

Sc

KEY STAGE  
3

TIER  
5–7

2003

# Science test

## Paper 1

Please read this page, but do not open the booklet until your teacher tells you to start. Write your name and the name of your school in the spaces below.

First name \_\_\_\_\_

Last name \_\_\_\_\_

School \_\_\_\_\_

### Remember

- The test is 1 hour long.
- You will need: pen, pencil, rubber, ruler, protractor and calculator.
- The test starts with easier questions.
- Try to answer all of the questions.
- Write all your answers on the test paper – do not use any rough paper.
- Check your work carefully.
- Ask your teacher if you are not sure what to do.

For marker's  
use only

Total marks

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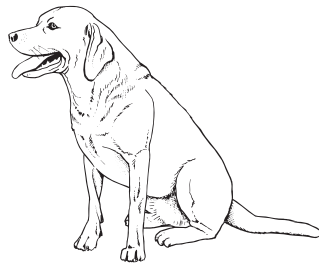
1. The drawings show a human, a chaffinch, a dog and a whale.



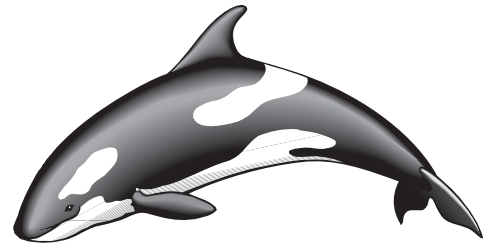
human



chaffinch



dog



whale

*not to scale*

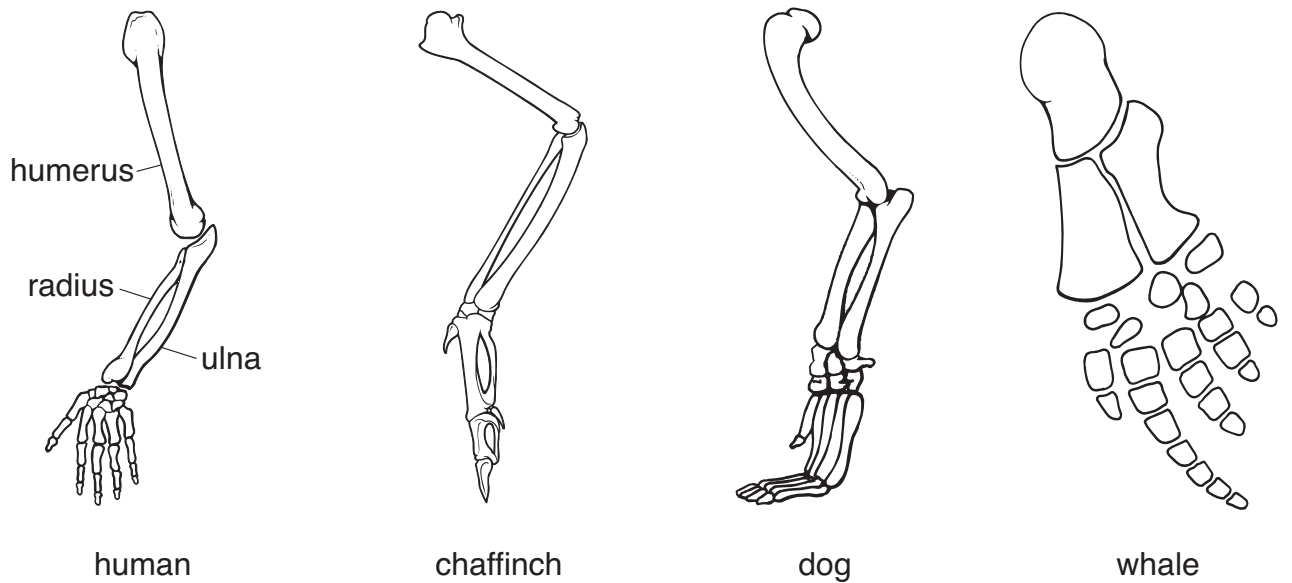
One of these animals is a bird. The other three are mammals.

(a) Which group do all four animals belong to?

*1 mark*

\_\_\_\_\_

- (b) The drawings below show the bones of the front limbs of the four animals. Some of the bones of the human limb are labelled.



*not to scale*

On the drawings, label:

- (i) the ulna of the chaffinch;
- (ii) the radius of the dog;
- (iii) the humerus of the whale.

*1 mark*

*1 mark*

*1 mark*

- (c) Describe how the shape of the front limb of the whale is adapted for moving in water.

*1 mark*

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- (d) The bones of birds are hollow. How does this help birds to fly?

*1 mark*

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*maximum 6 marks*



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2. (a) When tobacco is burned in cigarettes, carbon monoxide is formed. A device called a 'Smokerlyzer' measures the percentage of carbon monoxide in a person's breath. This indicates the percentage of carbon monoxide in the person's blood.

Four people tested their breath using a 'Smokerlyzer' as shown below. They repeated the test every two hours during one day at work.



The results are shown in the table.

name	percentage of carbon monoxide in the blood			
	9 am	11 am	1 pm	3 pm
<b>Amy</b>	3.6	2.9	3.4	2.8
<b>Don</b>	1.8	1.3	1.2	1.2
<b>Kisham</b>	6.3	5.0	4.3	3.8
<b>Pat</b>	0.5	0.3	0.3	0.3

- 
- (i) Look at the table opposite.  
Which **two** people are most likely to have smoked tobacco before 9 am?

1 mark

\_\_\_\_\_ and \_\_\_\_\_

- (ii) Don says he is a **non**-smoker. Suggest **one** other way carbon monoxide could have got into Don's blood before he came to work that day.

1 mark

\_\_\_\_\_  
\_\_\_\_\_

- (b) Red blood cells transport oxygen from the lungs to the muscles.  
If the air we breathe in contains carbon monoxide, the red blood cells will take up carbon monoxide instead of oxygen.

Use this information to explain why, when they are running, many smokers become out of breath sooner than **non**-smokers do.

