Sc

KEY STAGE
3

TIER
3–6

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	

QCA/03/1001

1. (a) The photograph below shows a team of dogs called huskies pulling a sledge across the ice.

Huskies need to survive in a cold climate. They must be able to pull a heavy sledge for a long time each day.

Which **two** features would a dog breeder look for when choosing huskies to breed from?
Choose from the list of features below and give the reason for each choice.

blue eyes **fierce nature** **long tail**

thick fur **short legs** **strong muscles**

1. feature _____ *1 mark*

   reason _____ *1 mark*

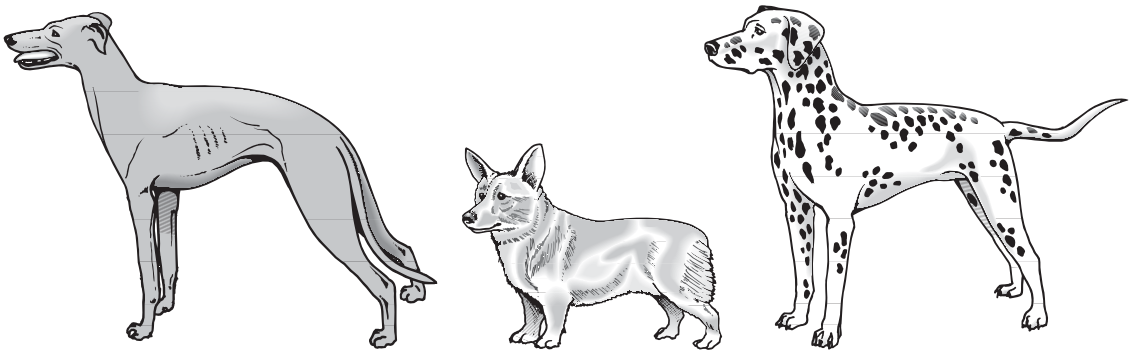
   _____

2. feature _____ *1 mark*

   reason _____ *1 mark*

   _____

(b) The drawings below show three dogs. They all look different.



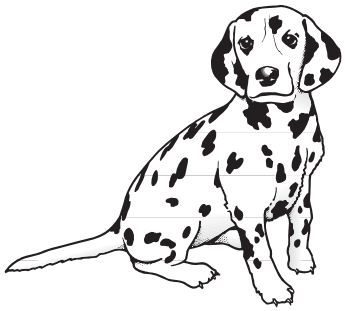
A **B** **C**

(i) Which word describes the differences between these dogs?
Tick the correct box.

1 mark

adaptation	☐	reproduction	☐
vaccination	☐	variation	☐

(ii) The drawing below shows a puppy. Dog C is the puppy's mother.



Why does the puppy look like his mother?
Tick the correct box.

1 mark

Information passed from the mother in an egg.	☐
Information passed from the mother in a sperm.	☐
Information passed from the mother in milk.	☐
Information passed from the mother in blood.	☐

maximum 6 marks

2. Two pupils planted lettuce seeds at three different temperatures.
They planted the same number of seeds at each temperature.

Their results are shown in the table.

temperature, in °C	total number of lettuce seeds germinated					
	day 1	day 2	day 3	day 4	day 5	day 6
5	0	0	----------	0	1	1
15	0	0	0	1	5	9
25	0	2	8	13	17	19

(a) Complete the table to show how many seeds had germinated at 5°C by day 3.

1 mark

(b) The pupils were trying to find out something about seeds.

Write down the question the pupils were investigating.

1 mark

_____

_____

(c) The pupils discussed their results and made the conclusions listed below.

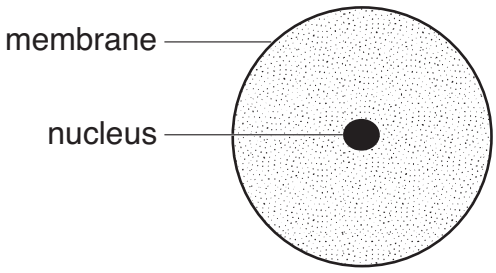
Look at their results in the table and decide whether each conclusion below is **true, false** or you **cannot tell**.
Tick the correct box for each conclusion.

2 marks

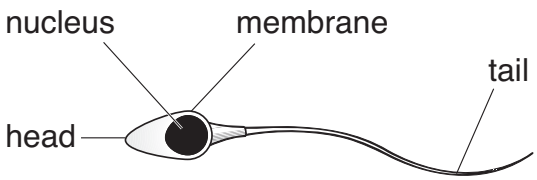
conclusions	true	false	cannot tell
The earliest germination was at 25ºC.	☐	☐	☐
At 25ºC all the seeds germinated by day 6.	☐	☐	☐
5ºC was too cold for seeds to germinate.	☐	☐	☐
The best temperature for germination was 15ºC.	☐	☐	☐

maximum 4 marks

3. The diagrams below show a human ovum (egg) and a human sperm.



human ovum (egg)



human sperm

not to scale

(a) What are eggs and sperm?
Tick the correct box.

1 mark

animals ☐ cells ☐ organs ☐

(b) Which part does a sperm use to swim towards an egg?

1 mark

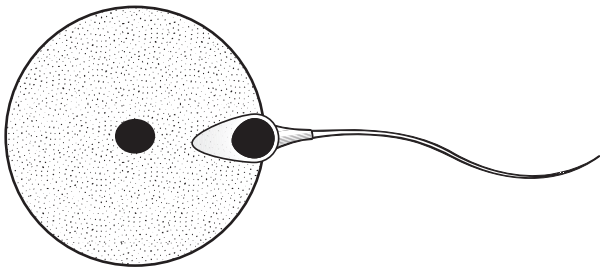
_____

(c) Give the name of the male reproductive organ where sperm are made.

1 mark

_____

(d) The diagram below shows a sperm joining with an egg.



not to scale

What is this process called?
Tick the correct box.

