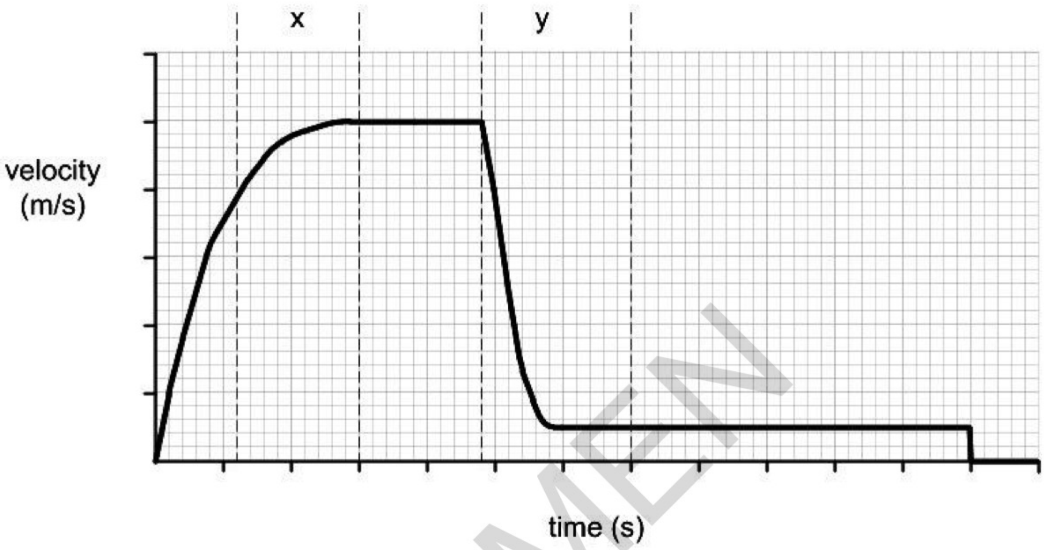
....

....

answer: .... m **[2]**

(c) A skydiver jumps from an aeroplane, falls towards the ground, opens her parachute and falls safely to earth.

Look at the graph of the velocity of the skydiver as she falls.



Look at these regions of the graph:

- **x**
- **y**

Use ideas about forces to explain the motion during **x** and **y**.

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END OF QUESTION PAPER