Name:

Subject : Physics

Grade : MYP 4

Topic : Mid Term Syllabus

MYP 4/5 Science : Physics

Criterion A : Knowing and understanding

Achievement level	Level descriptor
7–8	The student is able to: i. **explain** scientific knowledge ii. apply scientific knowledge and understanding to **solve problems** set in **familiar and unfamiliar situations** iii. **analyse** and **evaluate** information to make **scientifically supported judgments**.

Criterion B : Inquiring and designing

Achievement level	Level descriptor
7–8	The student is able to: i. **explain** a problem or question to be tested by a scientific investigation ii. **formulate and explain** a testable hypothesis **using correct scientific reasoning** iii. **explain** how to manipulate the variables, and **explain** how **sufficient, relevant data** will be collected iv. **design** a **logical, complete and safe method** in which he or she **selects appropriate materials and equipment**..

Criterion C : Processing evaluating

Achievement level	Level descriptor
7–8	The student is able to: i. **correctly collect, organize, transform and present** data in numerical and/or visual forms ii. **accurately interpret** data and **explain** results **using correct scientificreasoning** iii. **evaluate** the validity of a hypothesis based on the outcome of a scientific investigation iv. **evaluate** the validity of the method based on the outcome of a scientific investigation v. **explain** improvements or extensions to the method that would benefit the scientific investigation

Criterion D : Reflecting on the impacts of science

Achievement level	Level descriptor
7–8	The student is able to: i. **explain** the ways in which science is applied and used to address a specific problem or issue ii. **discuss and evaluate** the implications of using science and its application to solve a specific problem or issue, interacting with a factor iii. **consistently apply** scientific language to communicate understanding **clearly and precisely** iv. document sources **completely**

INSTRUCTIONS:

Write your name on top of the Answer sheet.
Write in dark blue font
Answer **all** questions.
Write your answers in the spaces provided.
You can use Phet-Simulation or Paint, calculator
Formulae sheet is provided in the Exam folder

Command Terms:

Analyze:*Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.*
Apply: *Use knowledge and understanding in response to a given situation or real circumstances*
Construct: *Develop information in a diagrammatic or logical form*
Deduce: *Reach a conclusion from the information given.*
Define: *Give the precise meaning of a word, phrase, concept or physical quantity.*
Describe: *Give a detailed account or picture of a situation, event, pattern or process*
Design: *Produce a plan, simulation or model.*
Discuss: *Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.*
Explain: *Give a detailed account including reasons or causes.*
Evaluate: *Assess the implications and limitations; make judgments about the ideas, works, solutions or methods in relation to selected criteria.*
Identify: Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing fact or feature.
Interpret: *Use knowledge and understanding to recognize trends and draw conclusions from given information.*
Investigate: *Observe, study, or make a detailed and systematic examination, in order to establish facts and reach new conclusions.*
Recall: *Remember or recognize from prior learning experiences*
Show: *Give the steps in a calculation or derivation.*
State: *Give a specific name, value or other brief answer without explanation calculation.*
Suggest: *Propose a solution, hypothesis or other possible answer.*
Calculate:*Obtain a numerical answer showing the relevant stages in the working.*

Question 1 (12 marks)

A raindrop falls from a cloud that is 500 m above the ground.

Question 2a (3 marks)

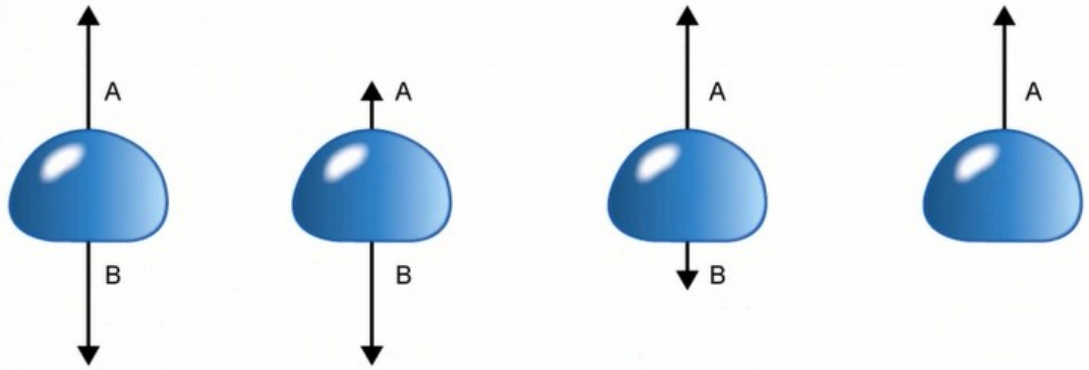
Calculate the theoretical maximum velocity of the raindrop before it hits the ground. Assume that the acceleration due to gravity, g, is equal to 10 ms^{-2}.