1 mark

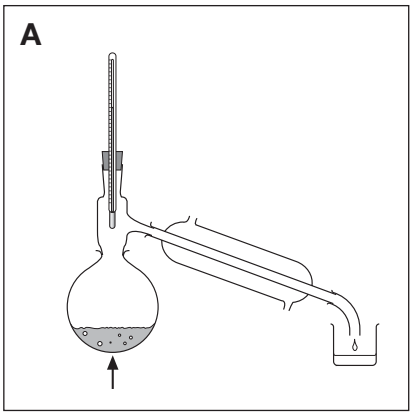
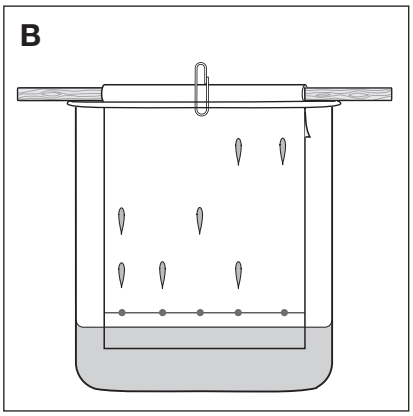
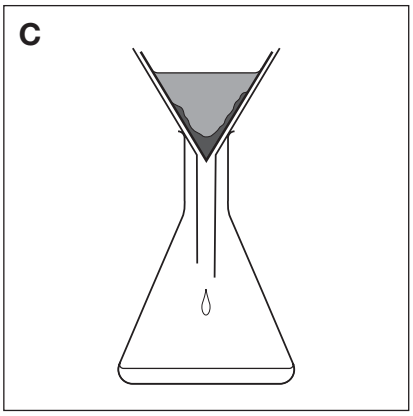
fertilisation	☐	growth	☐
nutrition	☐	respiration	☐

maximum 4 marks

4. Diagrams A, B and C show three pieces of apparatus for separating substances.

(a) Draw a line from each apparatus to the name of the method of separation.
Draw only **three** lines.

3 marks

diagram of apparatus	**method of separation**
	chromatography
A 	
	distillation
B 	
	filtration
C 	
	crystallisation

(b) Debbie has a mixture of sand and salt water.
Look at the diagrams on the opposite page.

(i) Which apparatus would Debbie use to separate the sand from the salt water?
Give the correct letter.

1 mark

_____

(ii) Which apparatus would she use to separate pure water from the salt water?
Give the correct letter.

1 mark

_____

maximum 5 marks

5. The drawing shows a gold mask from a tomb in Egypt. The gold is still shiny after thousands of years.

(a) What is pure gold? Tick the correct box.

1 mark

a compound	☐	a mixture	☐
an element	☐	a solution	☐

(b) The list shows some of the properties of gold.

It conducts electricity. **It melts at 1064°C.** **It is yellow.**

It is easily scratched. **It stays shiny.** **It conducts heat.**

(i) Which **one** of these properties shows that gold does **not** react with oxygen in the air?

1 mark

_____

(ii) Which **two** of the properties above are properties of **all** metals?

2 marks

1. _____

2. _____

(c) Old iron objects from tombs in Britain are often covered with rust. Iron reacts with oxygen when it rusts.

What else is needed for iron to go rusty? Choose **one** substance from the list below.

lead **nitrogen** **carbon dioxide** **water**

1 mark

_____

(d) A box contains a collection of metal objects from a tomb.

What piece of equipment would you use to separate the iron objects from the other metal objects?

1 mark

_____

maximum 6 marks

6. The table below gives information about three fuels that can be used in cars.

✓ shows a substance is produced when the fuel burns.
X shows a substance is **not** produced when the fuel burns.

fuel	physical state	energy released, in kJ/kg	some of the substances produced when the fuel burns		
			carbon monoxide	sulphur dioxide	water
petrol	liquid	48 000	✓	✓	✓
hydrogen	gas	121 000	X	X	✓
ethanol (alcohol)	liquid	30 000	✓	X	✓

(a) Which fuel, in the table, releases the **least** energy per kilogram (kg)?

1 mark

_____

(b) Some scientists say that if hydrogen is burned as a fuel there will be less pollution.
From the information in the table, give **one** reason why there will be less pollution.

1 mark

_____

_____

(c) Which of the three **fuels** in the table can be compressed into a small container?

1 mark

_____

(d) Which gas in the air is needed for fuels to burn?
Tick the correct box.

1 mark

carbon dioxide	☐
nitrogen	☐
oxygen	☐
water vapour	☐

(e) Petrol and ethanol are both fuels. Petrol is made from oil.
Scientists say that oil could run out in 100 years.
In some countries people plant sugar cane and use it to make ethanol.

Sugar cane will **not** run out. Explain why.

1 mark

_____

_____

maximum 5 marks

7. Some children watched an eclipse of the Sun.
During the eclipse, the Moon passed between the Sun and the Earth.
It blocked out sunlight.

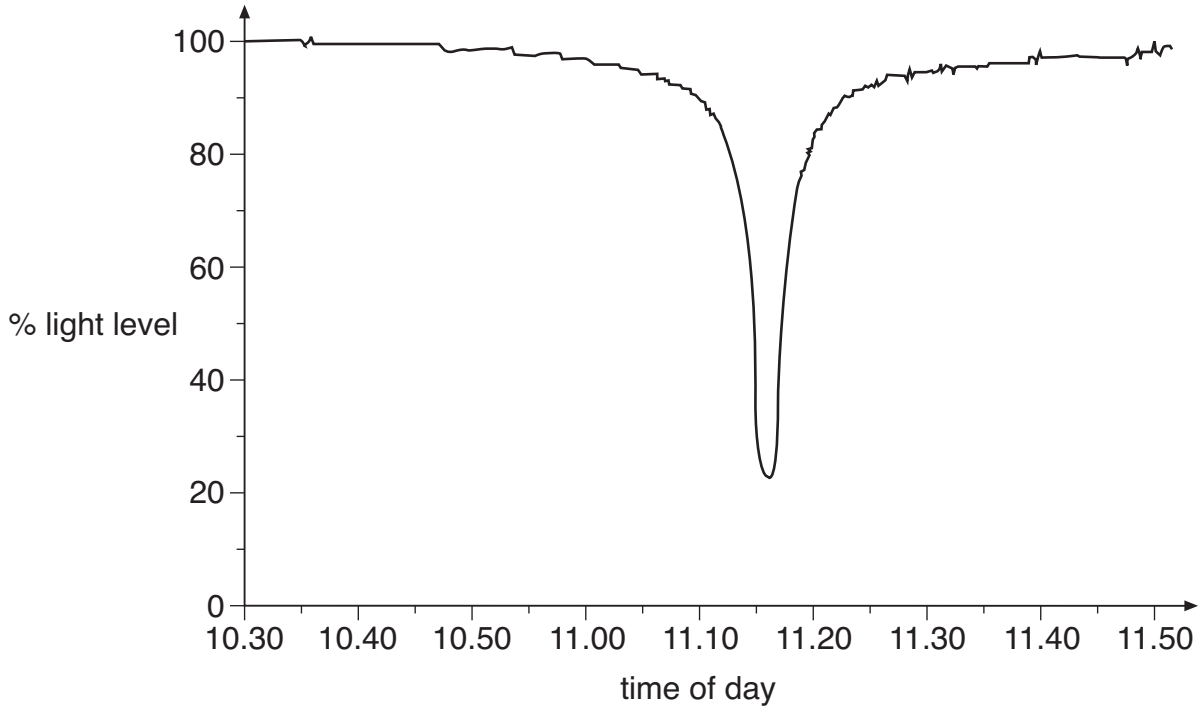
(a) Amrik watched the eclipse. He knew that the Sun is much bigger than the Moon but they looked about the same size.

