KS3 Science

Motion

Question Paper

Time available: 34 minutes
Marks available: 46 marks

1. A gannet is a type of sea bird.

(a) When a gannet flies at a **constant height** above the sea, there is a downward force of 30N on the gannet.

What is the size of the upward force on the gannet?
Tick the correct box.

less than 30N	☐
exactly 30N	☐
more than 30N	☐
need more information	☐

1 mark

(b) To catch food, the gannet dives down into the sea.
What is the useful energy transfer when the gannet dives?
Choose words from the box below.

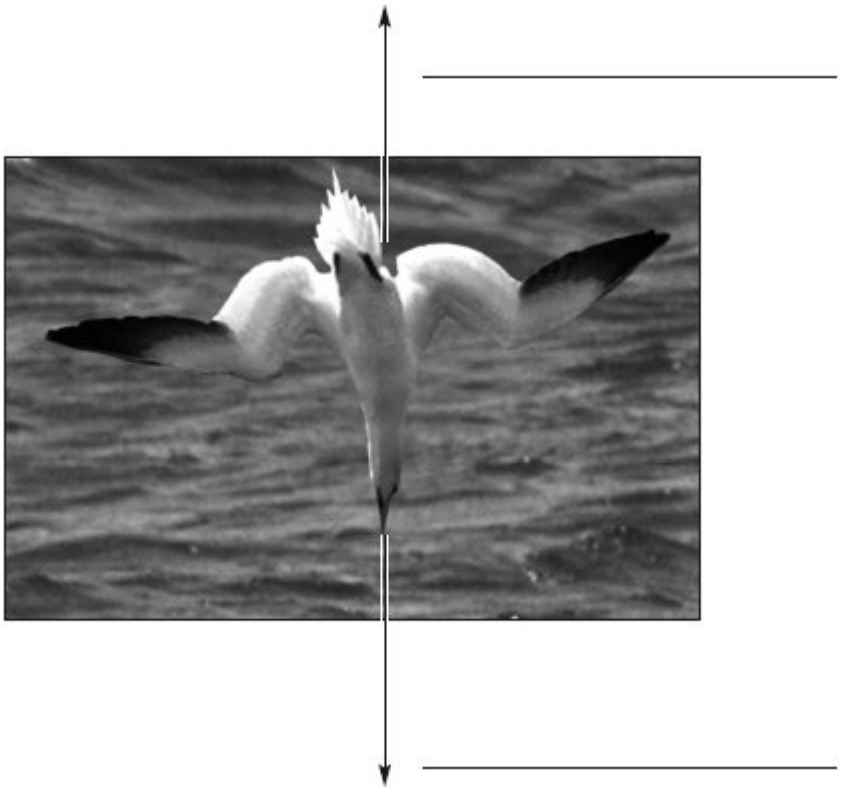
thermal	**gravitational potential**	**sound**	**kinetic**	**light**

When the gannet dives, ... energy is

transferred to ..... energy.

2 marks

(c) Label the arrows to show the **names** of the forces acting on the gannet as it dives.



2 marks

(d) Gannets have pockets of air between their muscles and their skin.
Suggest how this is a good adaptation for gannets when they hit the water at fast speeds.

.....

.....

1 mark

(e) The gannet releases energy through respiration.
An aeroplane also releases energy when fossil fuels burn.