Ans:

Question b (1 mark)

The raindrop does not reach this theoretical maximum speed: instead it reaches the terminal velocity.

Select the free body diagram that shows the forces acting on the raindrop when it reaches its terminal velocity.



1. ○ 2. ○ 3. ○ 4. ○

Ans:

Question 2c (1 mark)

Label the forces A and B.

Force A

Force B

A:
B:

Question d (1 mark)

A typical raindrop has a mass of 3.0×10^{-5} kg.

State the mass of the raindrop in grams (g).

Ans:

Question e (2 marks)

Use your answers to part (a) and part (d) to **calculate** the maximum final theoretical momentum of the raindrop. You should include the unit in your answer.

Ans:

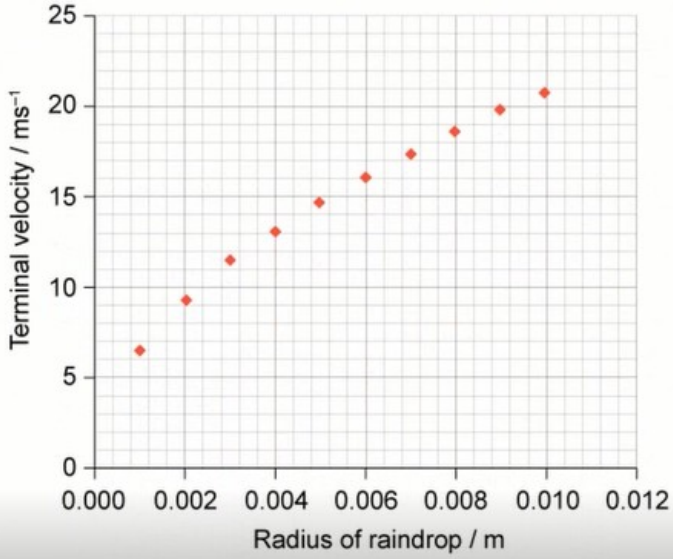
Question f (2 marks)

A student reads that the terminal velocity of a raindrop is determined by its radius.

To determine experimentally if this is true, the student makes the following prediction:

"The terminal velocity of a raindrop is proportional to the radius of the raindrop because the weight will be larger."

The student measures the terminal velocity of different raindrops and produces the following graph.

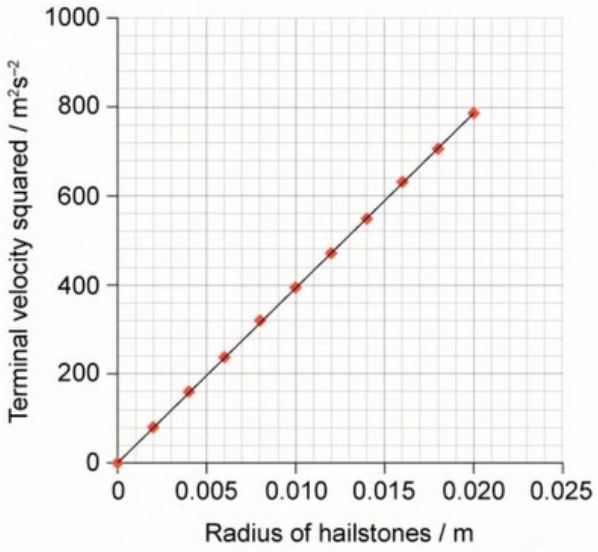


Use the graph to **discuss** the validity of the hypothesis.

Ans:

Question g (2 marks)

A second student decides to complete a similar investigation to measure the terminal velocity of hailstones. He draws a different graph of the results shown below.



Explain what these results show about the relationship between the radius of hailstones and terminal velocity.