Why did they look the same size? Tick the correct box.

1 mark

The Moon is nearer to the Earth than the Sun is.	☐
The Sun is nearer to the Earth than the Moon is.	☐
The Sun goes round the Earth faster than the Moon does.	☐
The Moon goes round the Sun faster than the Earth does.	☐

(b) Amrik's class measured the light level during the eclipse.
The graph below shows their results.



(i) At what time did the Moon block out most of the Sun's light?
Use the graph to help you.

1 mark

_____ am

(ii) What happened to the air temperature during the eclipse?

_____

Give the reason for your answer.

_____

1 mark

_____

maximum 3 marks

8. Lee blew across the top of paper tubes to make sounds.
He investigated how changing the length of a tube affects the pitch of the sound.

(a) What equipment could he use to measure the length of the tubes?
Tick the correct box.

1 mark

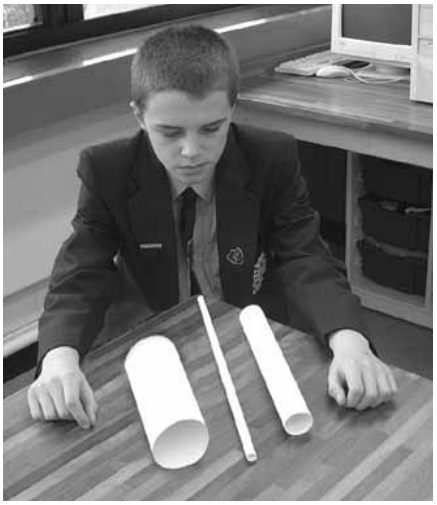
☐

☐

☐

☐

(b) The photograph below shows the different lengths of tubes Lee used.



Suggest **one** way his test might **not** have been fair.

1 mark

_____

_____

(c) Lee made a prediction.

Which of these statements is a prediction?
Tick the correct box.

1 mark

The tubes were made of paper.	☐
The pitch of the sound is how high or low it is.	☐
The longer tube will make a lower sound.	☐
The sound is caused by the vibration of air.	☐

(d) Lee blew across the ends of 3 different lengths of tube and compared the pitch of the sound produced.

His results are shown below.

Length of the tube, in cm	pitch of the sound
5	high
25	medium
50	low

Which length of tube made the sound with the highest pitch?

1 mark

_____ cm

maximum 4 marks

9. Thunder and lightning happen at the same time.

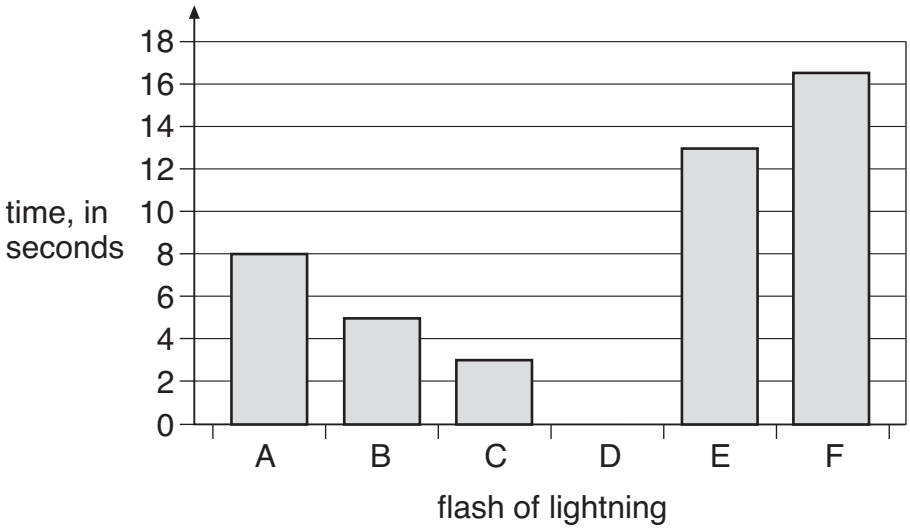
(a) We see the flash of lightning before we hear the thunder.
Give the reason for this.

1 mark

(b) Omar investigated the movement of a storm. He measured the time between seeing a flash of lightning and hearing the thunder.
He did this six times. Omar put his results in a table.

flash of lightning	time between seeing the lightning and hearing the thunder, in seconds
A	8.0
B	5.0
C	3.0
D	9.0
E	13.0
F	16.5

Omar drew a bar chart of his results as shown below.



(i) On the bar chart, draw a bar for flash D. Use a ruler.

1 mark

(ii) Which flash of lightning was closest to Omar?
Give the correct letter.

1 mark

_____

(iii) Describe how the distance between the storm and Omar changed as the storm moved between flash A and flash F.

