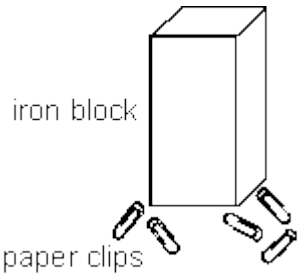
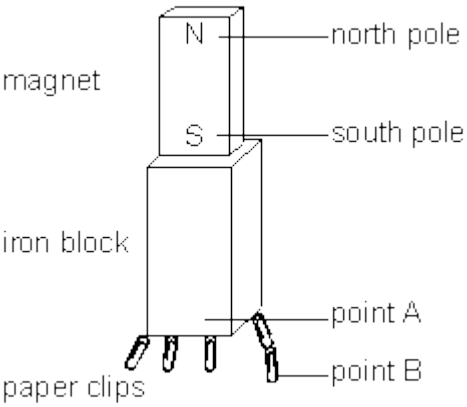
1 An iron block is near some steel paper clips. The paper clips do not stick to the iron block.



A pupil puts a magnet on top of the iron block. The paper clips stick to the iron block and to each other.



(a) What are the magnetic poles at points **A** and **B** in the diagram?
Put **one** tick in each row in the table.

	north pole	south pole	no magnetic pole
point **A**			
point **B**			

2 marks

(b) (i) The sentences below are about the force which the magnet exerts on the iron block.

Tick the box by the **one** correct sentence.

The magnet attracts the iron block. ☐

The magnet repels the iron block. ☐

There is no magnetic force on the iron block. ☐

1 mark

(ii) The sentences below are about the force which the magnetised iron block exerts on the magnet.

Tick the box by the **one** correct sentence.

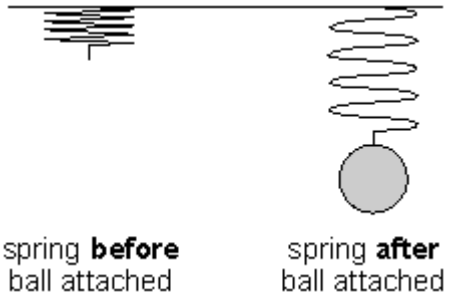
The iron block attracts the magnet. ☐

The iron block repels the magnet. ☐

There is no magnetic force on the magnet. ☐

1 mark
Maximum 4 marks

2 (a) John attaches a ball to a spring. The diagram below shows what happens.



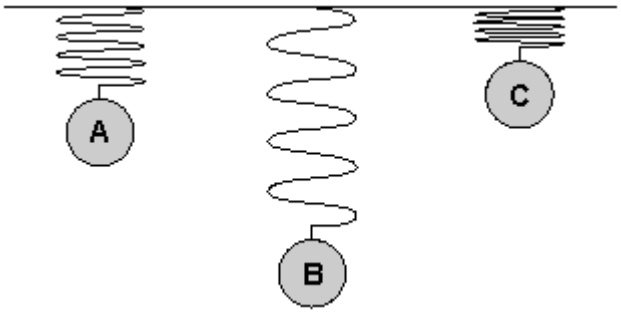
(i) Which arrow shows the direction of the **force of the ball on the spring**?
Tick the correct box.

1 mark

(ii) Which arrow shows the direction of the **force of the spring on the ball**?
Tick the correct box.

1 mark

(b) The diagram below shows three metal balls attached to **identical** springs.



Which ball is the heaviest?
Write the letter.

.....

1 mark

Explain your answer.

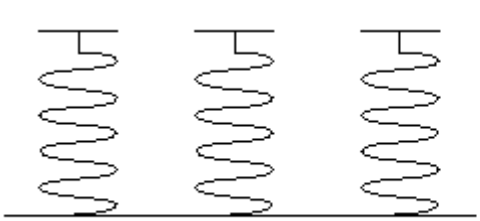
.....

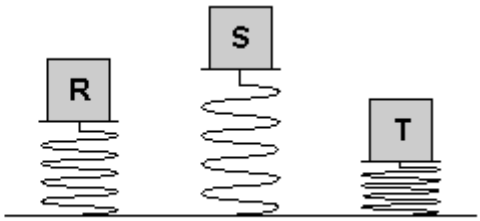
.....

1 mark

(c) John has another three **identical** springs.
He puts a cube on each spring. Each cube has a different mass.

The diagrams below show the springs before and after John added the cubes.


springs **before** adding the cubes



springs **after** adding the cubes

Which cube is the heaviest?
Write the letter.

.....

1 mark

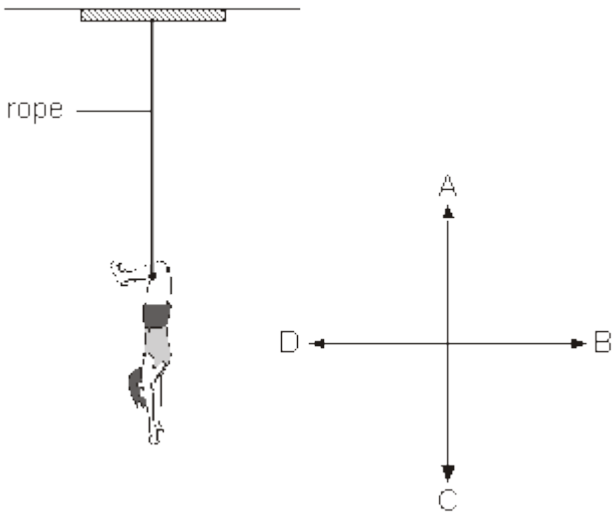
Explain your answer.

.....

.....

1 mark
maximum 6 marks

3 The diagram below shows Jo hanging on a trapeze (swing) in a circus.



(a) (i) Which arrow, A, B, C or D, shows the direction of Jo's weight?

.....

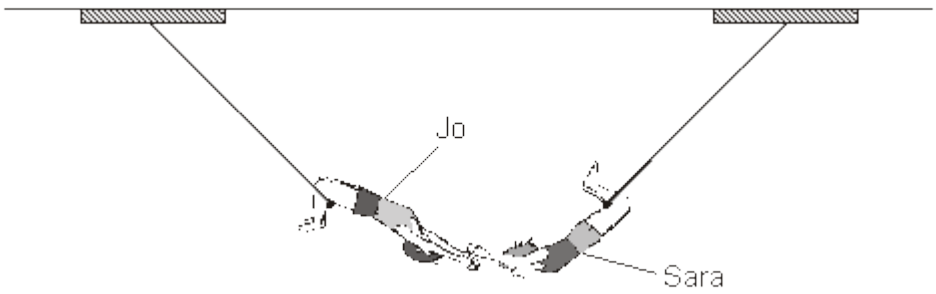
1 mark

(ii) Which arrow, A, B, C or D, shows the direction of the force of the rope on Jo?