Ans:

Question-2

Question (16 marks)

A student living in Tanzania decides to investigate if there is a relationship between the altitude (height above sea level) and the boiling point of water.

She climbs Mount Kilimanjaro recording the temperature at which water boils at different altitudes, from the bottom of the mountain to the top.

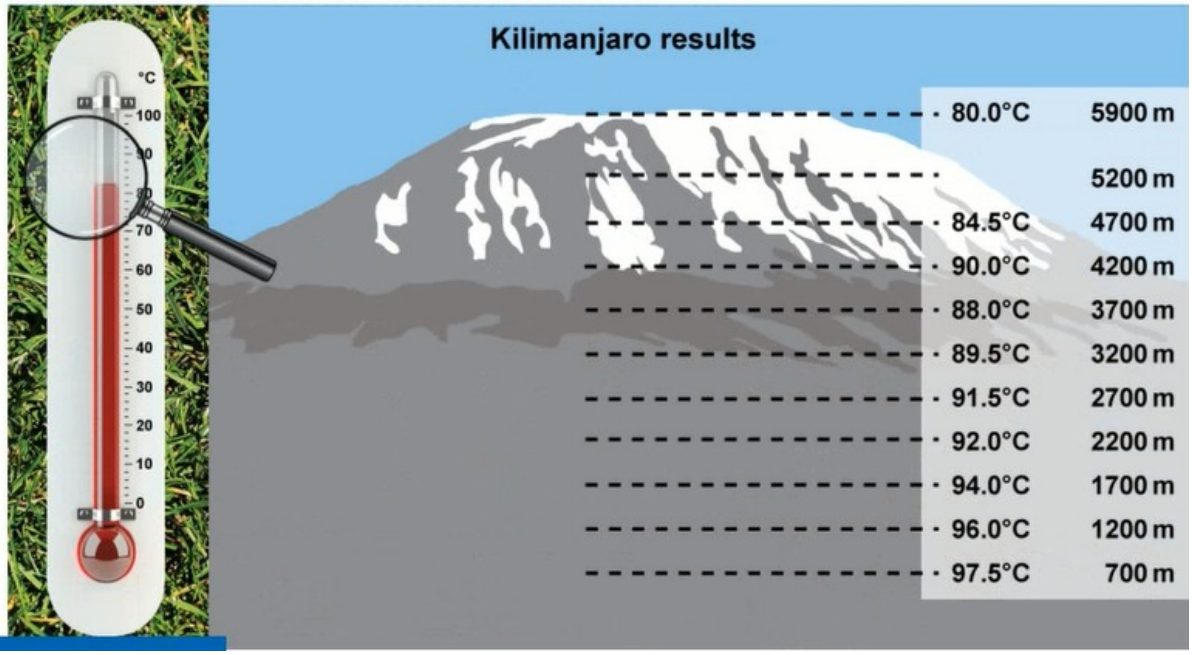
She records her results on a picture of the mountain, shown below.

Question a (3 marks)

The student forgot to label the table correctly. **Write down** labels for heading 1 and heading 2. At 5200 m the student did not record a temperature, but took a photo of the thermometer. **Measure** the temperature shown in the photograph and add it to the results table.

This media is interactive

Click on the magnifying glass to enlarge the thermometer.



Heading 1	Heading 2
5900	80.0
5200	
4700	84.5
4200	90.0
3700	88.0
3200	89.5
2700	91.5
2200	92.0
1700	94.0
1200	96.0
700	97.5

Heading 1:

B I U x_2 x^2 Ω Σ Styles

Heading 2:

Ans:

Question b (2 marks)

Explain why a bar chart is not appropriate to display these results.

Ans:

Question c (2 marks)