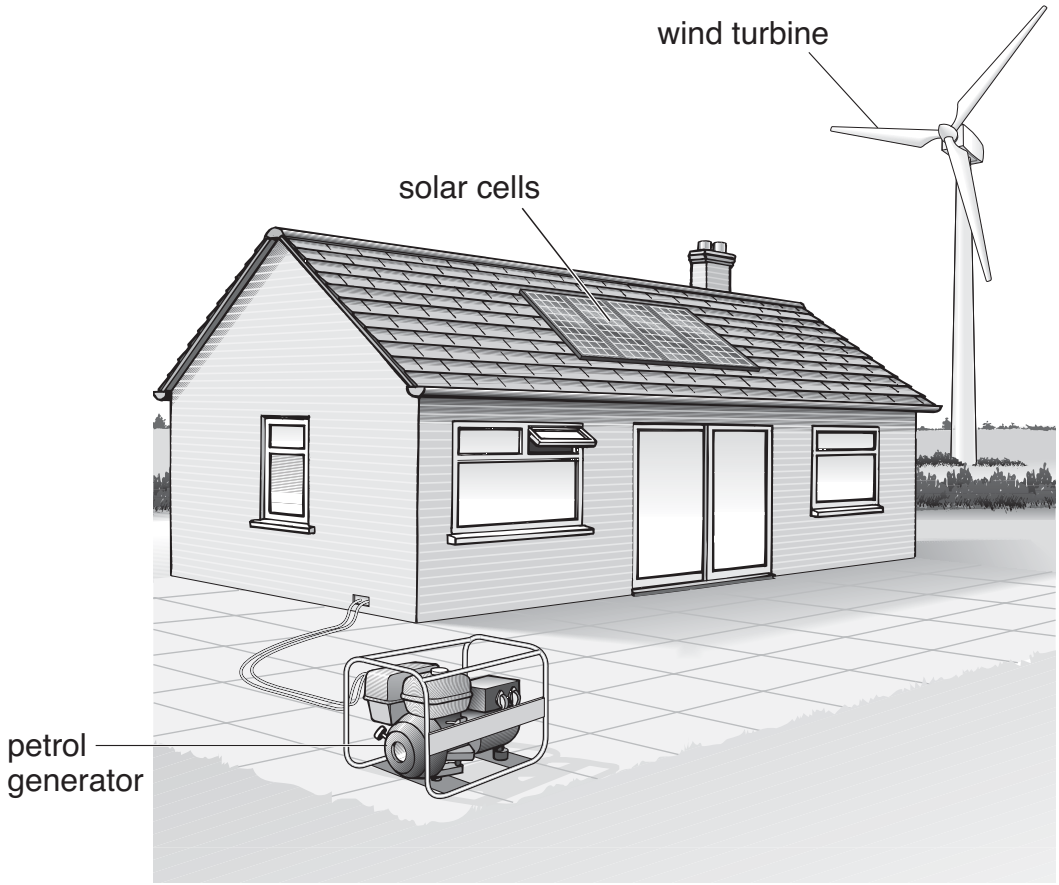
1 mark

_____

_____

maximum 4 marks

10. The drawing shows Mark's house. He uses three methods to generate electricity.



(a) Draw a straight line from each of the **two** methods below to the main energy resource used to generate electricity.
Draw only **two** lines.

2 marks

method	**energy resource**
	air movement
solar cells	
	chemicals
	sunlight
petrol generator	
	heat

(b) (i) The solar cells **cannot** work at night.
Give the reason for this.

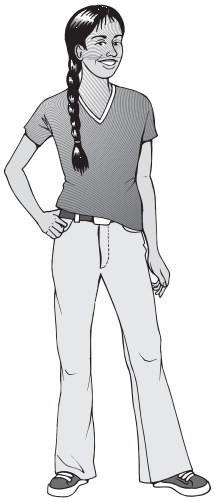
1 mark

(ii) The wind turbine **cannot** generate electricity all the time.
Give the reason for this.

1 mark

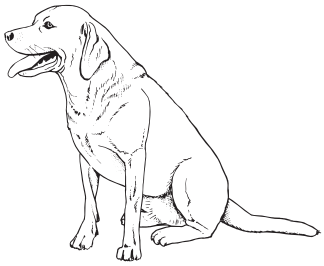
maximum 4 marks

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

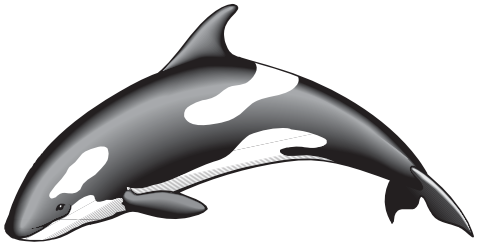


human

chaffinch



dog



whale

not to scale

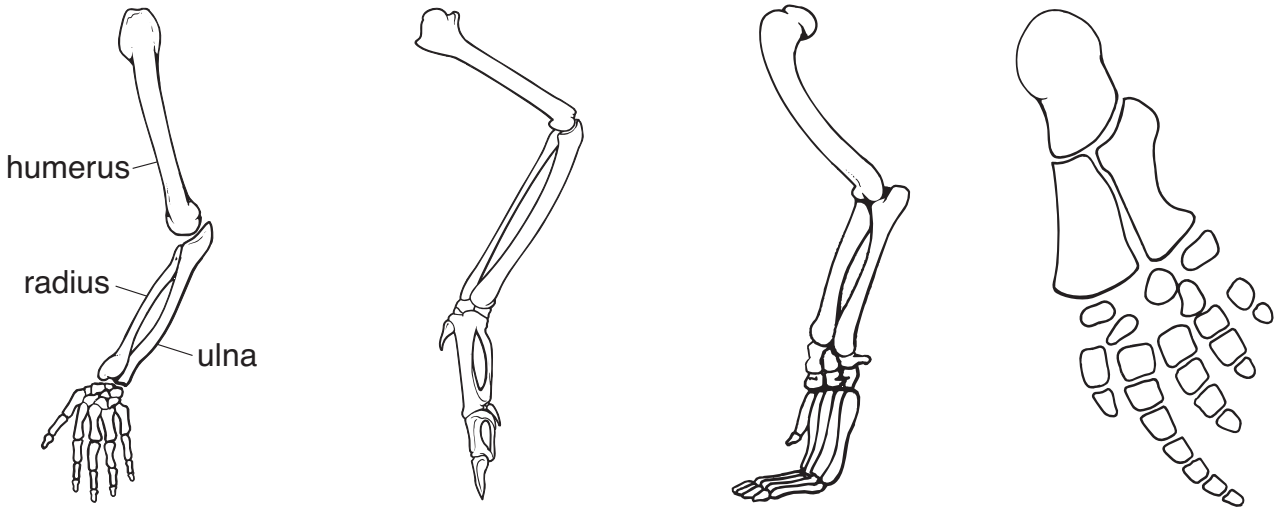
One of these animals is a bird. The other three are mammals.