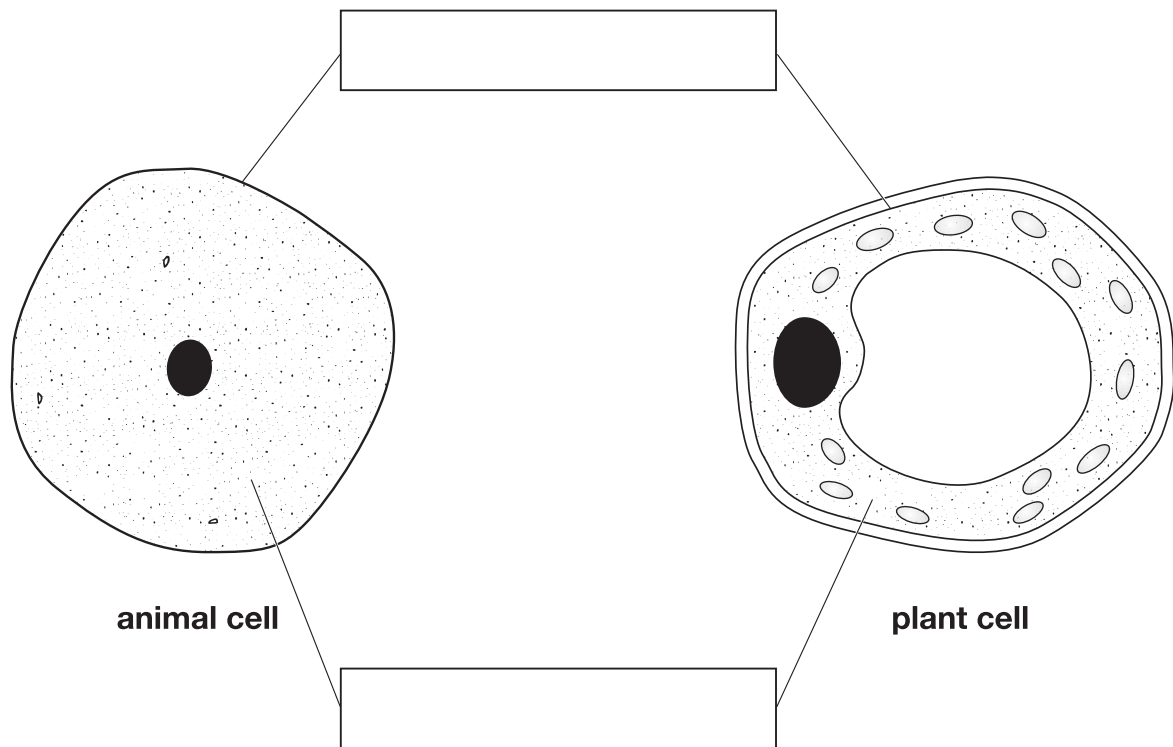
2 marks

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

maximum 4 marks



3. (a) The diagrams below show an animal cell and a plant cell.



- (i) The lines from the boxes show the positions of two of the parts that are present in both cells. In the boxes, write the names of these **two** parts.

2 marks

- (ii) Give the names of **two** parts that are present in plant cells but **not** in animal cells.

2 marks

1. \_\_\_\_\_

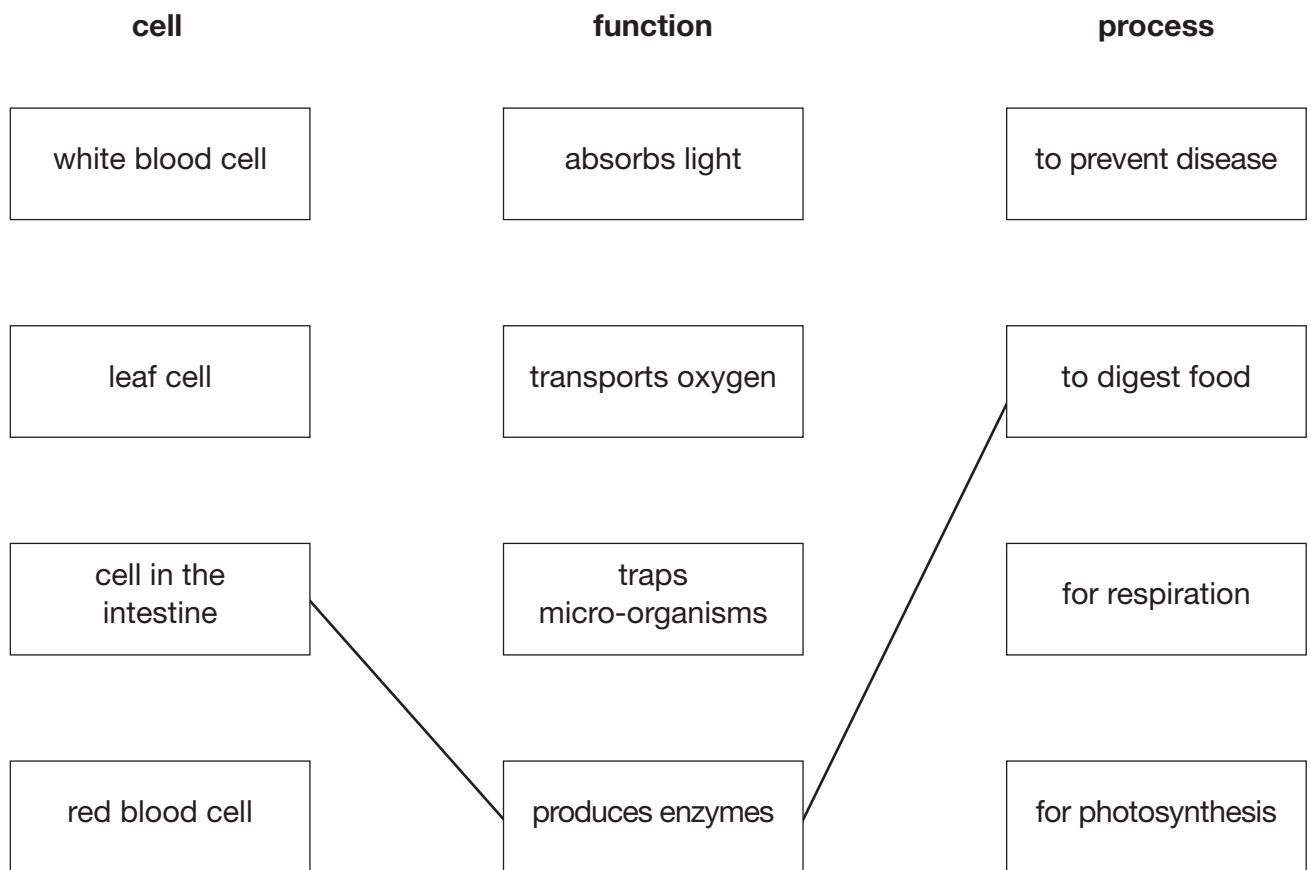
2. \_\_\_\_\_

(b) Organs can carry out their functions because of the special cells they have.

Draw a straight line from the name of each type of cell to the function of the cell and then to the process it carries out.

One has been done for you.