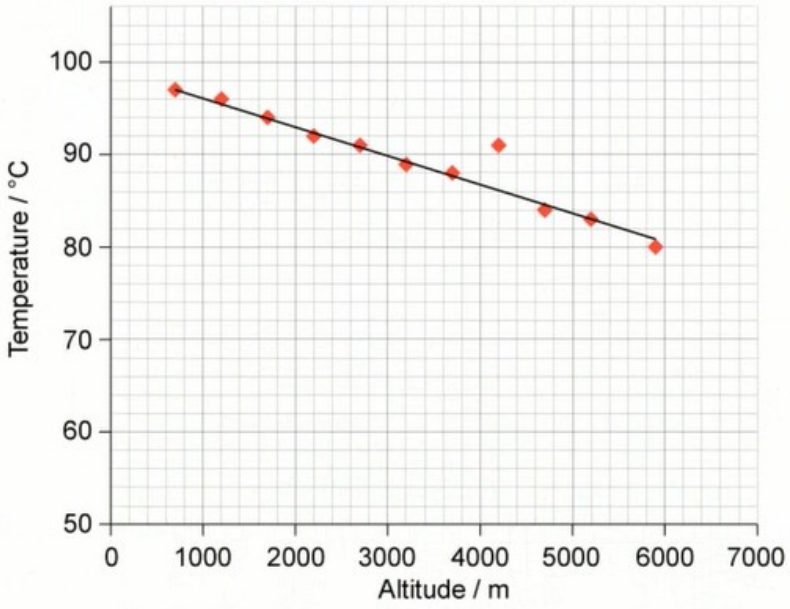
Air pressure reduces as altitude increases.

Resource 01

Before starting her climb, the student writes the following hypothesis:

"As the altitude increases the boiling point will increase. The water molecules will find it harder to escape from the liquid because the pressure is dropping as you go up the mountain."

Once she has completed the experiment the student presents her results on the following graph.



Identify which altitude produced an anomalous result and **justify** your answer.

Ans:

Question d (2 marks)

Outline what this graph shows about the relationship between altitude and boiling temperature of water.

Ans:

Question e (4 marks)

Explain the results of the investigation using particle theory.

Ans:

Question f (2 marks)

"As the altitude increases the boiling point will increase. The water molecules will find it harder to escape from the liquid because the pressure is dropping as you go up the mountain."

Use the results shown on the graph in part (c) to **comment** on the validity of the hypothesis.

Ans:

Question g (1 mark)

Suggest an extension to this investigation.

Ans:

Question-03 (Use Resource 02)

Question (22 marks)

A second student in the class carries out an investigation using a trolley. He investigates how a trolley's stopping distance is affected by the drag force created by a sail, on a horizontal surface. The friction between the wheels and the track is negligible. The variables in the investigation are:

Independent variable:

Area of the sail

Dependent variable:

Stopping distance

Control variable 1:

Initial speed of the trolley

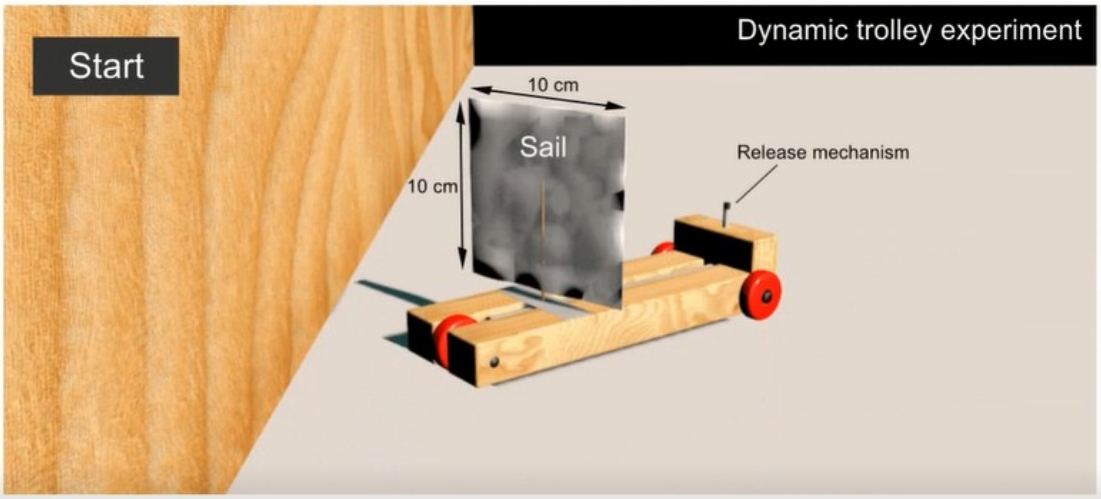
Control variable 2:

Mass of the trolley

Question (3 marks)

Take appropriate measurements and use your measurements to **determine** the stopping distance of the trolley.