(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.



human chaffinch dog whale

not to scale

On the drawings, label:

(i) the ulna of the chaffinch; *1 mark*

(ii) the radius of the dog; *1 mark*

(iii) the humerus of the whale. *1 mark*

(c) Describe how the shape of the front limb of the whale is adapted for moving in water. *1 mark*

_____

_____

(d) The bones of birds are hollow. How does this help birds to fly? *1 mark*

_____

_____

maximum 6 marks

12. (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
Amy	3.6	2.9	3.4	2.8
Don	1.8	1.3	1.2	1.2
Kisham	6.3	5.0	4.3	3.8
Pat	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

_____

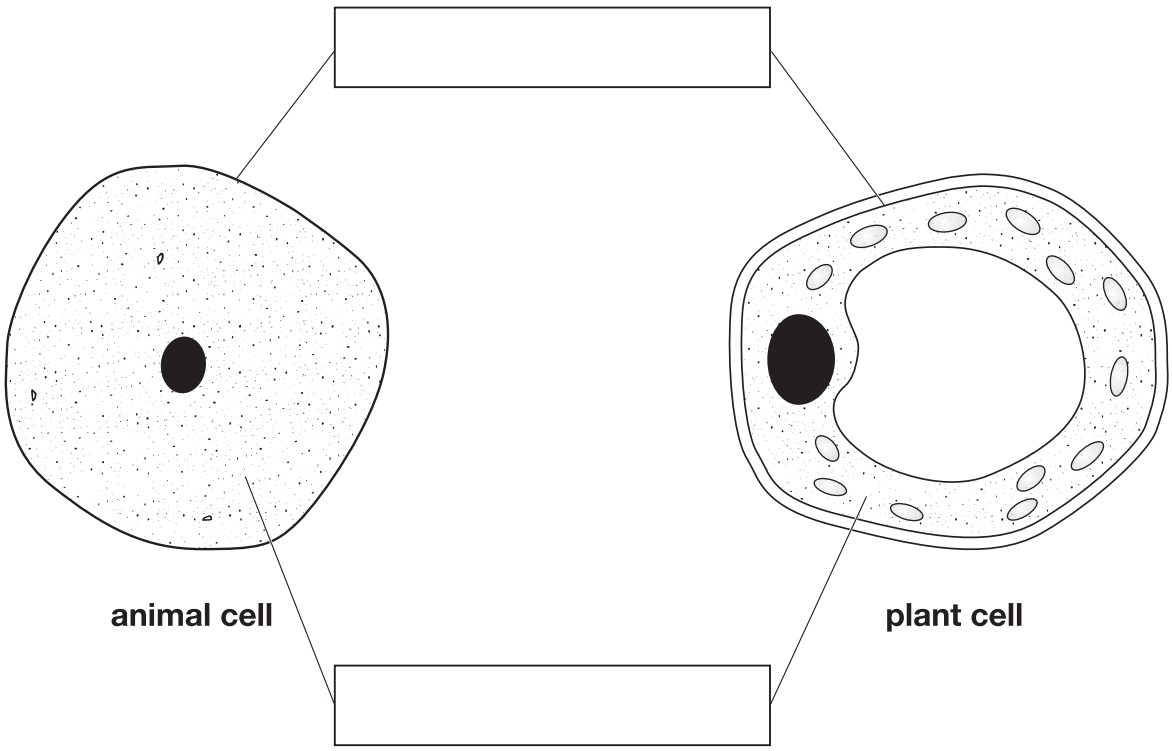
_____

_____

_____

maximum 4 marks

13. (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

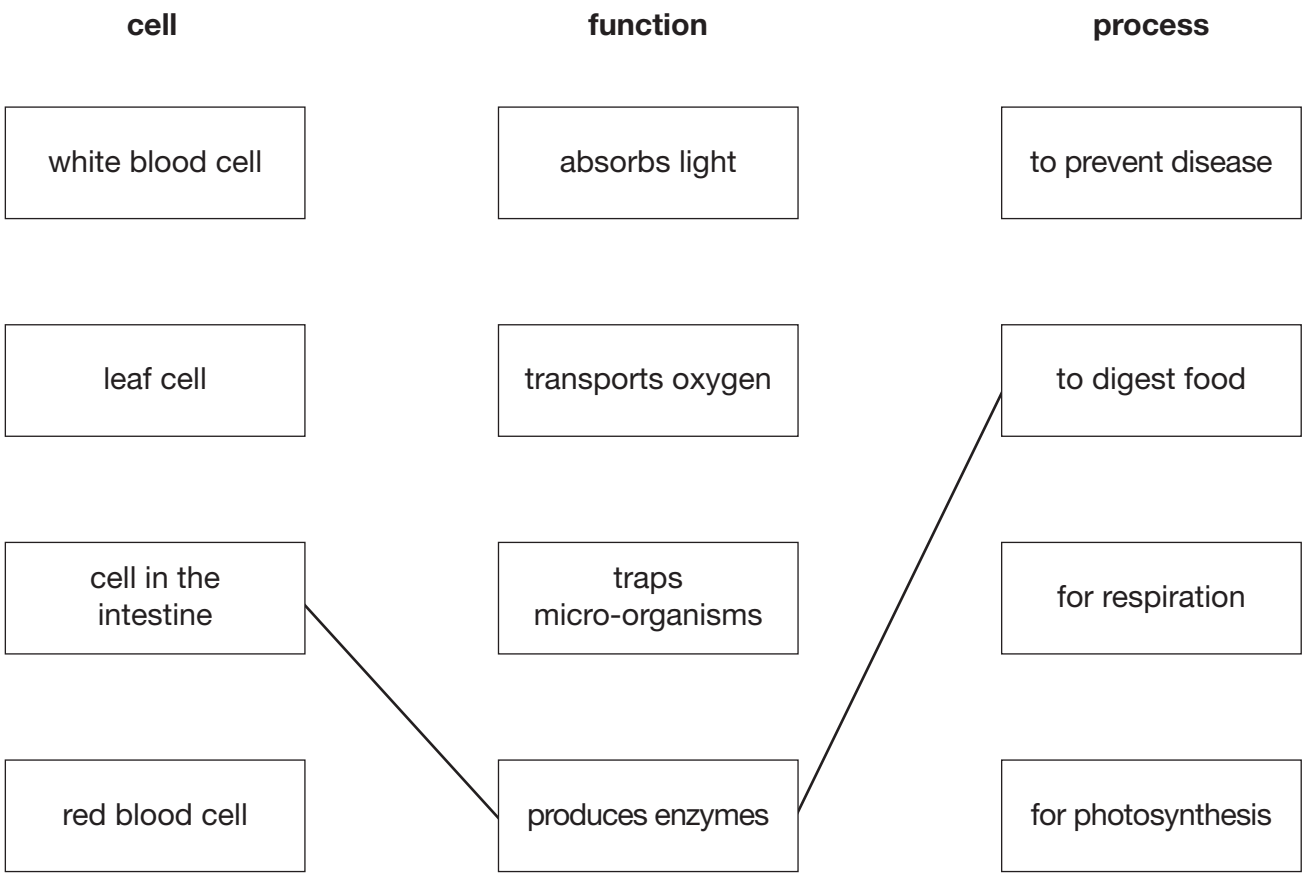
1. _____

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.

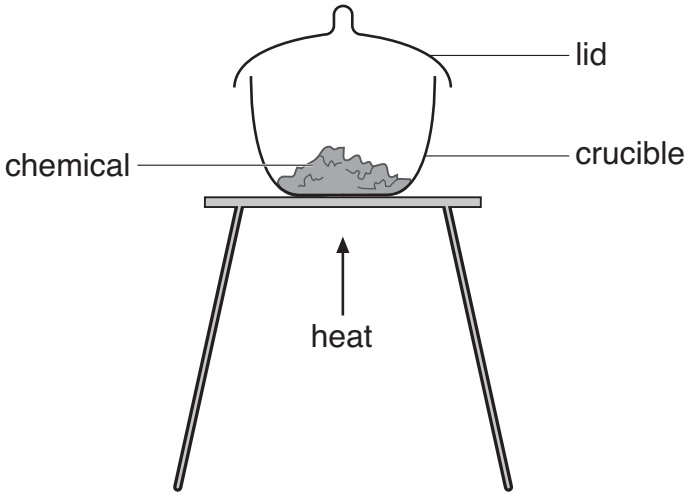
3 marks



maximum 7 marks

14. 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.

2 marks

magnesium + _____ → _____

(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.

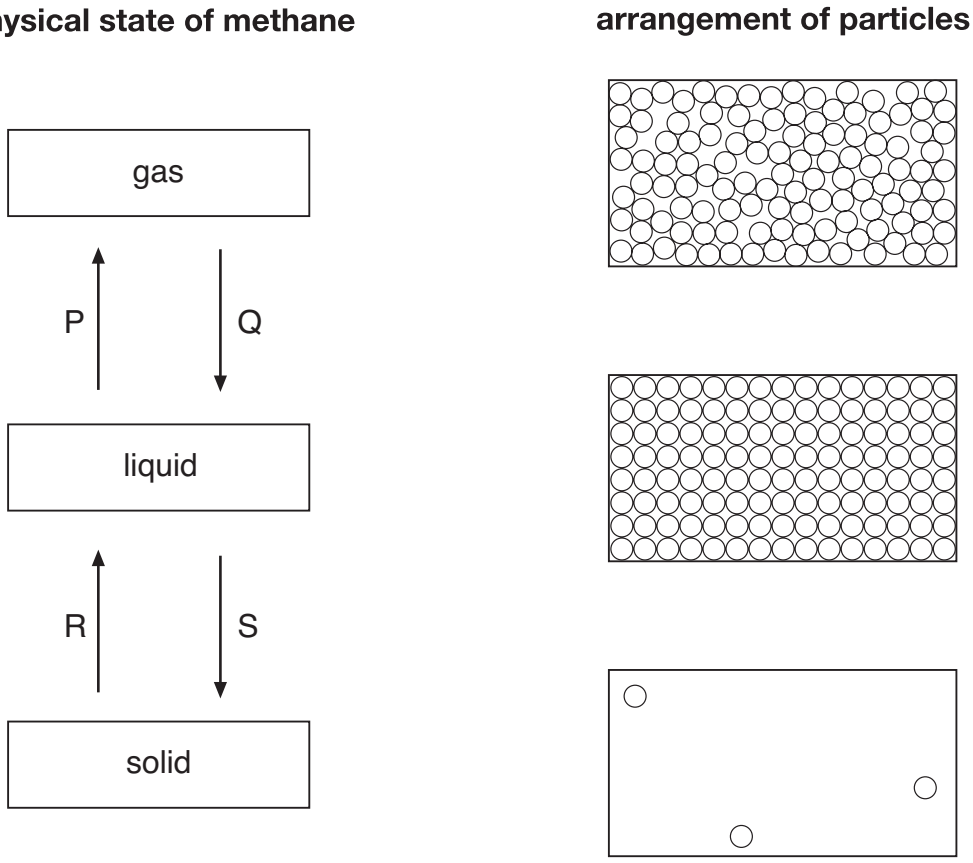
experiment	chemical change	physical change
A		
B		
C		

1 mark

maximum 6 marks

15. (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.



(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

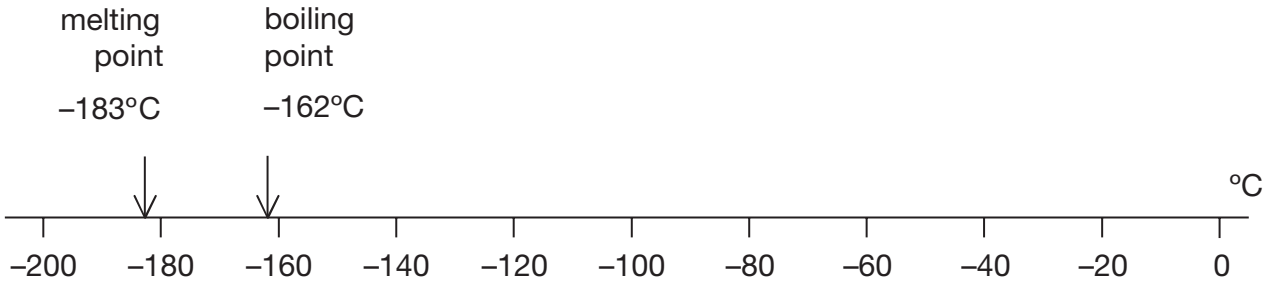
(ii) Arrows P, Q, R and S represent changes of state.
Which arrow represents:

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°C?

1 mark

_____

(ii) The formula of methane is 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, H_2O.

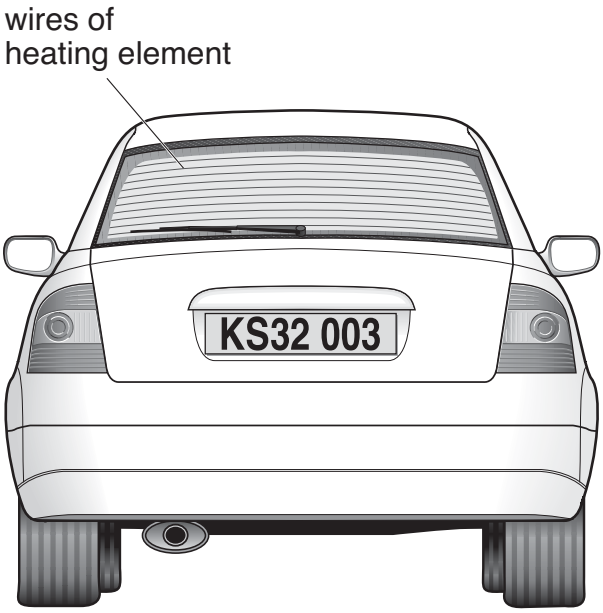
Give the name of the other product.

1 mark

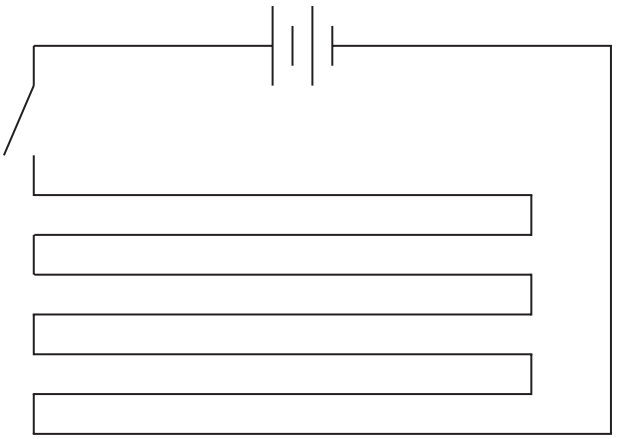
_____

maximum 7 marks

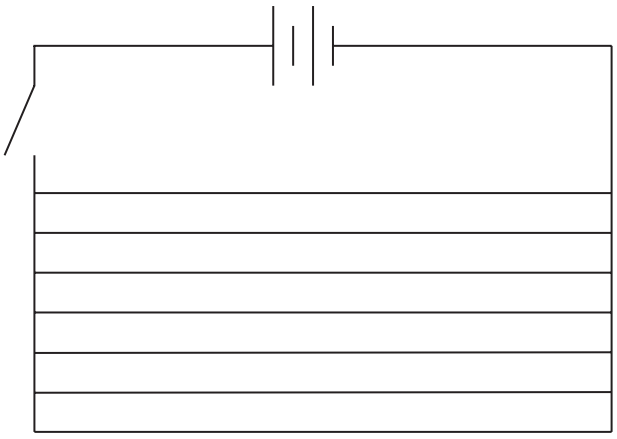
16. The back window of this car contains a heating element.
The heating element is part of an electrical circuit connected to the battery of the car.



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



circuit A



circuit B

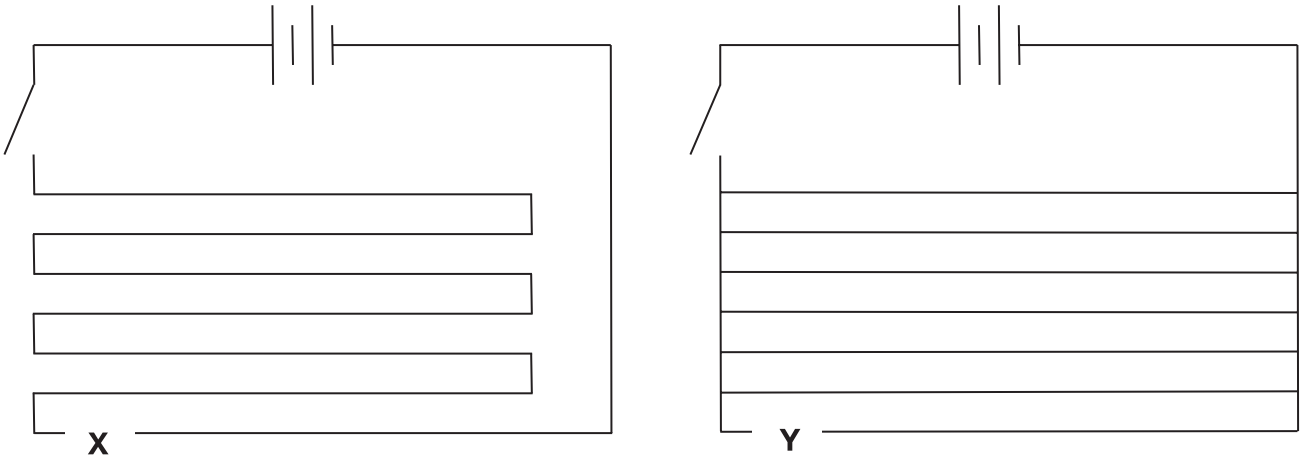
(a) Give the name of each type of circuit:

1 mark

circuit A _____

circuit B _____

(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.

When the heater is switched on, _____ energy is *1 mark*

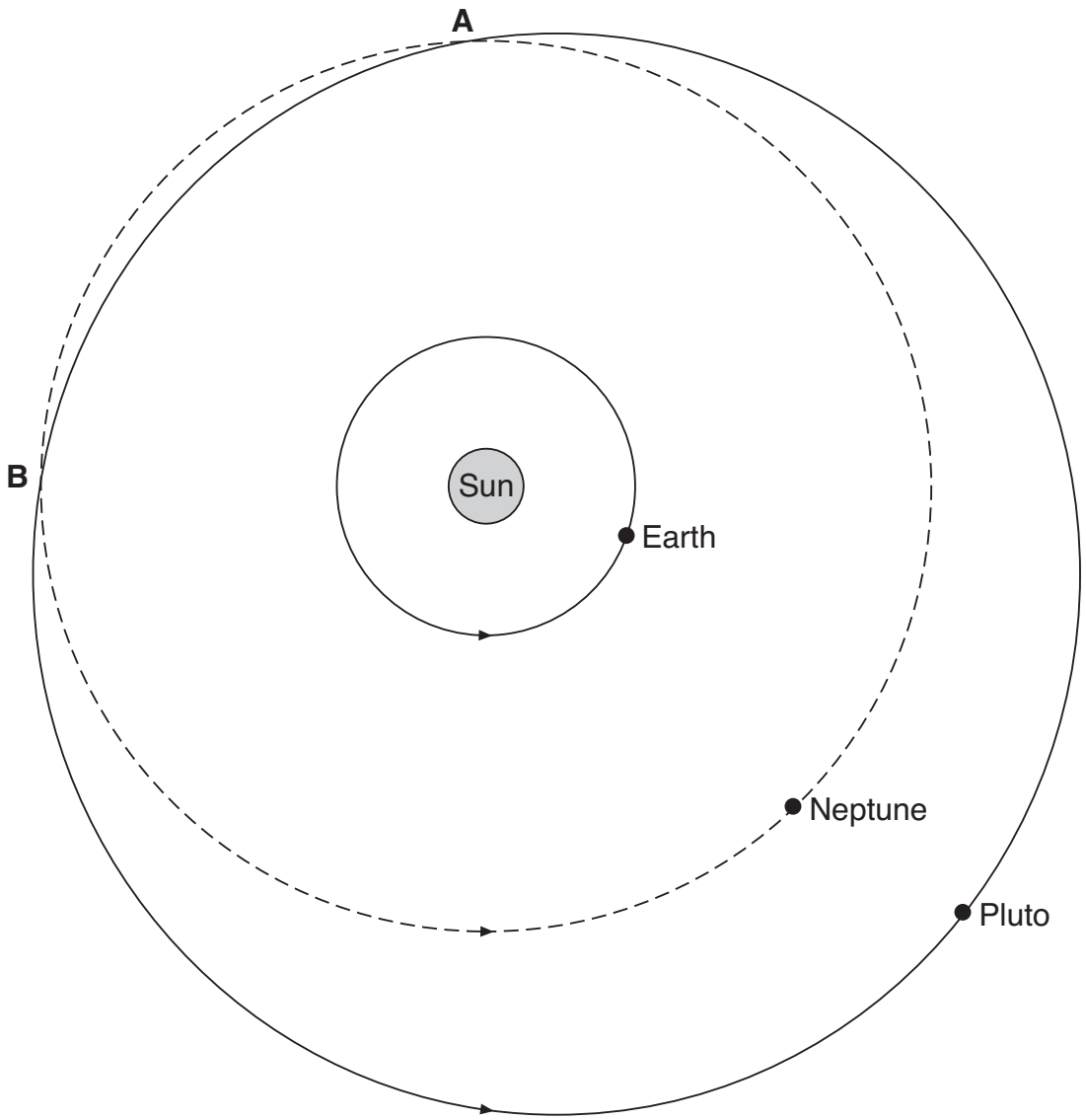
transferred from the wires to the ice.

(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

17. 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

_____

(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

_____

_____

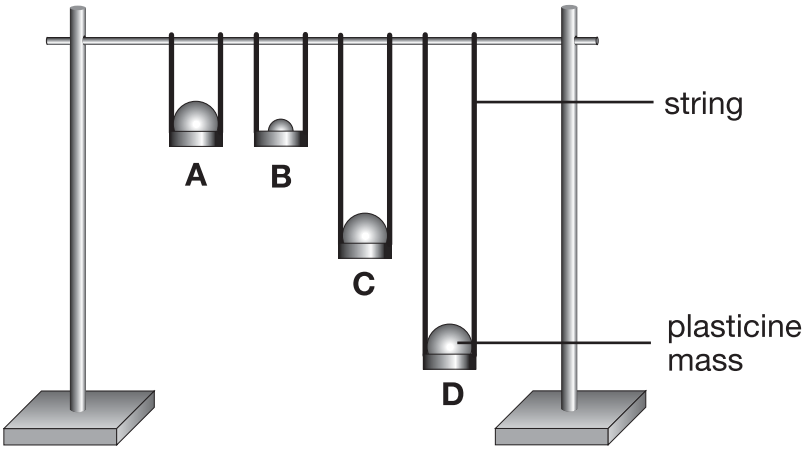
maximum 6 marks

18. 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?

1 mark

_____ and _____

(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?

1 mark

_____ and _____ and _____

(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

END OF TEST

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