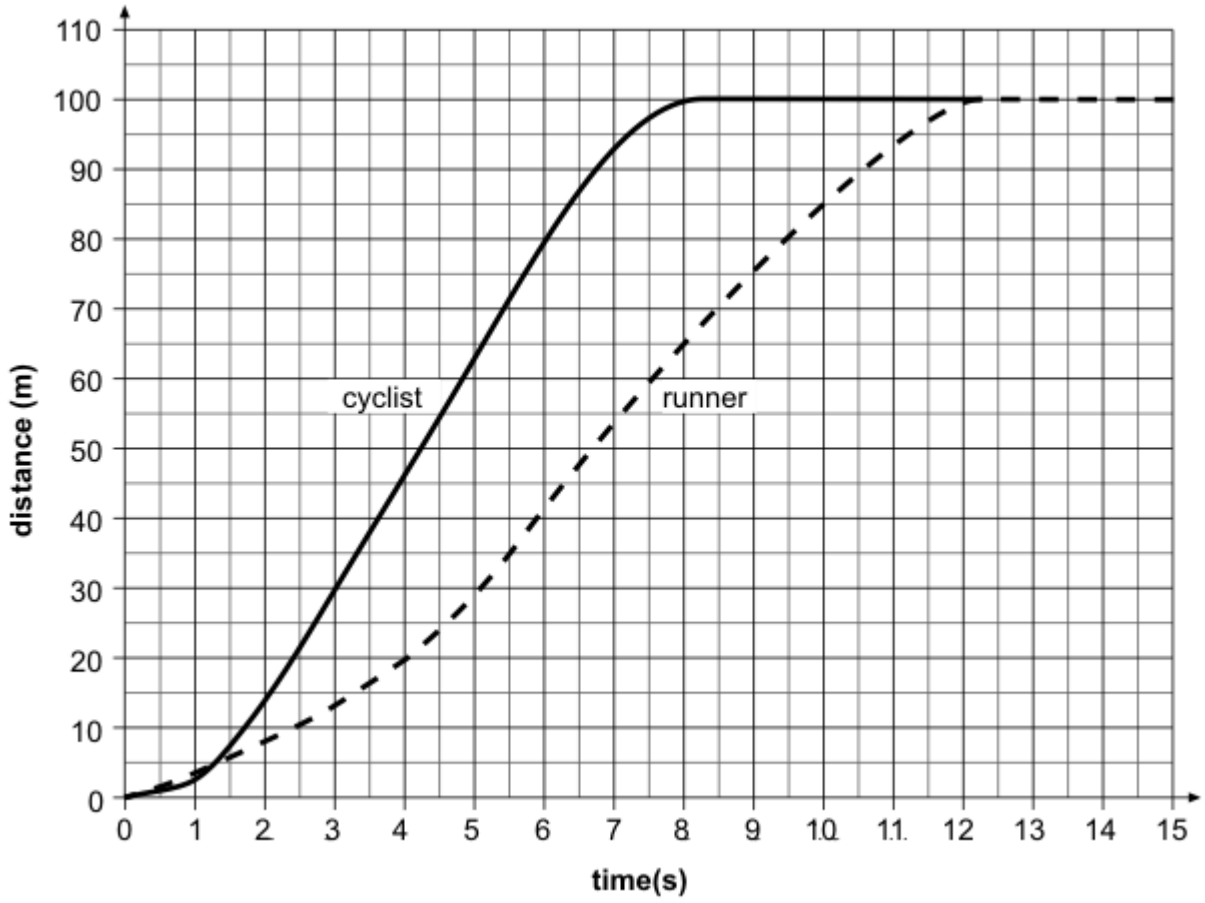
Write **two** other ways that respiration and burning are similar.

1 .....

2 .....

2 marks
maximum 8 marks

2. A cyclist and a runner have a race.
The distance-time graph for the race is shown below.



Use the graph to answer the following questions.

(a) (i) How much time did it take the cyclist to travel 100 m?

..... s

1 mark

(ii) When the cyclist finished the race how far behind was the runner?

..... m

1 mark

(iii) How much more time did the runner take compared with the cyclist to complete the race?

..... s

1 mark

(b) The cyclist is travelling at a constant speed between 3 seconds and 6 seconds.

How does the graph show this?

.....

.....

1 mark

(c) (i) When the race started, a walker set off at a steady speed of 2m/s.

Draw a line on the graph on the opposite page to show the distance covered by the walker in the first 15 seconds. Use a ruler.

1 mark

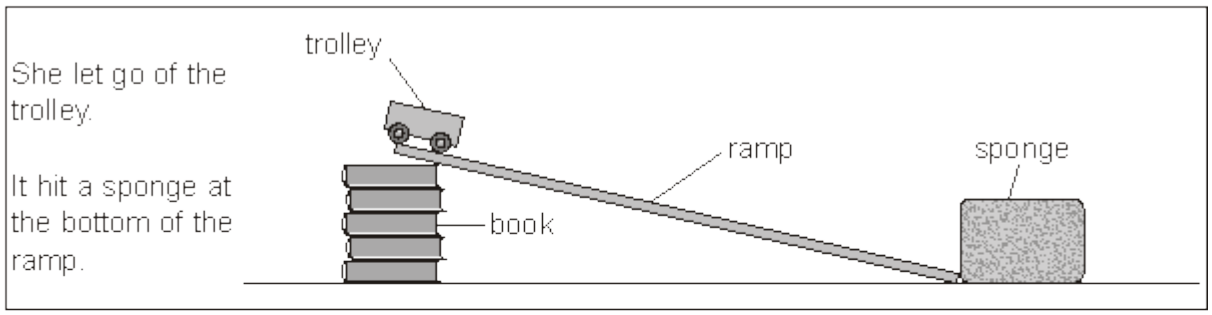
(ii) Calculate how much time it will take for the walker to walk 100m.

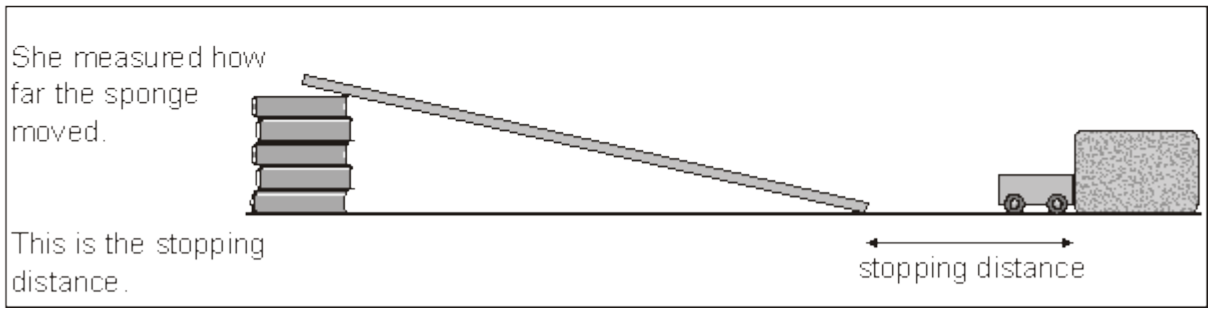
.....

..... s

1 mark
maximum 6 marks

3. Yasmin investigated the stopping distance of a trolley.





(a) Yasmin did the investigation five times.
She changed the steepness of the ramp each time.

(i) How could she make this ramp steeper?

.....

.....

1 mark

(ii) Yasmin's results are shown in the table.

steepness of ramp	stopping distance (cm)
A	10
B	16
C	16
D	28
E	34

She predicted, 'The steeper the ramp, the greater the stopping distance'.
If Yasmin was correct, which ramp was the steepest? Write the letter.

.....

1 mark

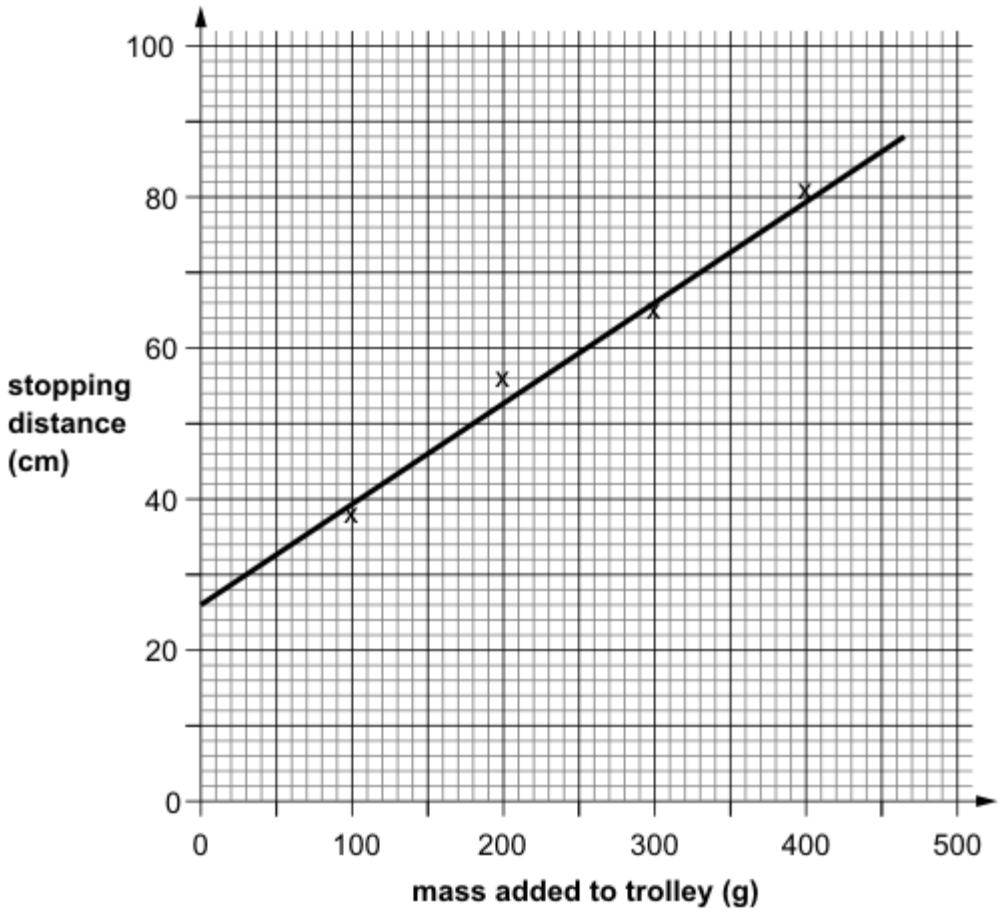
(iii) Yasmin looked at her results and decided she should repeat her investigation.
Look at Yasmin's results.

Suggest why she decided to repeat her investigation.

.....

1 mark

(b) Yasmin then investigated the stopping distance of a trolley with different masses on it.
The graph shows her results.



(i) What would be the stopping distance if 0 g were on the trolley?

..... cm

1 mark

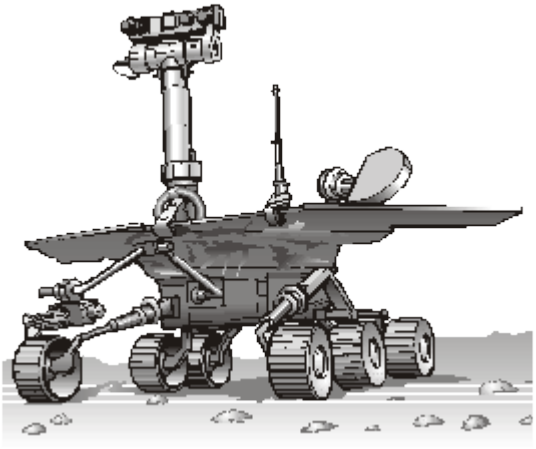
(ii) Complete the sentence with **decreases**, **increases** or **stays the same**.

As the mass added to the trolley increases,

the stopping distance ..... .

1 mark
maximum 5 marks

4. The drawing below shows a space buggy on the surface of Mars.



(a) The distance between Earth and Mars is 192 000 000 km.

It took a spacecraft 200 days to take the buggy from Earth to Mars.

Calculate the speed at which the spacecraft travelled.

Give the unit.

.....

.....

2 marks

(b) The weight of the buggy was 105 N on Earth and 40 N on Mars.

Why was the weight of the buggy less on Mars than on Earth?

.....

.....

1 mark

(c) The buggy uses solar panels to generate electrical energy.

The solar panels generate less electrical energy on Mars than on Earth.

Give a reason why.

.....

.....

1 mark

(d) The weight of the buggy was 40 N on Mars.
When the buggy landed on Mars it rested on an area of 0.025 m^2.

Calculate the pressure exerted by the buggy on the surface of Mars.

Give the unit.

.....

.....

2 marks
maximum 6 marks

5. The photographs below show pupils investigating the movement of objects on ramps.

Plan an investigation into the factors affecting the movement of objects on ramps.

You can use any objects and any surfaces you like, and any other equipment you need.

In the box below, write a short draft of **one** question you could plan to investigate about the movement of objects on ramps.

Use your draft to help you answer the following questions.

(a) Give **one** factor you could change as you carry out your investigation (the independent variable).

.....

.....

1 mark

(b) What factor would you observe or measure to collect your results (the dependent variable) and what equipment would you use to measure them?

The factor I would observe or measure is .....

.....

1 mark

The measuring equipment I would use is .....

.....

1 mark

(c) Give **one** factor you should keep the same to make your test fair.

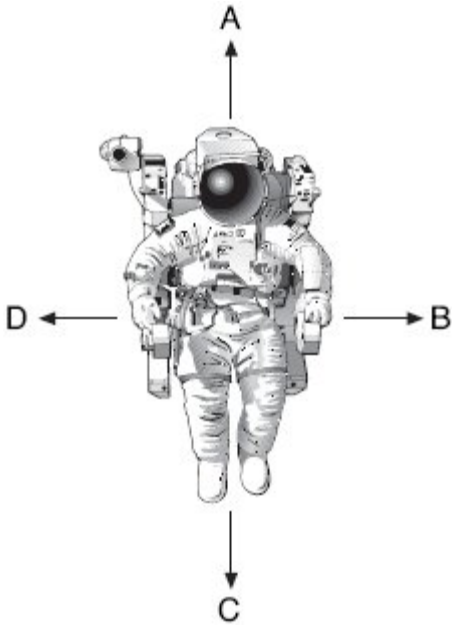
.....

.....

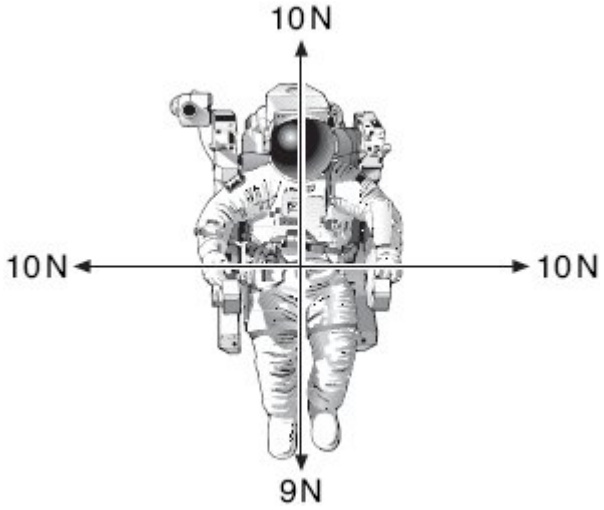
1 mark

maximum 4 marks

6. The drawing below shows an astronaut in space.
He has four small jets attached to his space suit.
These jets produce forces on the **astronaut** in the directions A, B, C and D.



(a) The drawing below shows the size and direction of four forces acting on the astronaut.



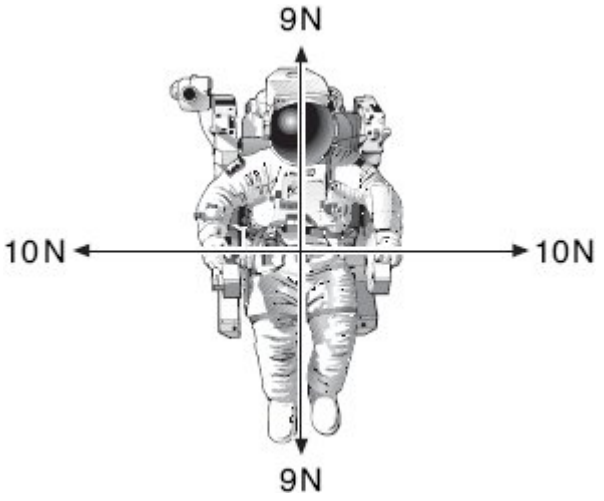
In which direction, A, B, C or D, will the astronaut move?

Give the letter.

.....

1 mark

(b) The drawing below shows the size and direction of four different forces acting on the astronaut.



What will happen to the astronaut when the jets produce these four forces?

.....

1 mark

Explain your answer.

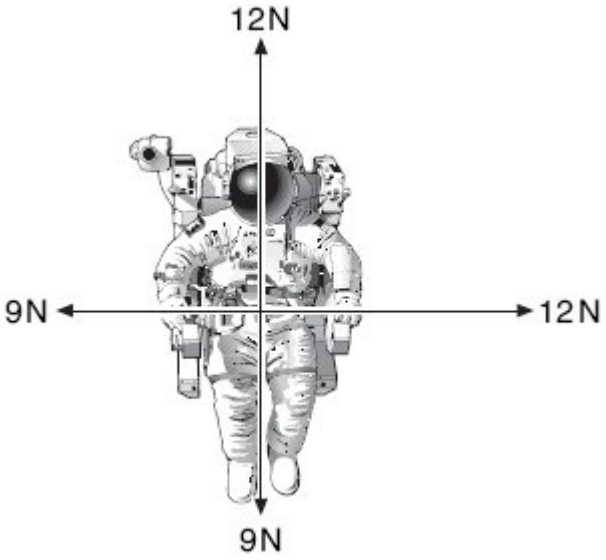
.....

.....

1 mark

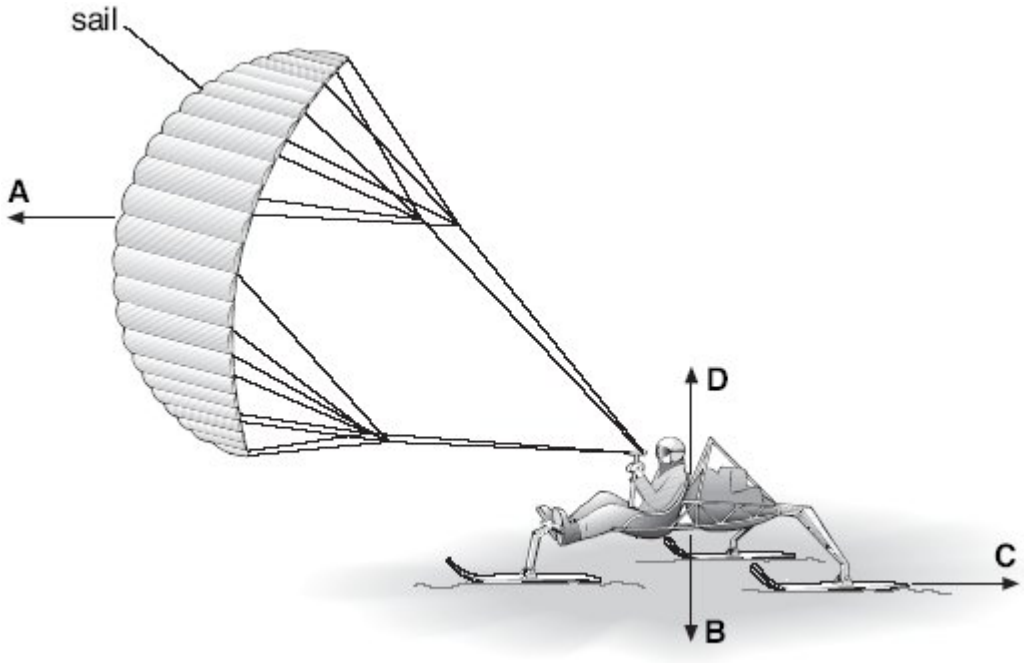
(c) The drawing below shows the size and direction of four different forces acting on the astronaut.

Draw an arrow on the diagram below to show the direction in which he will move.



1 mark
maximum 4 marks

7. The drawing shows a snow-buggy being pulled by a sail.
The buggy rests on three skis on the snow.



(a) The drawing shows four forces that act when the snow-buggy is moving.

Draw a line from each force in the list below to the correct letter from the diagram.
Draw only **three** lines.

force	letter
the weight of the buggy	A
the force pulling the buggy along	B
the friction between the skis and the snow	C
	D

3 marks

(b) A scientist travelled 80 kilometres (km) each day in the buggy.

How many kilometres did he travel in 10 days?

..... km

1 mark

(c) The buggy carried the scientist, food and equipment for the journey.
The table shows how the total mass changed.

	total mass at start of journey (kg)	**total mass at end of journey (kg)**
mass of buggy, scientist, food and equipment	295	130

The buggy sank deeper into the snow at the start of the journey than at the end.

Why did it sink deeper at the start? Use the table to help you.

.....

.....

1 mark

(d) The buggy rests on three skis instead of three wheels.

Why are skis better than wheels for travelling on snow?

.....

.....

1 mark

(e) When a bigger sail is used, the buggy goes faster.

How does a bigger sail help the buggy to go faster?

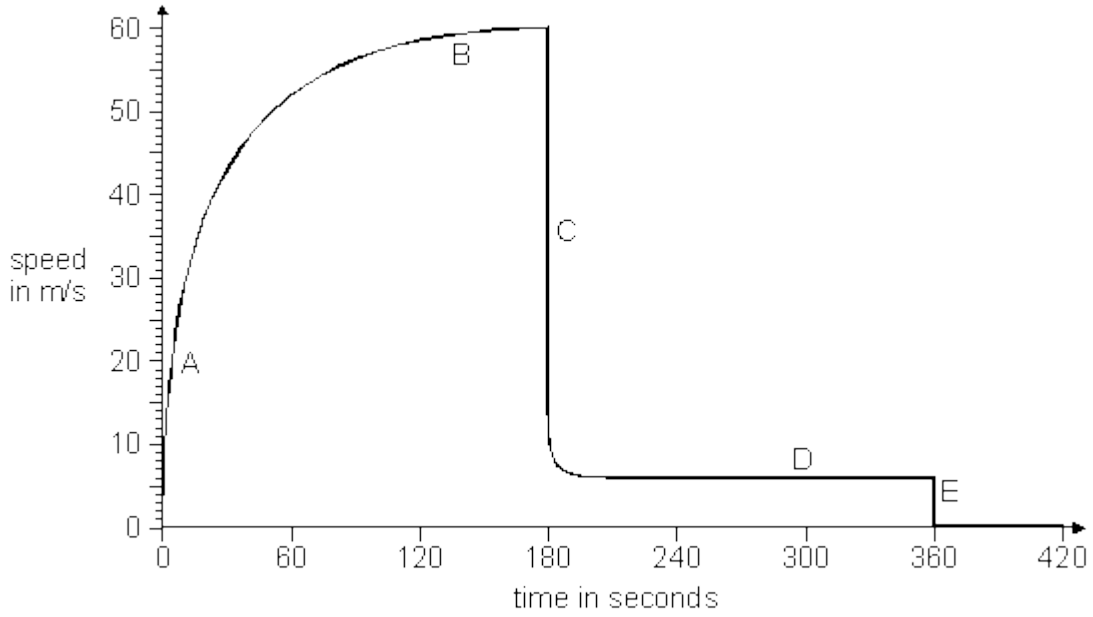
.....

.....

1 mark

maximum 7 marks

8. A sky-diver jumped out of an aeroplane. After falling for some time she opened her parachute. The graph below shows how the speed of the sky-diver changed from the moment she jumped out of the aeroplane until she landed on the ground.



(a) What happened at 180 seconds and at 360 seconds after the sky-diver jumped out of the aeroplane?

1 8 0 s e c o n d s … .

3 6 0 s e c o n d s … ..

2 marks

(b) There was an increase in air resistance on the sky-diver as her speed increased. Explain how the graph shows this.

… … … . … … … … … … … … … … … … … … … … … … …

… … … . … … … … … … … … … … … … … … … … … … …

1 mark

(c) Two sections of the graph show where the air resistance was equal and opposite to the sky-diver's weight. Which sections are they?

Give the letters.

… … … … … … … … a n d … …

1 mark

(d) (i) Use the graph to estimate how far the sky-diver fell between 180 s and 360 s.

… …

… …

1 mark

(ii) Why can this only be an approximate figure?

… …

… …

1 mark

Maximum 6 marks