This media is interactive



A student repeated the investigation with a circular sail. The student's data for stopping distance and sail radius is given below.

(Consider: Student uses Circular Snail with radius values given)

Question (5 marks)

Organize and **present** the radius and stopping distance data in a suitable table.

Ans: (Insert table by your own)

Question (2 marks)

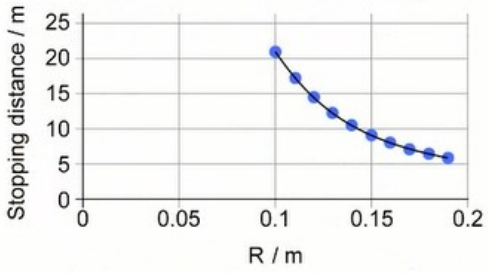
Explain why a scatter/line graph is the most appropriate choice to display and analyse these results.

Question (2 marks)

Before recording his results, the student writes the following hypothesis:

"As the radius of the sail increases, the stopping distance will decrease. Stopping distance will be inversely proportional to radius."

Once the student has completed the experiment he produces the following graph.



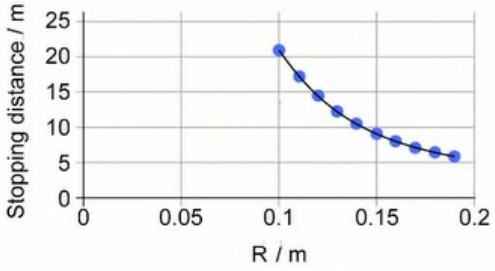
Outline what this graph shows about the relationship between stopping distance and radius.

Styles

Ans: **Use Resource 2 to see further Graphs**

Graph 1 Graph 2 Graph 3 Graph 4

Sail experiment: graph showing stopping distance against sail radius



Question 7e (1 mark)

Deduce the relationship between the variables.

Styles

Ans:

Question (3 marks)

Explain the results of the investigation using scientific reasoning.

Ans:

Question (2 marks)

Evaluate the validity of the hypothesis.

Ans:

Question (1 mark)

Suggest an extension to this investigation.

Ans:

Question 3 marks)

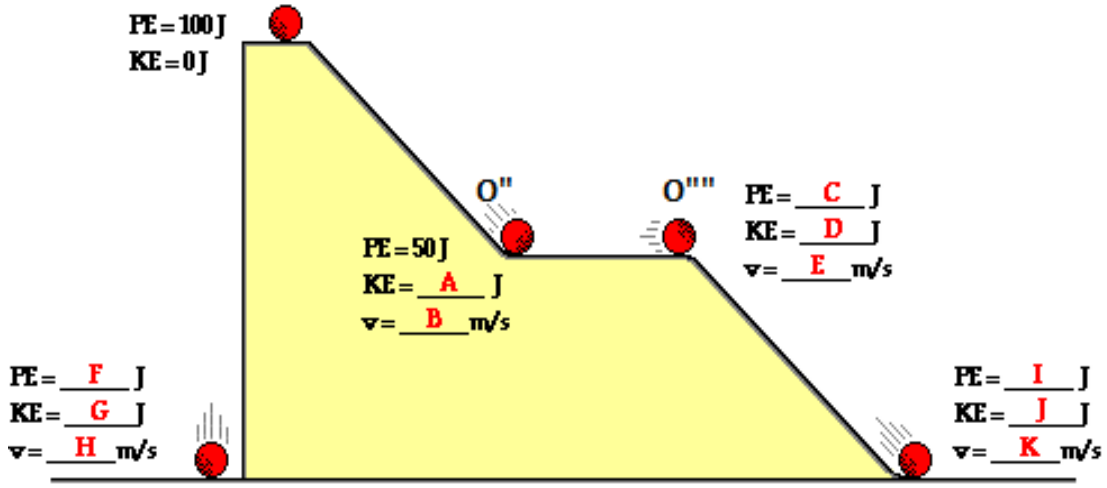
Formulate and **explain** a hypothesis that the extension in part (h) would test.

Ans:

Question-04

Use your understanding of the work-energy theorem to answer the following questions.

1. Consider the falling and rolling motion of the ball in the following two resistance-free situations. In one situation, the ball falls off the top of the platform to the floor. In the other situation, the ball rolls from the top of the platform along the staircase-like pathway to the floor. For each situation, indicate what types of forces are doing work upon the ball. Indicate whether the energy of the ball is conserved and explain why. Finally, fill in the blanks for the 2-kg ball.