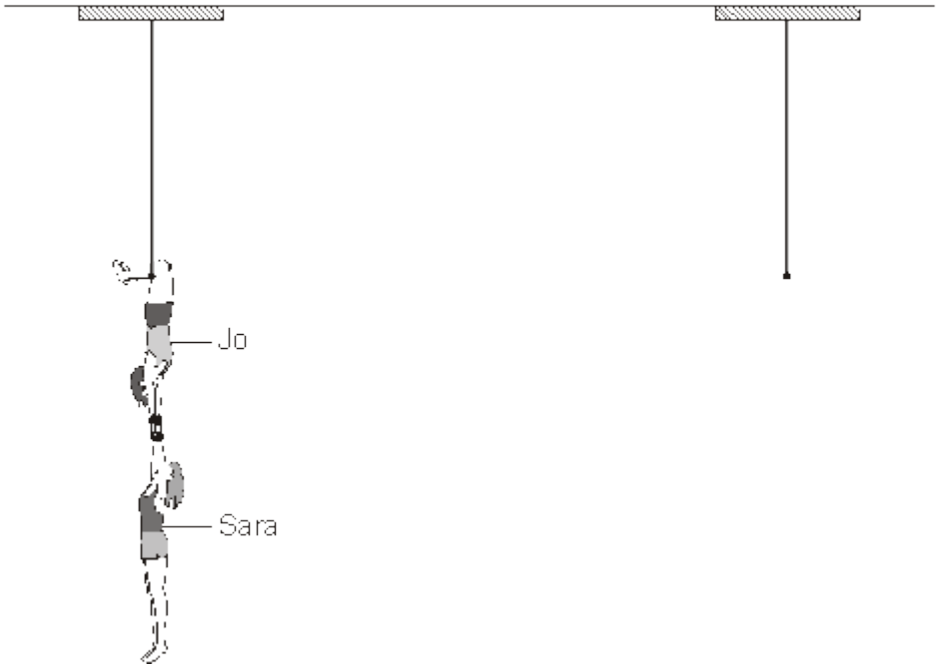
.....

1 mark

(b) Sara swings towards Jo.



Sara lets go of her trapeze and Jo catches her.



(i) What happens to the downward force on the rope of Jo's trapeze?
Tick the correct box.

increases	decreases	stays the same	there is **no** force
☐	☐	☐	☐

1 mark

(ii) Explain your answer.

.....

1 mark

(c) Jo lets go of the trapeze and both Sara and Jo fall into a safety net below them.

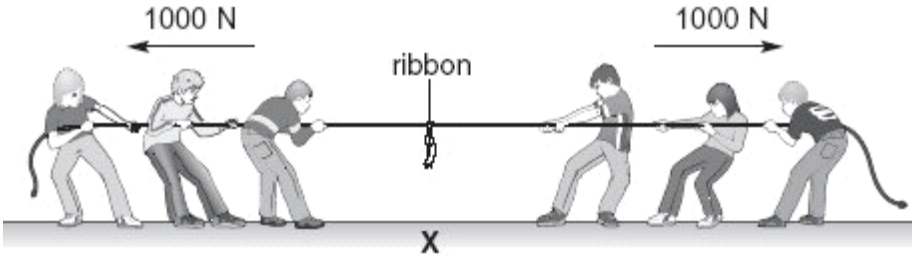
What happens to the downward force on the rope when Jo lets go?

.....

1 mark
maximum 5 marks

4 The drawings in parts (a), (b) and (c) show two teams of pupils in a tug-of-war. There is a ribbon tied to the middle of the rope.

(a) The sizes and directions of the forces of each team are shown.



team A **team B**

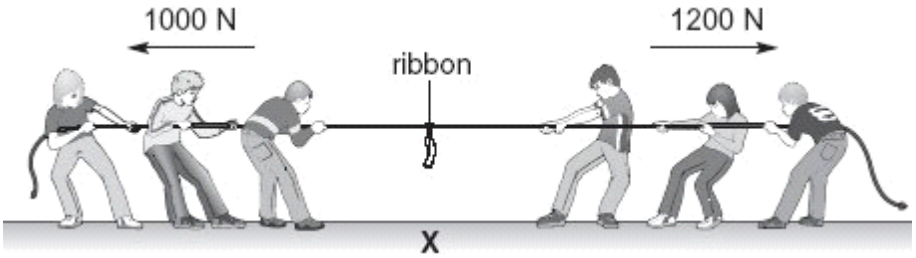
The ribbon stays above point X on the ground.
Give the reason for this.

.....

.....

1 mark

(b) The teams then pull with the forces shown below.

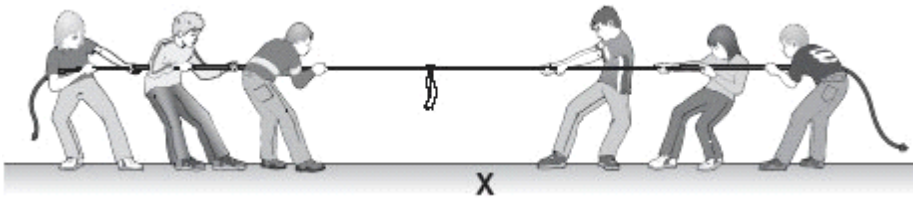


team A **team B**

Draw an arrow on the rope to show the direction in which the ribbon will move.

1 mark

(c) Later, the ribbon was to the left of point X as shown below.



team A **team B**

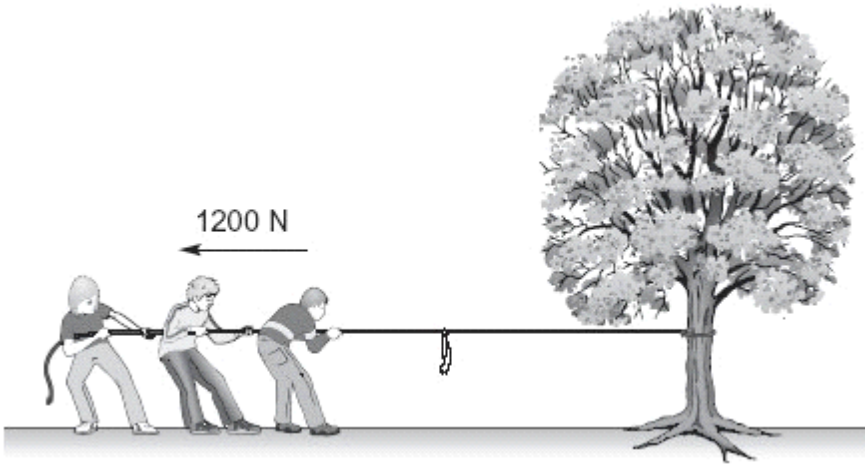
Why did the ribbon move towards the left?

.....

.....

1 mark

(d) Team A practises by pulling a rope tied to a tree.



The team pulls with a force of 1200 N but the tree does **not** move.

What is the force of the tree on the rope?
Tick the correct box.

zero	☐	less than 1200 N	☐	1200 N	☐	more than 1200 N	☐

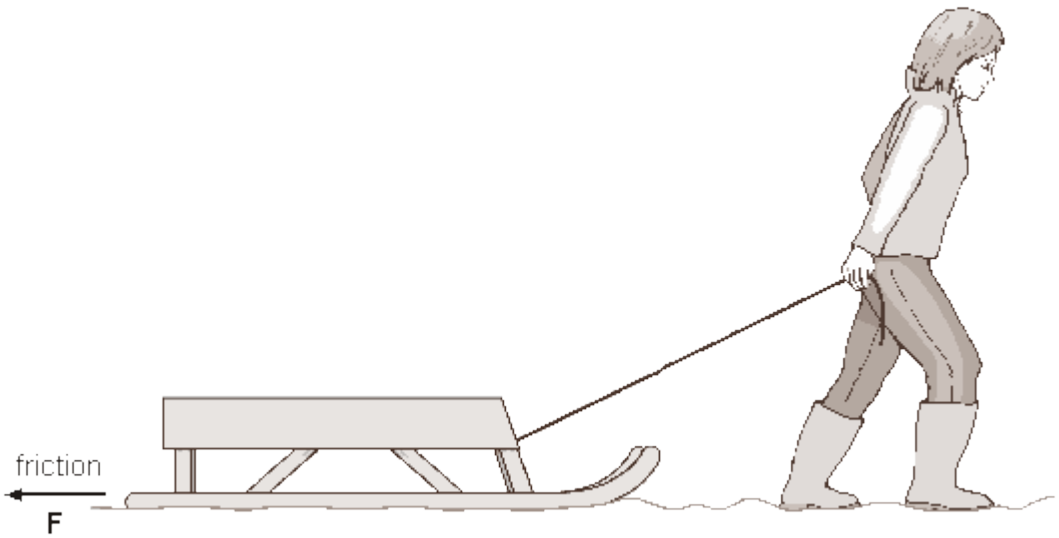
1 mark

(e) The pupils do **not** slip because there is a force between their shoes and the ground. What is the name of this force?

.....

1 mark
maximum 5 marks

5 Sally pulls a sledge in the snow.



(a) (i) Draw an arrow on the rope to show the direction of the force of the rope on the sledge.

Label the arrow **R**.

(ii) Draw an arrow on the diagram to show the direction of the force of gravity on the sledge.

Label the arrow **G**.

2 marks

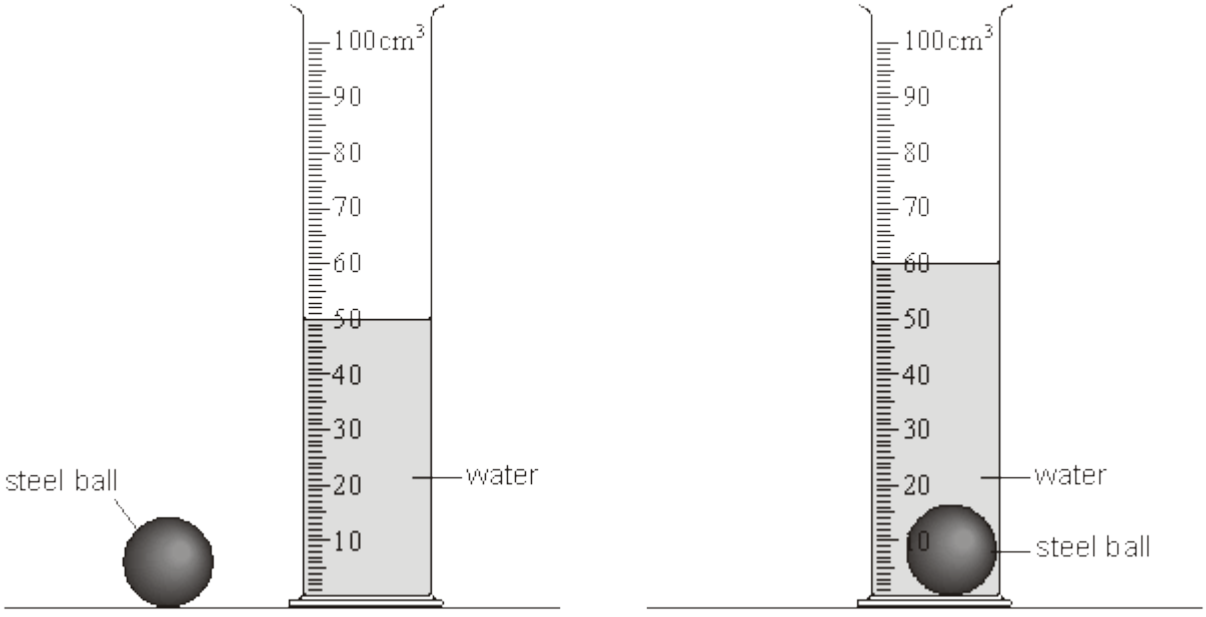
(b) Force **F** is the friction between the sledge and the snow.
Sally then pulled the sledge over a concrete path.

Friction is less on snow than on concrete.
Give the reason for this.

.....

1 mark
maximum 3 marks

6 (a) Gary poured 50 cm^3 of water into a measuring cylinder.
He then put a steel ball into the measuring cylinder.



(i) What is the new reading on the measuring cylinder?

..... cm^3

1 mark

(ii) What is the volume of the steel ball?

..... cm^3

1 mark

(b) The table below shows the mass and volume of four objects.

object	mass (g)	volume (cm^3)
aluminium figure	230	85
lead weight	800	70
steel block	200	25
wood puzzle	400	500

(i) Which object is the heaviest? .....

1 mark

(ii) Which object takes up the most space? .....

1 mark

(c) The frame of a bike is made of aluminium.

(i) Give **one** reason why aluminium is a suitable material for the frame.

.....

.....

1 mark

(ii) A force between the tyres and the road stops the bike skidding.

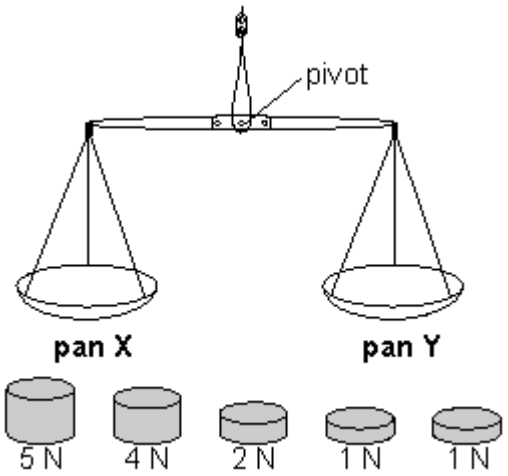
What is the name of this force?

.....

1 mark

maximum 6 marks

7 Ellie has a set of scales and some weights as shown below.



Ellie puts two weights in pan X and one weight in pan Y. The scales balance.

(a) Which weights could be in pans X and Y?

pan X: ..... and .....

pan Y: .....

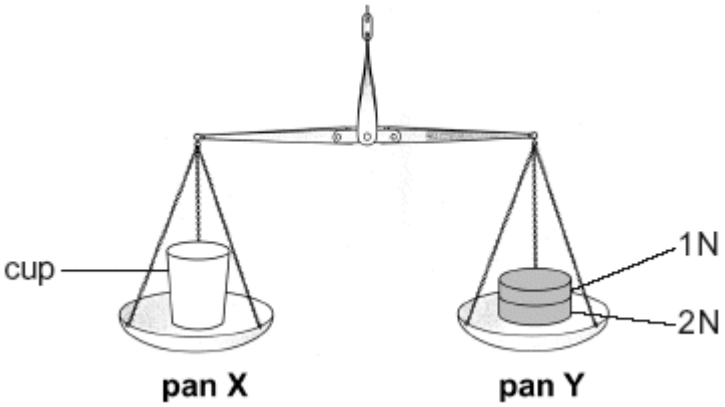
1 mark

(b) Ellie removes all the weights from the scales.
She then puts a cup on pan X.
In which direction will pan Y move?

.....

1 mark

(c) She puts weights into pan Y so the scales balance.

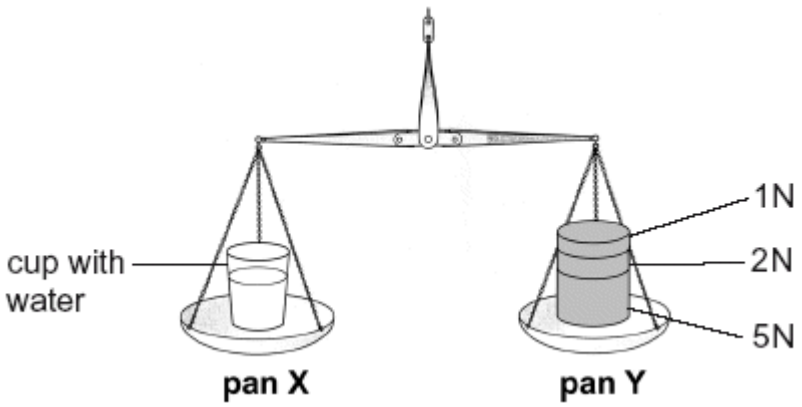


How much does the cup weigh?

..... N

1 mark

(d) Ellie puts some water in the cup.
She then adds some more weights to pan Y to make the scales balance.



(i) How much do the cup **and** water weigh?

..... N

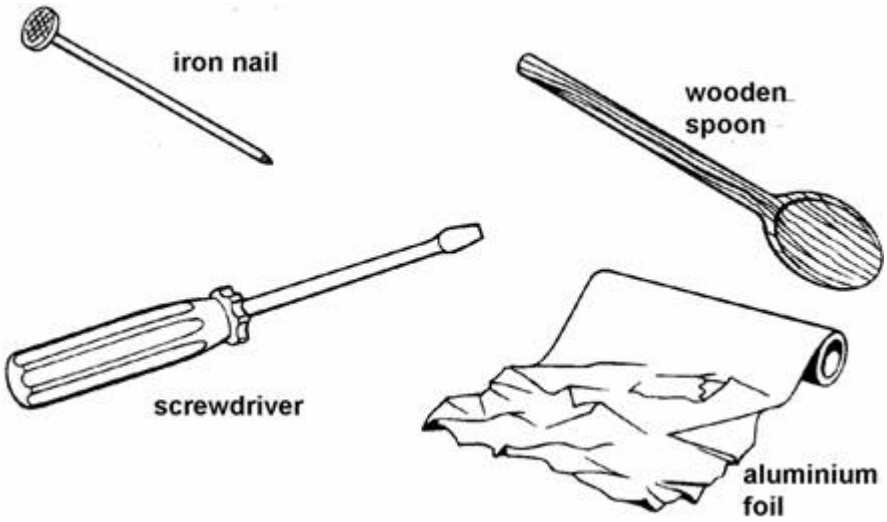
1 mark

(ii) How much does the water weigh?

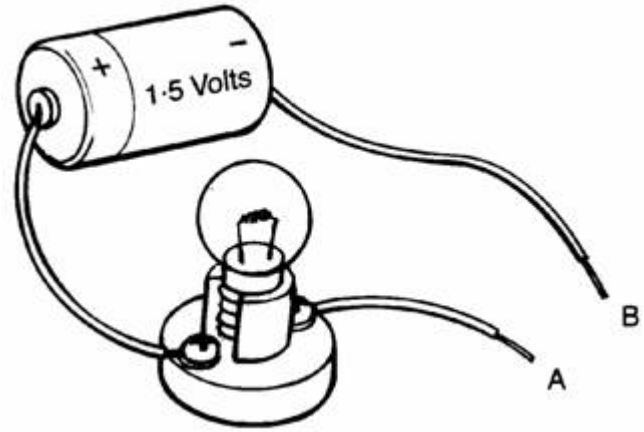
..... N

1 mark
maximum 5 marks

8 The drawings show four objects.



John tests each of the objects with the apparatus shown below.
He puts both of the wires A and B on each object to see if the bulb lights.

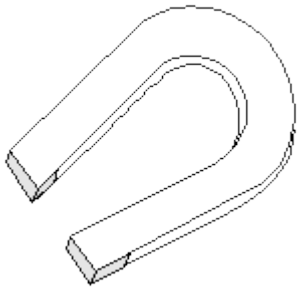


(a) Fill in the results table. Two have been done for you.

object tested	did the bulb light?
plastic screwdriver handle	no
steel screwdriver blade	yes
wooden spoon	
iron nail	
aluminium foil	

3 marks

John then tests the same objects with a magnet to see if it attracts them.

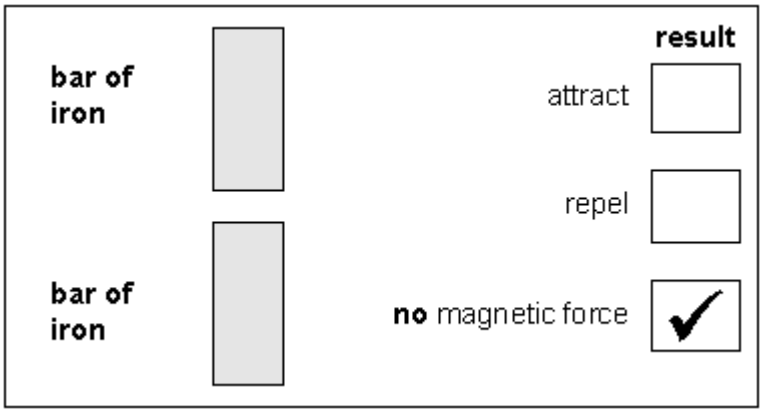


(b) Fill in the results table. Two have been done for you.

object tested	did the magnet attract the object?
plastic screwdriver handle	no
steel screwdriver blade	yes
wooden spoon	
iron nail	
aluminium foil	

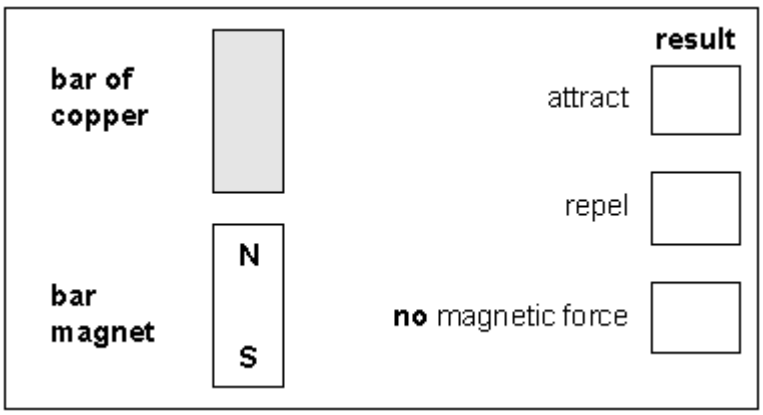
3 marks
Maximum 6 marks

9 David put two bars of iron close to each other.
There was **no** magnetic force between them.
David recorded the result as shown below.



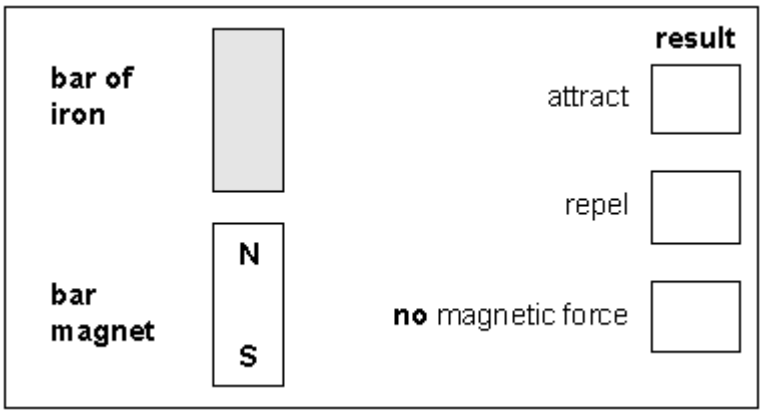
(a) David did three other tests.
Tick the correct box to show the result for each test.

(i)



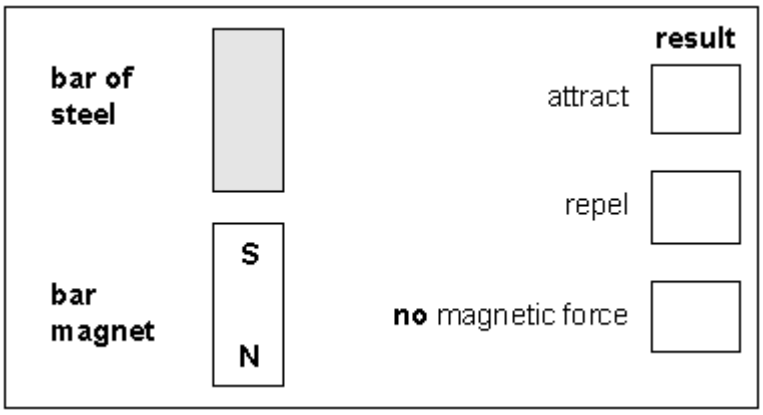
1 mark

(ii)



1 mark

(iii)



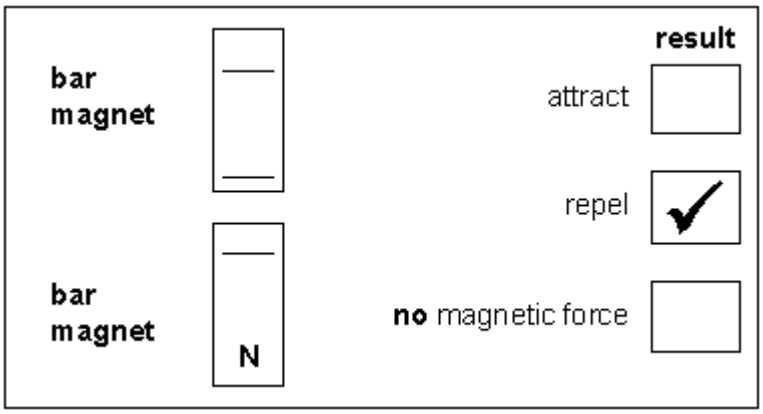
1 mark

(b) David then did two experiments with magnets.

The tick in each box shows David's results in each experiment.

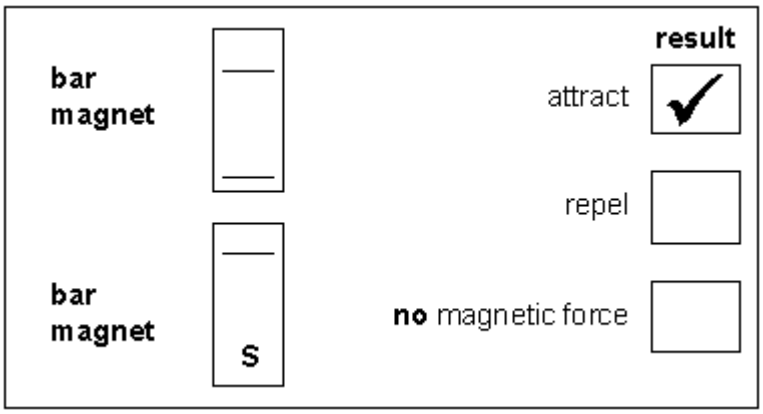
Label the missing poles on **each** magnet to match David's results.

(i)



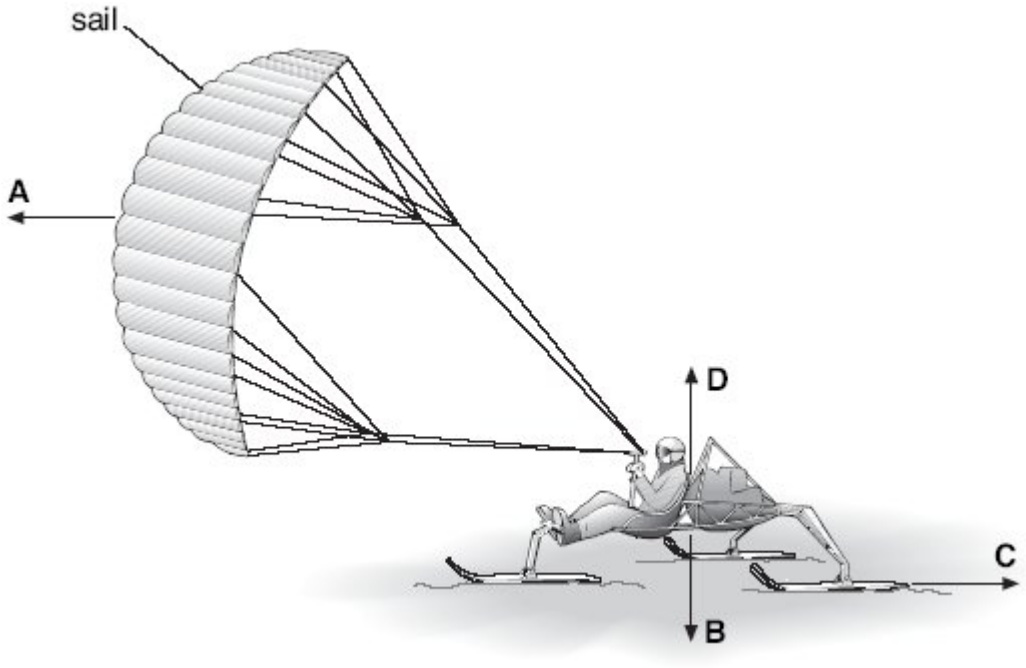
1 mark

(ii)



1 mark
maximum 5 marks

10 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?

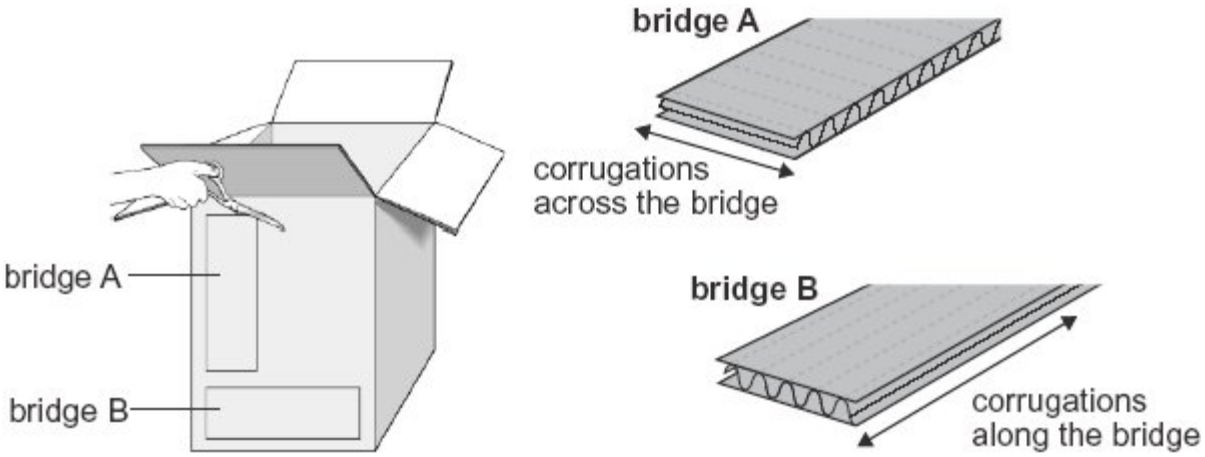
.....

.....

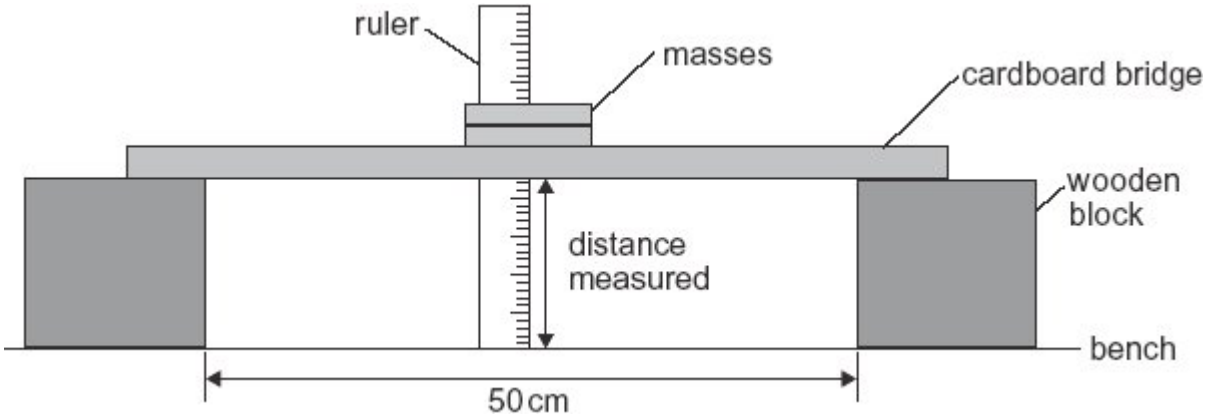
1 mark

maximum 7 marks

11 Joe makes two bridges from strips of cardboard cut as shown.



Joe tests the bridges by adding masses to them. He measures the distance from the bench to the bottom of each bridge for different masses as shown.



(a) Suggest **two** things Joe must do to make his test fair.

1. .....

1 mark

2. .....

1 mark

Here are Joe's results.

mass added to bridge (g)	distance from bench to bottom of bridge (cm)	
	bridge A	bridge B
0	7.2	7.2
100	7.1	7.0
200	7.0	6.5
250	6.8	6.1
300	3.0	5.6
350	0.0	5.0

(b) (i) Joe put 325g on each bridge.
Using the results table, estimate the distance from each bridge to the bench.

bridge A ..... cm bridge B ..... cm

1 mark

(ii) Suggest what happened to **bridge A** when it was loaded with 350g.

.....

1 mark

(c) (i) Which bridge would be better for carrying a **200g** toy car?
Tick the correct box.

bridge A ☐ bridge B ☐

Explain your answer.

.....

.....

1 mark

(ii) Which bridge would be better for carrying a **300g** toy car?
Tick the correct box.

bridge A ☐ bridge B ☐

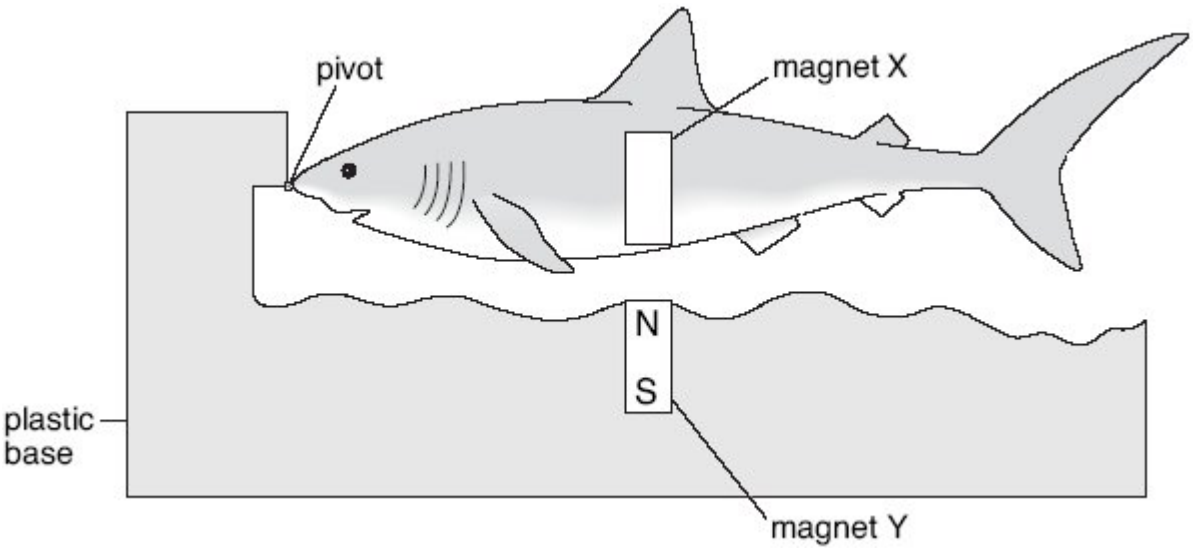
Explain your answer.

.....

.....

1 mark
maximum 6 marks

12 The drawing shows a toy shark. Magnets X and Y make the shark 'float' above the plastic base.



(a) On magnet X, write the letters N and S to label the poles of the magnet.

1 mark

(b) (i) Choose a word from the list below to complete the sentence.

attract **cancel** **repel**

The toy shark 'floats' because the magnets ..... each other.

1 mark

(ii) Sophie pressed down on the tail of the shark with her finger.

What happened to the shark when she removed her finger?

.....

1 mark

(c) Sophie added weights to the toy shark and measured the distance between the two magnets.
Her results are shown below.

weight added to the toy shark (N)	distance between the magnets (mm)
0.1	6
0.2	4
0.3	3

Complete the sentence below.

As the weight on the toy shark increased, the distance between the magnets

.....

1 mark

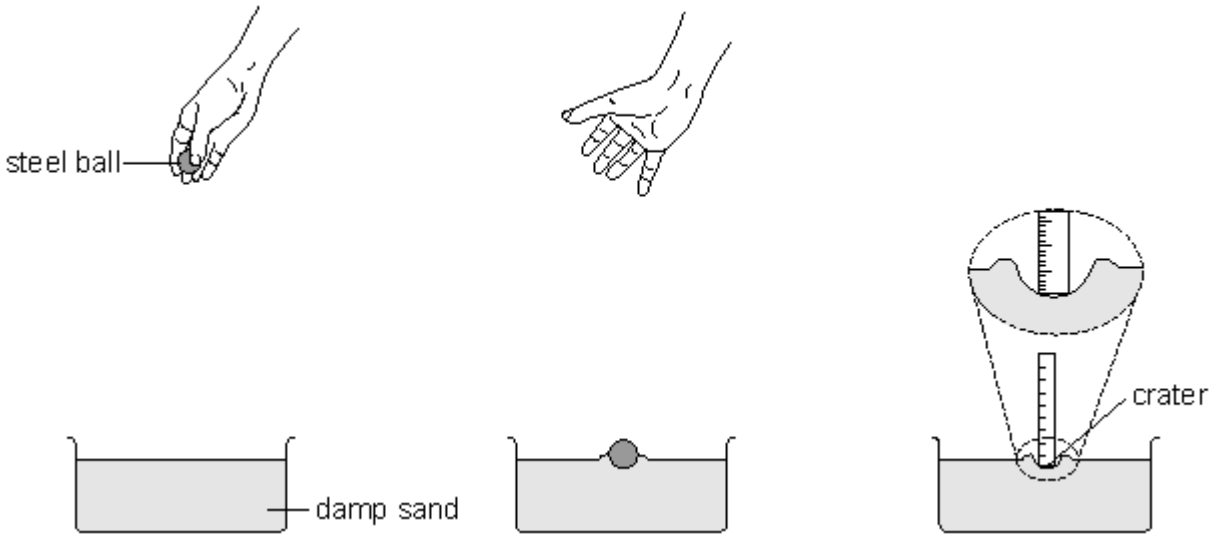
(d) Sophie turned the magnet in the plastic base the other way up.

What happened to the shark?

.....

1 mark
maximum 5 marks

13 Jack and Aneesa dropped a steel ball into trays of damp sand.
They measured the depth of the craters made by the steel ball.



not to scale

Their results are shown in the table below.

height the ball was dropped from (cm)	depth of crater (cm)		
	Jack's results		Aneesa's results
10	1.1	1.2	0.8
20	1.4	1.5	1.4
30	1.6	1.6	1.5
40	1.8	1.7	1.8
50	2.0	2.1	2.1

(a) Use information in the table to answer the questions below.

(i) What was the independent variable that Jack and Aneesa changed in their investigation?

.....

1 mark

(ii) Why was Jack's investigation better than Aneesa's?

.....

1 mark

(b) Look at the results in the table.
What is the relationship between the height the ball was dropped from and the depth of the crater?

.....

.....

1 mark

(c) Aneesa said that they made sure the investigation was fair.

Suggest **two** variables they must have kept the same to make their investigation fair.

1 .....

2 .....

2 marks

(d) (i) Jack removed the steel ball using his fingers. Then he measured the depth of the crater.
Aneesa said he should use a magnet instead of his fingers.

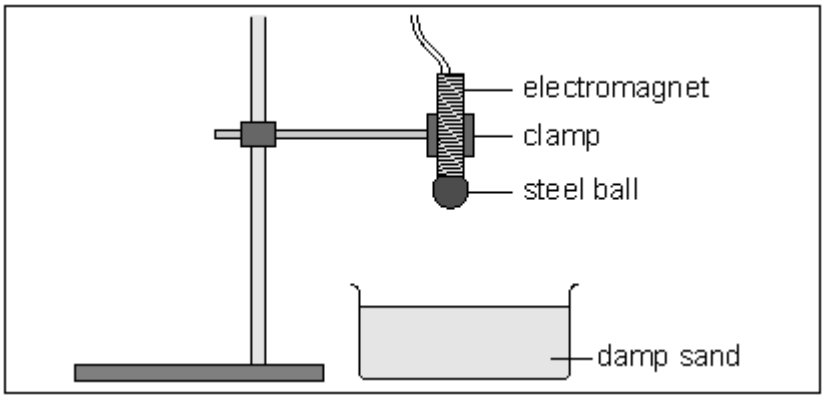
Explain why using a magnet to remove the ball would improve the investigation.

.....

.....

1 mark

(ii) Jack said that the ball could be dropped using an electromagnet instead of dropping it by hand.



Explain why this would improve the investigation.

.....

.....

1 mark
maximum 7 marks

14 (a) Megan was doing time-trials on her bike around a 400 metre horizontal track.

(i) She took 32 seconds to travel 400 m.
What was her average speed? Give the unit.

.....

.....

1 mark

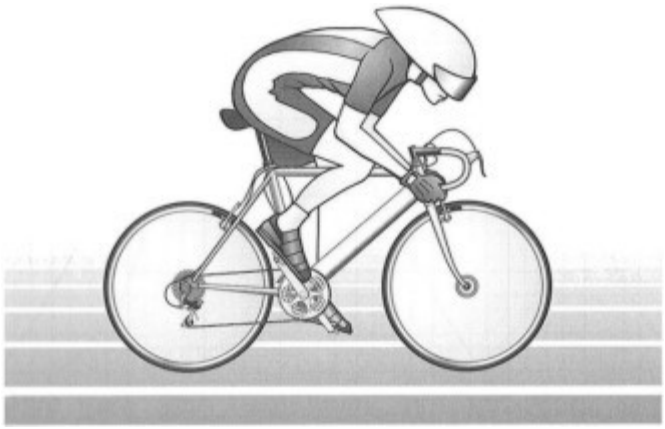
(ii) Compare the forward force on the bike with the backward force on the bike when Megan was travelling at a constant speed.

.....

.....

1 mark

(b) Megan then crouched down over the handlebars to make herself more streamlined, as shown below.
She continued to pedal with the same force as before.



Compare the forward and backward forces on Megan and her bike now.

.....

.....

1 mark

Explain your answer.

.....

.....

1 mark
maximum 4 marks

15 (a) Debbie put a paper cup into a glass beaker.
She glued a magnet in the bottom of the paper cup.
She glued another magnet in the bottom of the beaker.
The magnets repelled.

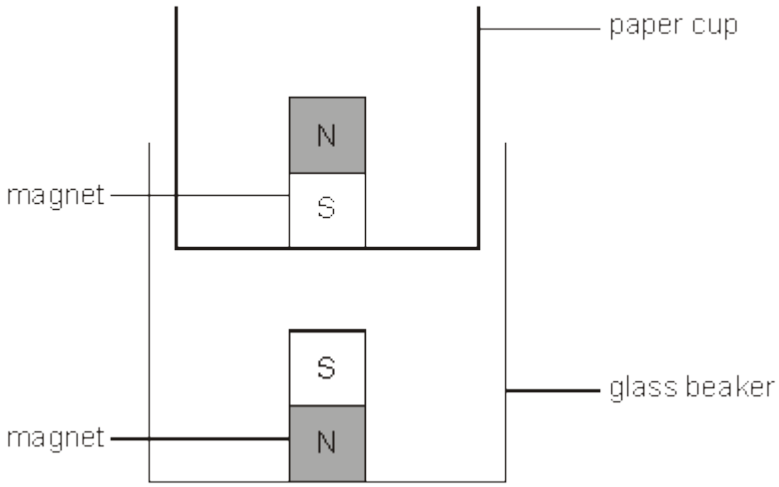


diagram A

not to scale

What **two** forces act on the paper cup and its contents to keep it in this position?

1. .....

1 mark

2. .....

1 mark

(b) Debbie put 5 g of aluminium rivets into the paper cup.
It moved down a little as shown in diagram B.

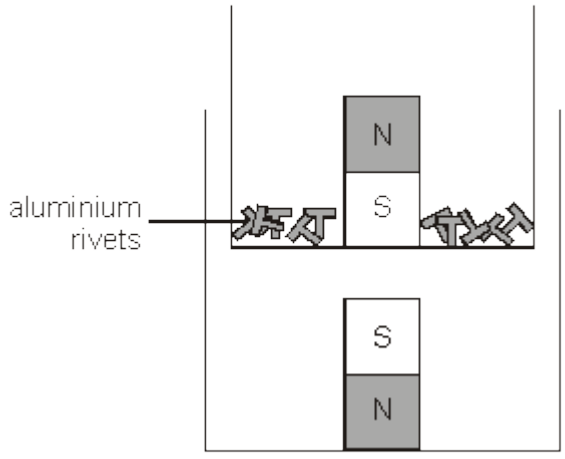
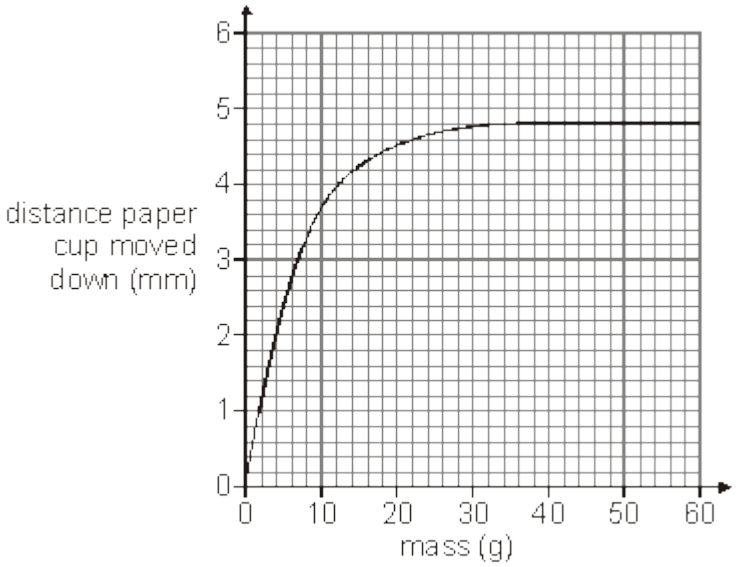


diagram B

not to scale

Debbie plotted a graph to show how the mass of aluminium rivets affected the distance the cup moved down.



(i) Use the graph to find the mass that made the cup move down 4 mm.

..... g

1 mark

(ii) Why did the graph stay flat with masses greater than 40 g?

.....

1 mark

(c) Debbie removed the 5 g of aluminium rivets and put 5 g of iron nails into the cup.

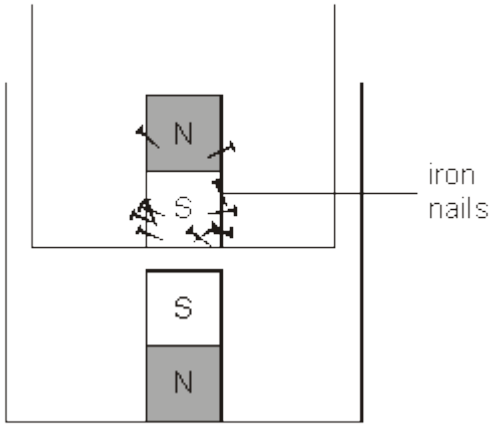


diagram C

not to scale

The paper cup moved down more with 5 g of iron nails than with 5 g of aluminium rivets as shown in diagram C.
Give the reason for this.

.....

.....

1 mark
maximum 5 marks