3 marks



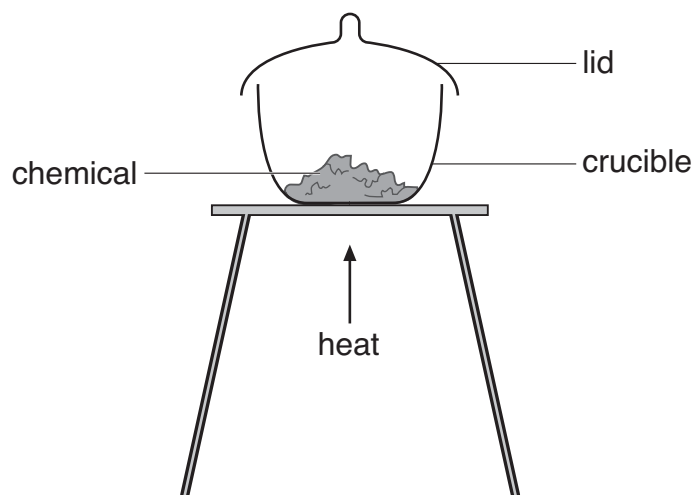
maximum 7 marks

4. Shuli investigated differences between physical and chemical changes.

She put three chemicals in separate crucibles and weighed each one.

She heated each crucible as shown below.

She weighed each crucible again when it had cooled down.



She recorded her observations in a table as shown below.

experiment	name of chemical	observations	change in mass
A	magnesium (a silvery solid)	The silvery magnesium burned brightly in air. A white powder was formed.	increase
B	potassium permanganate (purple crystals)	The purple crystals crackled and turned black. A colourless gas was given off.	decrease
C	zinc oxide (a white powder)	The white powder turned pale yellow on heating. It turned white again on cooling.	no change



- (a) (i) In experiment A, magnesium reacts with a gas in the air.

Complete the word equation for the reaction in experiment A.

magnesium + \_\_\_\_\_ → \_\_\_\_\_

2 marks

- (ii) Explain the increase in mass in experiment A. Use your word equation to help you.

1 mark

\_\_\_\_\_

\_\_\_\_\_

- (b) The gas given off in experiment B re-lit a glowing splint.  
Give the name of this gas.

1 mark

\_\_\_\_\_

- (c) Name the white powder left at the end of experiment C.

1 mark

\_\_\_\_\_

- (d) In each experiment, did a chemical change or a physical change take place?

Tick **one** box for each experiment.

experiment	chemical change	physical change
A		
B		
C		

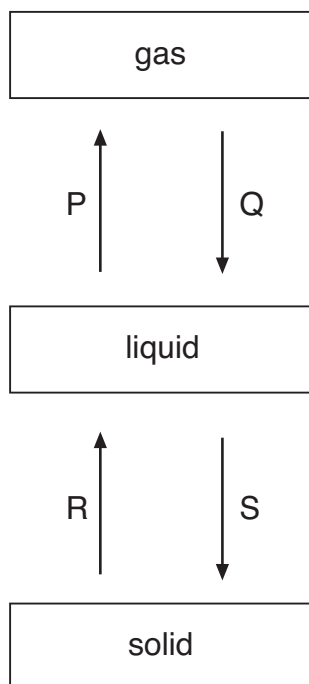
1 mark

maximum 6 marks

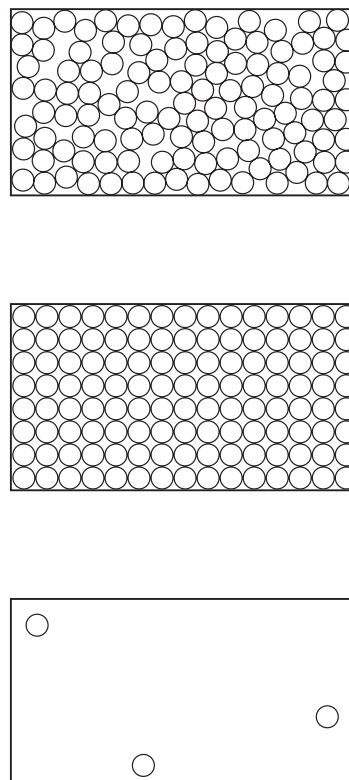
5. (a) Methane can be a gas, a liquid or a solid. In the diagram below, arrows P, Q, R and S represent changes of state.

The boxes on the right show the arrangement of particles of methane in the three different physical states.  
Each circle represents a particle of methane.

**physical state of methane**



**arrangement of particles**



- (i) Draw a line from each physical state of methane to the arrangement of particles in that physical state.  
Draw only **three** lines.

1 mark

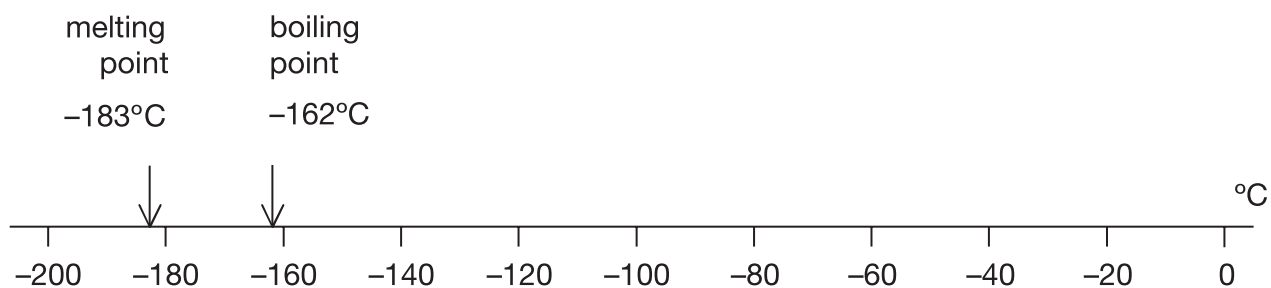
- (ii) Arrows P, Q, R and S represent changes of state.  
Which arrow represents:

2 marks

evaporation? \_\_\_\_\_

melting? \_\_\_\_\_

- (b) Methane is the main compound in natural gas. The scale below shows the melting point and the boiling point of methane.



Methane has three physical states: solid, liquid and gas.

- (i) What is the physical state of methane at  $-170^{\circ}\text{C}$ ?

1 mark

\_\_\_\_\_

- (ii) The formula of methane is  $\text{CH}_4$ . The symbols for the two elements in methane are C and H.

Give the names of these **two** elements.

2 marks

element C \_\_\_\_\_

element H \_\_\_\_\_

- (iii) When methane burns, it reacts with oxygen. One of the products is water,  $\text{H}_2\text{O}$ .

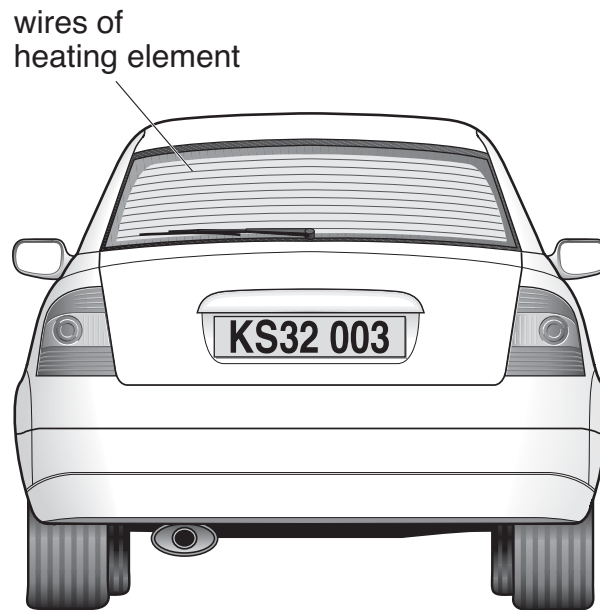
Give the name of the other product.

1 mark

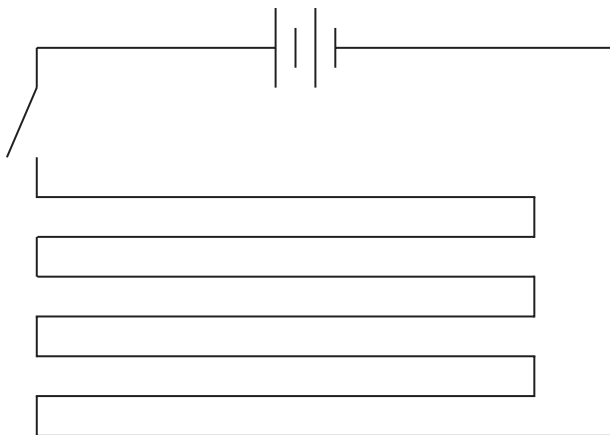
\_\_\_\_\_

maximum 7 marks

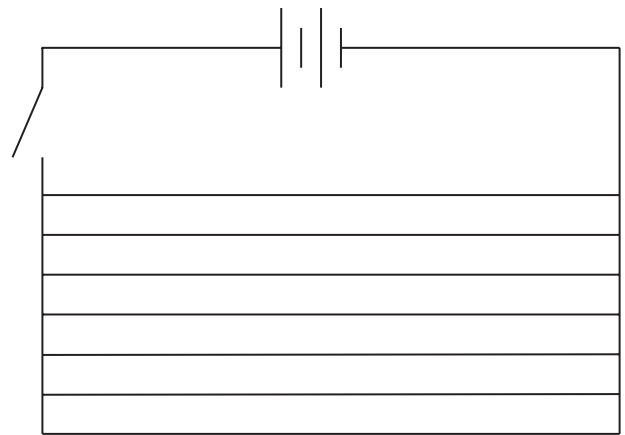
6. The back window of this car contains a heating element.  
The heating element is part of an electrical circuit connected to the battery of the car.



The diagrams below show **two** ways of connecting the circuit of a heating element.



**circuit A**



**circuit B**

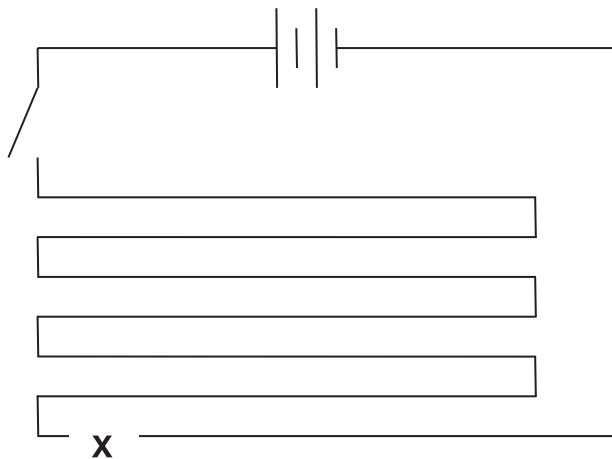
- (a) Give the name of each type of circuit:

circuit A \_\_\_\_\_

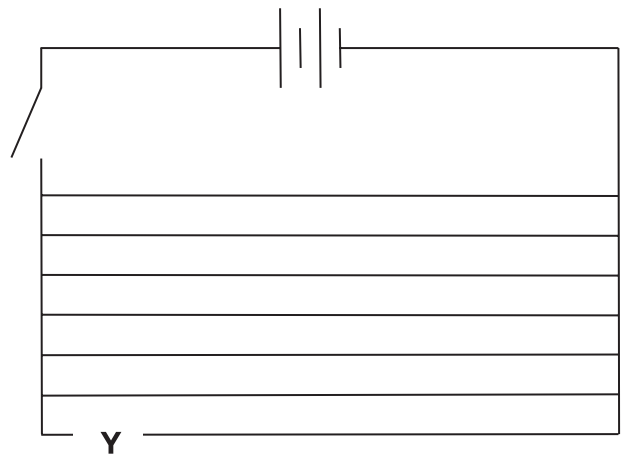
circuit B \_\_\_\_\_

*1 mark*

(b) A wire gets broken at point X on circuit A and at point Y on circuit B.



**circuit A**



**circuit B**

When the switch is closed, how does the broken wire affect the heating element in:

(i) circuit A? \_\_\_\_\_ 1 mark

\_\_\_\_\_

(ii) circuit B? \_\_\_\_\_ 1 mark

\_\_\_\_\_

(c) In very cold weather, ice may form on the back window of the car. When the heating element is switched on, the ice will disappear and the surface of the window will become clear and dry.

(i) Fill the gap below to show the energy transfer that takes place. 1 mark  
 When the heater is switched on, \_\_\_\_\_ energy is

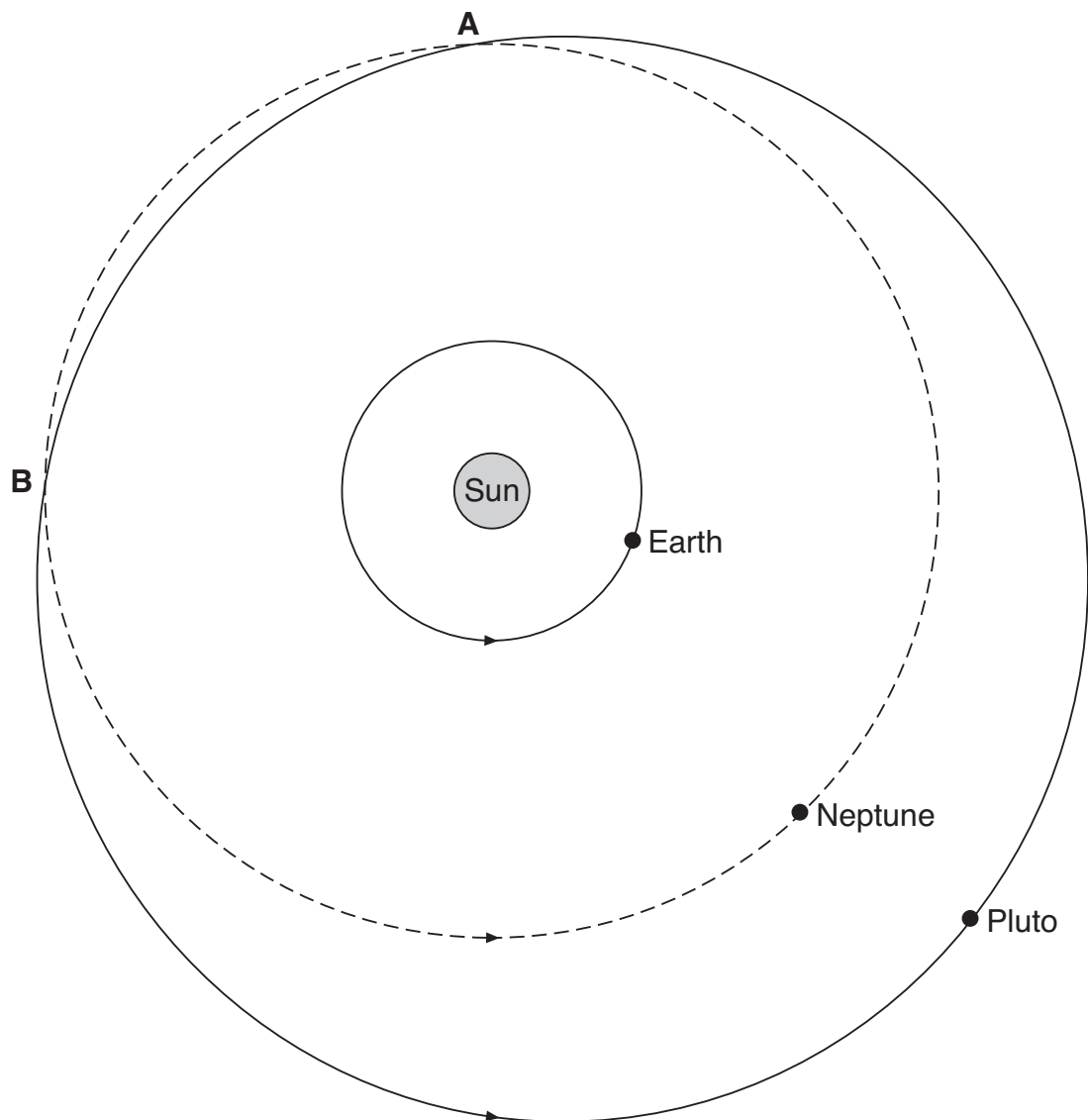
transferred from the wires to the ice.

(ii) As the window becomes clear and dry, physical changes take place in the ice. Fill the gaps below to show the physical changes which take place. 1 mark

from \_\_\_\_\_ to \_\_\_\_\_ to \_\_\_\_\_

*maximum 5 marks*

7. The diagram below shows the orbits of Neptune, Pluto and the Earth. At two points, A and B, the orbits of Neptune and Pluto cross over each other.



*not to scale*

- (a) What force keeps planets in orbit around the Sun?

*1 mark*

\_\_\_\_\_

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(b) Give **two** reasons why it takes Pluto more time than Neptune to orbit the Sun.

2 marks

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(c) (i) Tom can see the Sun because it is a light source. It gives out its own light. Neptune and Pluto are **not** light sources but Tom can see them when he looks through his telescope.

Explain why Tom can see Neptune and Pluto even though they are **not** light sources.

2 marks

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(ii) Between points A and B, Pluto is nearer than Neptune to the Earth. Tom noticed that Pluto is **not** as bright as Neptune, even when Pluto is closer than Neptune to the Earth.

Give **one** reason why Pluto is **not** as bright as Neptune.

1 mark

\_\_\_\_\_

\_\_\_\_\_

maximum 6 marks

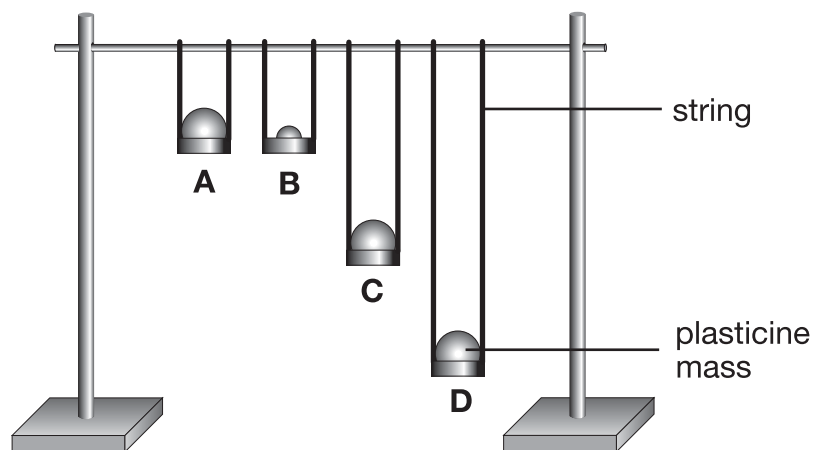
8. Joe saw two types of swing in the park.



He noticed that the time for one complete swing, forward and back, was different for the two types of swing.

He did **not** know whether the length of the chains or the mass of the person affected the time for one complete swing.

He made model swings and measured how long it took for 10 complete swings in 4 investigations.



Here are his results.

	investigation			
	A	B	C	D
length of string, in cm	25	25	50	75
mass of plasticine, in g	100	50	100	100
time for 10 complete swings, in s	10.0	10.0	14.2	17.4



Here is Joe's conclusion:



Changing the mass of the plasticine has no effect on the time taken for 10 complete swings.

- (a) Which **two** of his investigations, A, B, C or D, provided evidence to support his conclusion?

\_\_\_\_\_ and \_\_\_\_\_

1 mark

- (b) Look at the results table.

- (i) Describe how the length of the string affects the time for 10 complete swings.

\_\_\_\_\_  
\_\_\_\_\_

1 mark

- (ii) Which **three** of his investigations are best evidence for this?

\_\_\_\_\_ and \_\_\_\_\_ and \_\_\_\_\_

1 mark

- (c) Use his previous table of results to predict the times for 10 complete swings in two further investigations E and F.

Write your answers in the table below.

1 mark

	investigation	
	E	F
length of string, in cm	25	100
mass of plasticine, in g	25	100
time for 10 complete swings, in s	-----	-----

maximum 4 marks



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9. Cholera is a disease caused by bacteria. These bacteria produce a poison. The poison prevents the large intestine from absorbing water from the food passing through it.  
People with cholera can lose more than a litre of water per hour.

(a) Give **one** function of water in the body.

1 mark

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(b) People can be injected with a vaccine against cholera. The vaccine contains a tiny amount of the cholera poison and **not** the cholera bacteria. As a result, people become immune to cholera.

Describe how vaccination makes a person immune to cholera.

2 marks

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(c) The cholera poison makes the skin permeable. A new method of vaccinating against cholera is to put a small amount of the poison, mixed with other vaccines, on a plaster. The plaster is left on the skin for a day. The vaccines pass through the skin and the person becomes immune to cholera and to other diseases.

(i) Why should only a tiny amount of the poison be used?

1 mark

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(ii) Suggest **one** advantage of vaccinating people in this way.

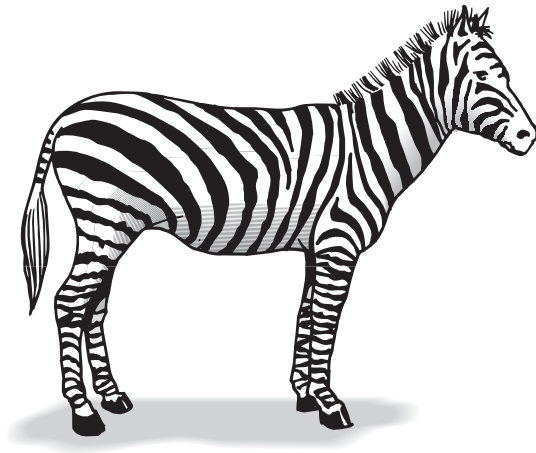
1 mark

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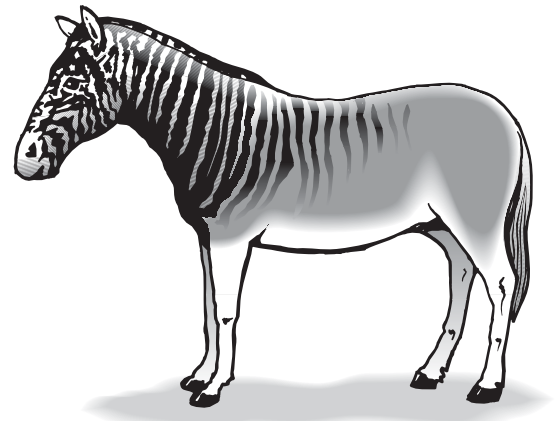
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maximum 5 marks

10. The quagga is an extinct animal that lived in Africa. Quaggas belonged to the same group as zebras.  
The drawings below show a zebra and a quagga.



zebra



quagga

- (a) Zebras and quaggas used to breed with each other. The offspring contained a combination of both zebra and quagga genes (genetic information).  
How were zebra **and** quagga genes passed on from the parents to their offspring?

1 mark

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- (b) These days there are some zebras that still show some quagga features. Scientists are using zebras to try to produce quaggas by selective breeding. Describe the steps in this selective breeding process.

3 marks

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maximum 4 marks



11. (a) Complete the word equation below for the reaction between calcium carbonate and hydrochloric acid.

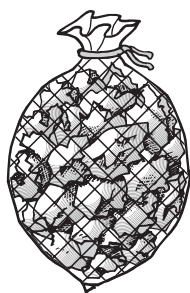
1 mark



Limestone is mainly calcium carbonate. It is weathered by acids in the air or in soil.

- (b) In June 1990, a year 9 class planned a long-term investigation into the chemical weathering of limestone by acids in soil.

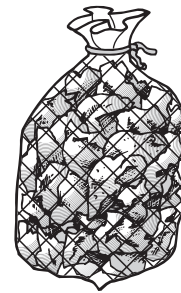
They put limestone chippings of similar size in three nylon mesh bags. They buried the bags outside in soils of different pH.



sample A  
in soil of pH 5



sample B  
in soil of pH 7



sample C  
in soil of pH 8

- (i) Chemical weathering took place in sample A, and the mass of the sample decreased.

Give the reason for the decrease in mass. Use the word equation above to help you.

1 mark

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- (ii) The pupils predicted that chemical weathering would **not** take place in samples B and C.

Give the reason for their prediction.

1 mark

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(iii) Some chemical weathering did take place in samples B and C.

What could have changed the conditions in these soils to cause weathering to take place?

1 mark

(c) The table shows how the mass of each sample changed between the years 1990 and 2000.

year	mass, in g		
	sample A, at pH 5	sample B, at pH 7	sample C, at pH 8
1990	1000	1000	1000
1995	980	992	997
2000	960	984	995

In 2000, a year 9 class buried another identical 1000 g sample of limestone chippings in soil of pH 6.

(i) Use the results in the table to predict an approximate value for the mass of this sample in 2010.

1 mark

\_\_\_\_\_ g

(ii) Why is it **not** possible to be certain what the mass of this sample will be in 2010?

1 mark

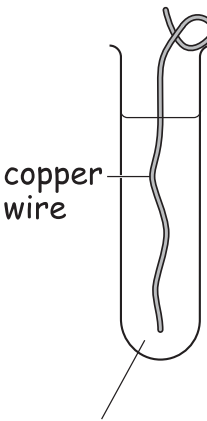
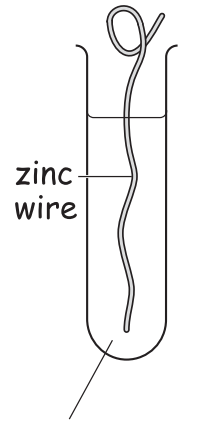
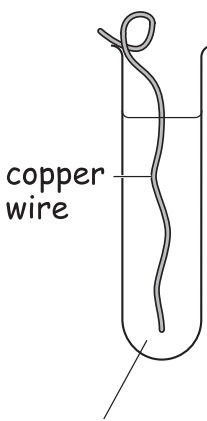
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maximum 6 marks



12. A group of pupils placed pieces of metal wire in different salt solutions. They recorded their observations in the table below.

experiment	1	2	3
diagram	 <p>copper wire</p> <p>silver nitrate solution</p>	 <p>zinc wire</p> <p>lead nitrate solution</p>	 <p>copper wire</p> <p>lead nitrate solution</p>
observations	crystals of silver formed on the wire	crystals of lead formed on the wire	no change

- (a) From these observations, write the order of reactivity of the four metals, copper, lead, silver and zinc.

2 marks

most reactive \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

least reactive \_\_\_\_\_

- 
- (b) The pupils then dipped a new piece of each of the metal wires into dilute hydrochloric acid.

Only **one** of the metals reacted. Which metal was this?

1 mark

\_\_\_\_\_

- (c) One pupil predicted that there would be **no** reaction when he put a piece of zinc wire into a solution of silver nitrate.

Was his prediction correct? Explain your answer.

1 mark

\_\_\_\_\_

\_\_\_\_\_

- (d) In nature, gold is never found combined with other elements.

Where should gold be placed in the reactivity series in part (a)?  
Explain your answer.

1 mark

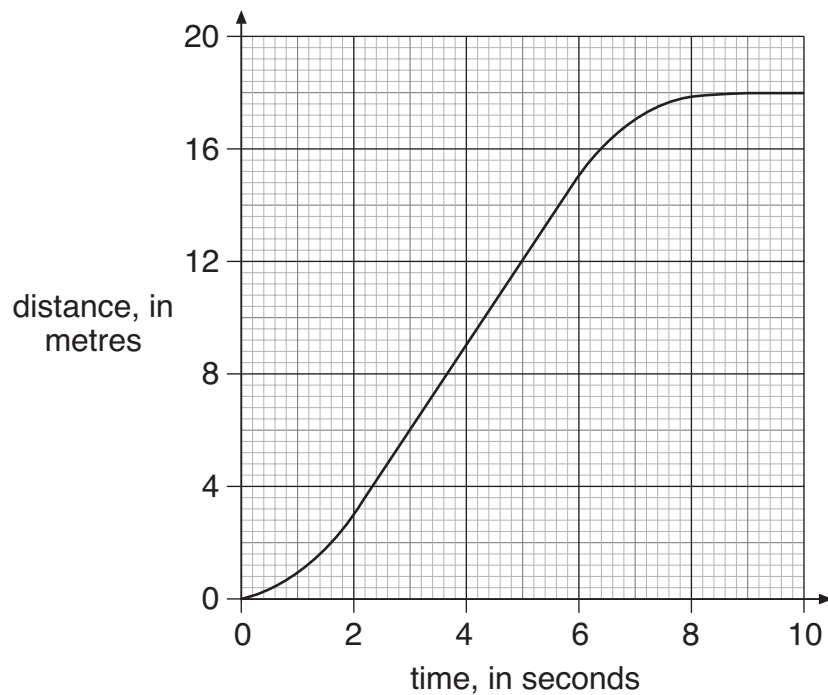
\_\_\_\_\_

\_\_\_\_\_

maximum 5 marks



13. A remote-controlled car was timed over a period of 10 seconds. A graph of **distance** against **time** is shown below.



- (a) Describe the motion of the car between:

- (i) 2 seconds and 6 seconds

1 mark

\_\_\_\_\_

- (ii) 9 seconds and 10 seconds

1 mark

\_\_\_\_\_

- (b) Calculate the average speed of the car between 0 and 10 seconds. Give the unit.

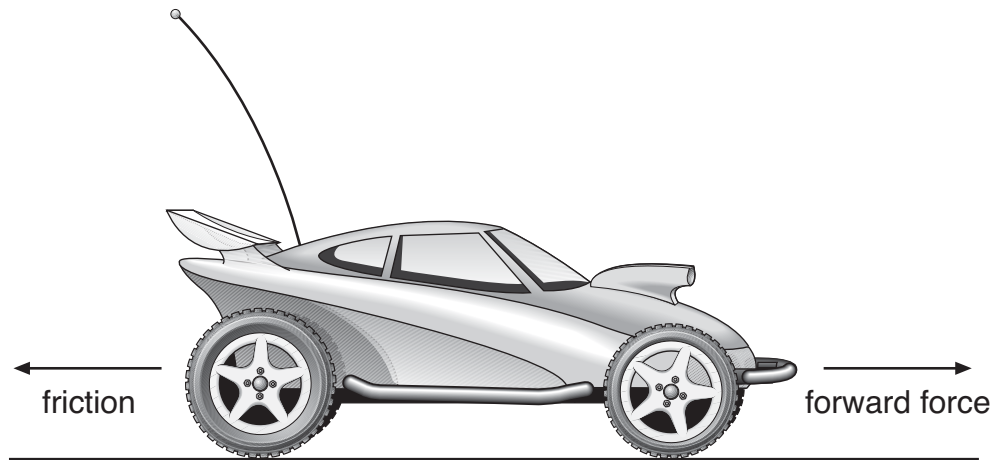
2 marks

\_\_\_\_\_

\_\_\_\_\_



- (c) The diagram below shows **two** of the forces acting on the car when it is moving.



- (i) When the motor was switched off, the car slowed down and then stopped.

While the car was slowing down, which of the following was true?  
Tick the correct box.

1 mark

Friction was zero and the forward force was greater than zero.

The forward force was zero and friction was greater than zero.

Friction was zero and the forward force was zero.

The forward force and friction were both greater than zero.

- (ii) Use the graph to find the time when the car started to slow down.

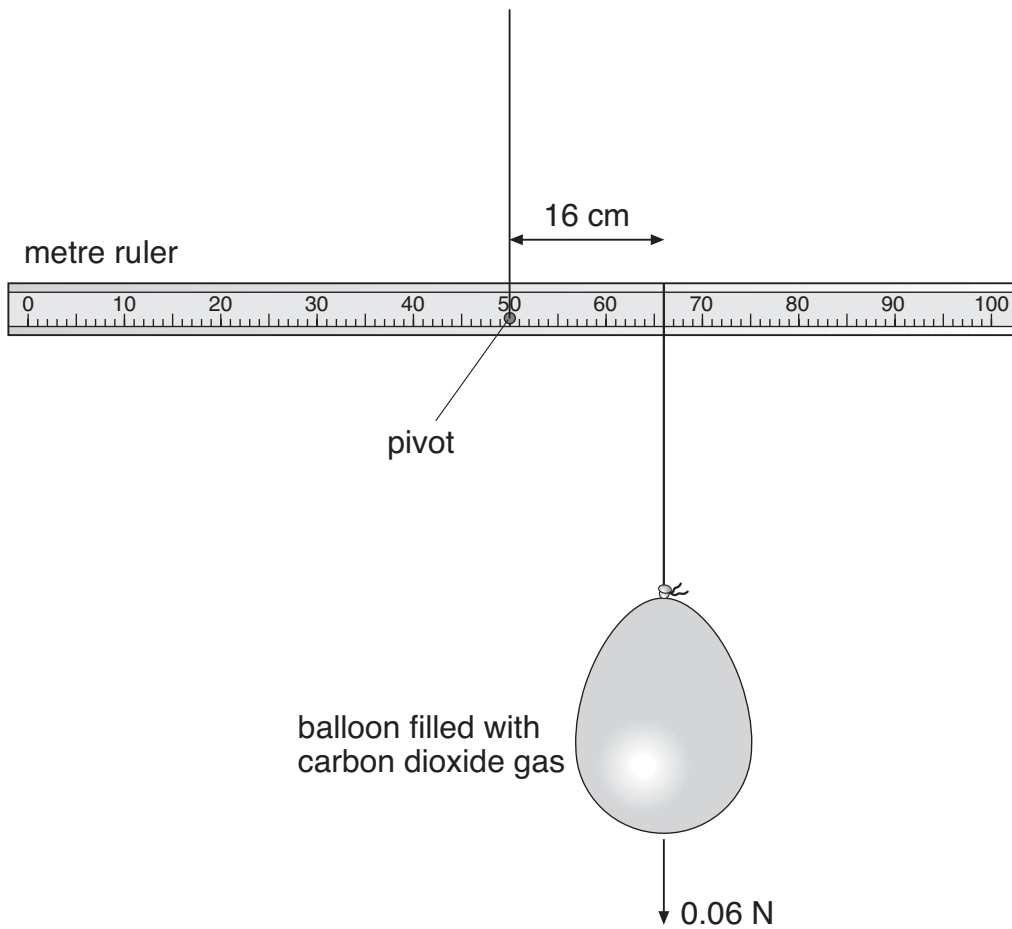
1 mark

The car started to slow down after \_\_\_\_\_ s.

maximum 6 marks

14. Alex has a 100 cm ruler pivoted at the centre. She ties a balloon filled with carbon dioxide 16 cm from the pivot, as shown below.

The total weight of the balloon and carbon dioxide is 0.06 N.



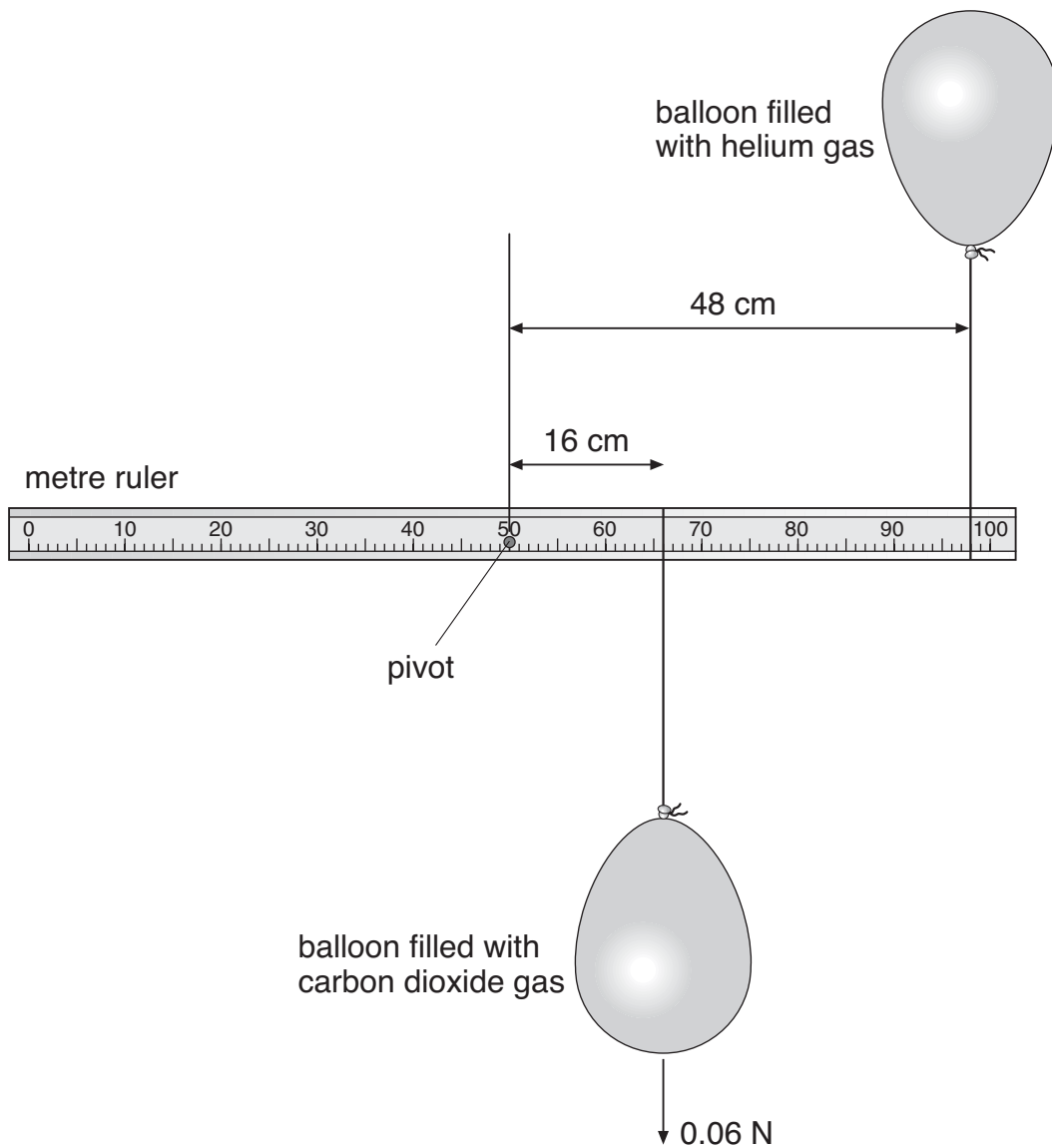
- (a) The ruler becomes unbalanced.  
Calculate the turning moment the balloon produces about the pivot on the ruler. Give the unit.

2 marks

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- (b) Alex ties another similar balloon, filled with helium, 48 cm from the pivot. The helium balloon exerts an upward force on the ruler. The ruler is balanced as shown below.



- (i) When the ruler is balanced, what turning moment must the helium balloon produce about the pivot?

1 mark

\_\_\_\_\_

- (ii) Calculate the upward force exerted by the helium balloon on the ruler.

1 mark

\_\_\_\_\_

\_\_\_\_\_ N

maximum 4 marks

**END OF TEST**