(i) **Calculate** the indicated Values and fill the column below:

Indicated Options	Answers
A	
B	
C	
D	
E	
F	
G	
H	

ii) From O" to O"" surface has got friction due to which 20 J energy is lost **calculate** the value of velocity when the ball will hit the ground.

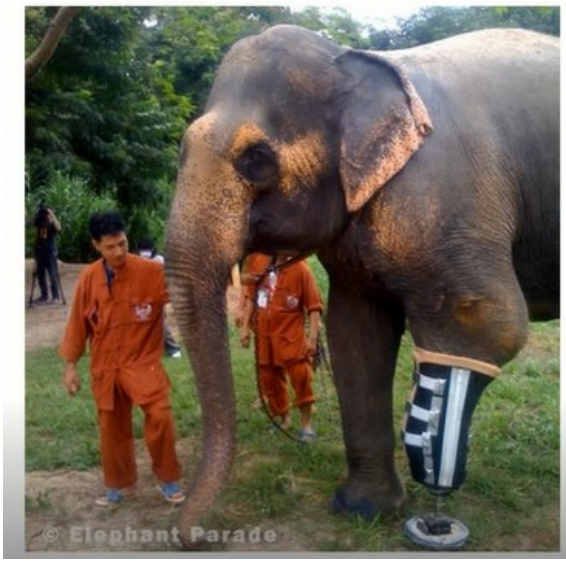
ii) **Calculate** the value of height when the block is at top of ramp, take the value of gravitation field strength to be 10 N Kg^{-1}.

Question-05

Question (14 marks)

Land mines around the world are responsible for thousands of injured people and animals. As advanced prosthetic limbs are not affordable to people on low incomes, solutions have been found for reducing costs to help amputees. Recycled aluminium was used to give an elephant that stepped on to a land mine the possibility of walking again. Human understanding of scientific principles was used to create the artificial leg.

Question (2 marks)



Calculate the pressure on the ground when an elephant weighing 30 000 N is standing on only three feet. Assume each foot has an area of 0.2 m^2.

Ans:

Question (5 marks)

Explain how the design of the prosthesis takes account of pressure when:

creating contact with the ground

providing comfort to the elephant when connecting the prosthesis to its upper leg.

Question (7 marks)

Outline the advantages and disadvantages a prosthetic limb would have on an elephant when returned to its natural habitat. **Evaluate** whether or not you think elephants with prosthetic limbs should be returned to their natural habitat.

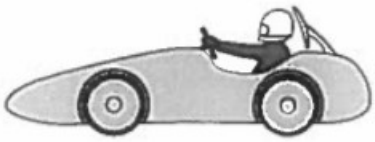
Ans:

Question-06

6 (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.

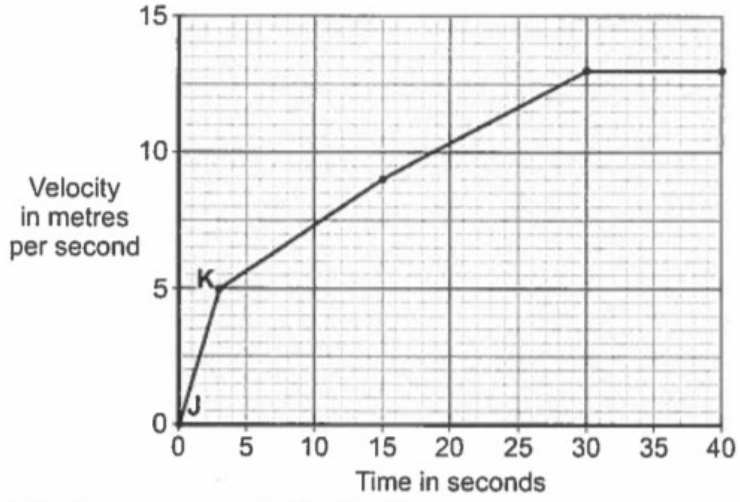
The change in shape from the first design (**X**) to the final design (**Y**) will affect the top speed of the go-kart.

Explain why.

Ans:

(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.

Ans:

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

Ans:

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

Ans: