ST ALBANS SCHOOL

13+ Entrance Examination Practice

Science

(60 minutes)

Calculator allowed

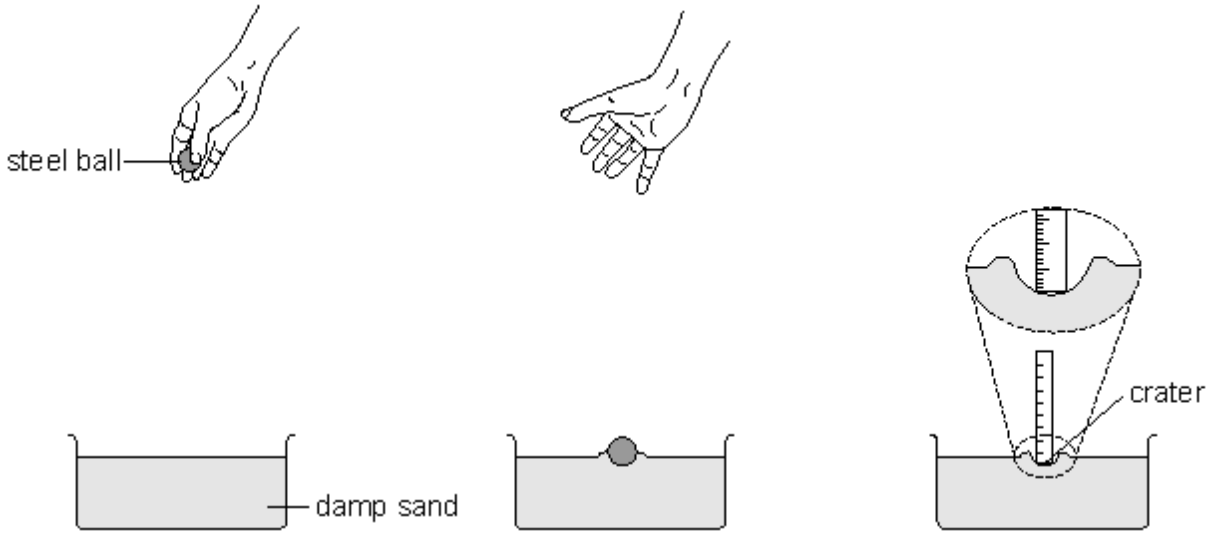
Surname	First Name

Date of Birth

Score Total
/60

Q1.

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.

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

.....

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.

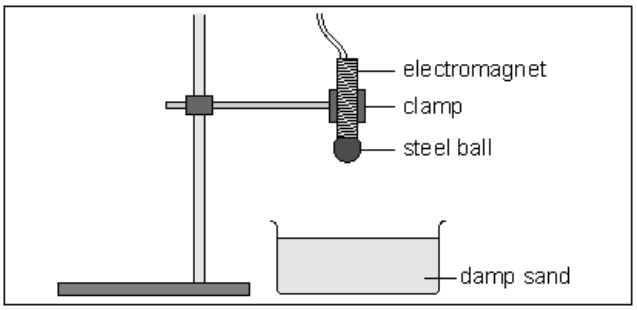
Suggest **two** variables they must have kept the same to make their investigation fair.

1 .....

2 .....

2 marks

(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.

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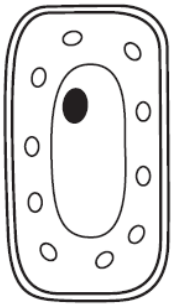
1 mark

Q2. (a)

Which diagram represents a typical plant cell?

A



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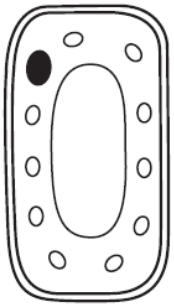
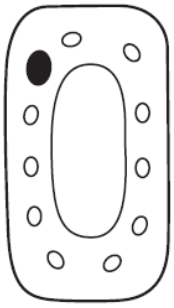
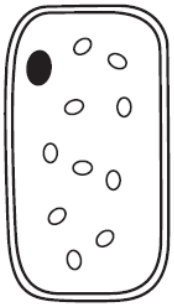


C



D



1 mark

(b)

The table gives information about mitochondria in different human cells.

Cell	Mean number of mitochondria per cell
heart muscle	5000
sperm	75
egg	600000

(a) (i) Explain why muscle cells and sperm cells contain mitochondria.

2 marks

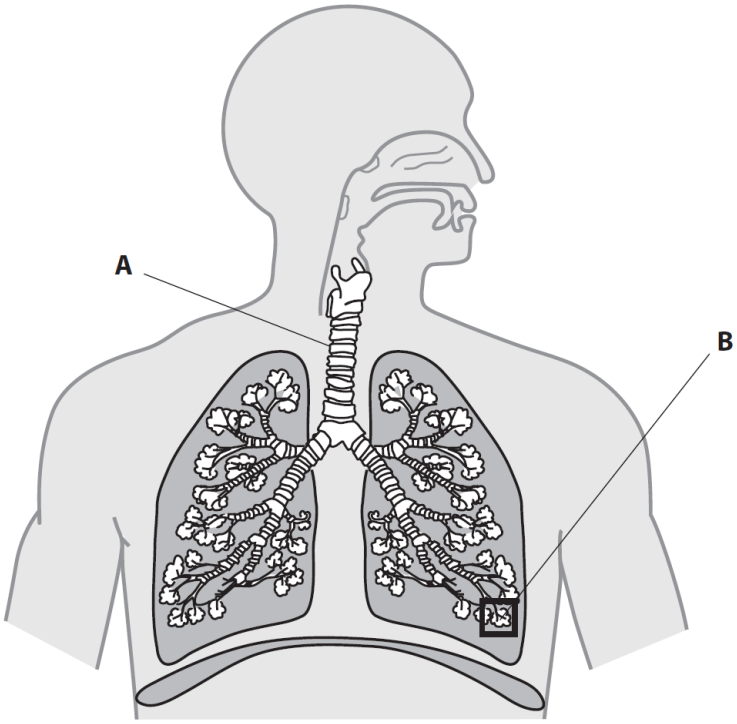
.....

.....

.....

Q3.

The diagram shows some structures in the human breathing system.



(a) Name structures **A** and **B**.

(2)

A .....

B .....

(b) The table shows the level of two gases, **X** and **Y**, in blood entering and leaving the lungs during the process of gas exchange.

Gas	Level of gas in cm^3 per 100 cm^3 of blood	
	Blood entering lungs	Blood leaving lungs
X	10.6	19.0
Y	58.0	50.0

(i) Name the two gases.

(2)

gas **X** .....

gas **Y** .....

(ii) How much of gas **X** enters 100 cm^3 of blood, before the blood leaves the lungs?

(1)

..... cm^3

(iii) What term is used to describe how the process of gas exchange takes place?

Put a cross ☒ in the box to indicate your answer.

(1)

☒ **A** active transport

☒ **B** diffusion

☒ **C** transpiration

☒ **D** osmosis

Q4.

Diagram 1 shows the female reproductive system.

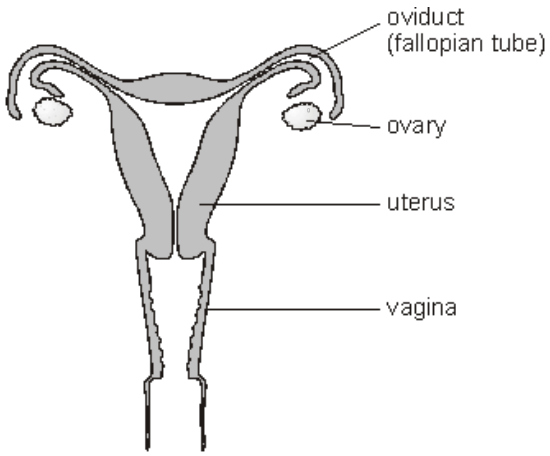


diagram 1

(a) **Diagram 2** is a graph showing how the thickness of the uterus changed over a 28-day cycle.

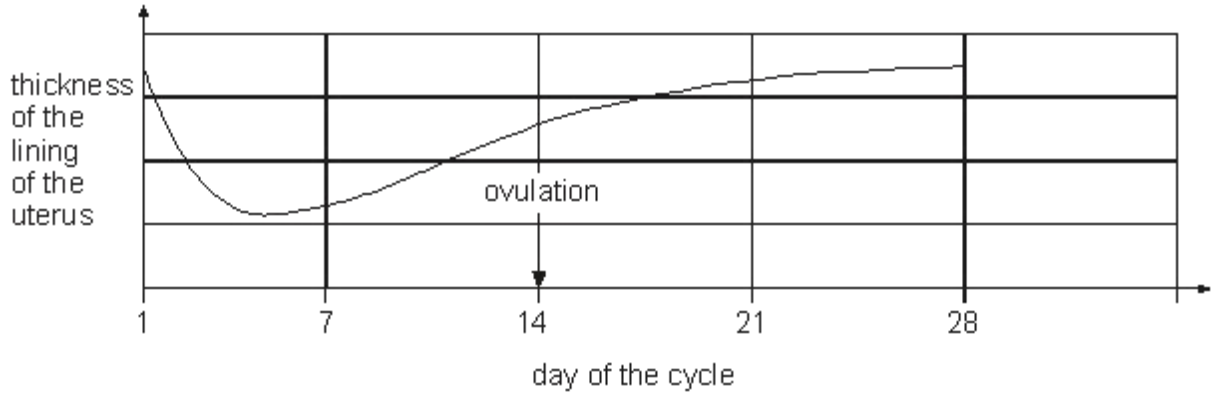


diagram 2

USE THE GRAPH TO ANSWER THE QUESTIONS OVER PAGE

USE THE GRAPH TO ANSWER THESE QUESTIONS

(i) Why did the thickness of the lining of the uterus decrease between day 1 and day 5 of this cycle?

.....

.....

1 mark

(ii) Suggest which day in this cycle an ovum (egg) is most likely to be fertilised.

day .....

What evidence is there for this in the graph?

.....

.....

1 mark

(iii) The graph shows that the lining of the uterus builds up again between day 5 and day 14.

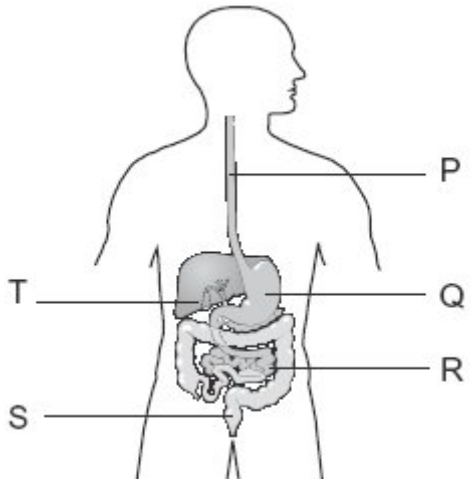
Why is this necessary?

.....

.....

1 mark

Q5. (a) The diagram shows part of the human digestive system.



(i) Write the letter which labels the small intestine.

.....

1 mark

(ii) Write the letter which labels the stomach.

.....

1 mark

(b) The liver produces bile.

(i) Explain how bile aids digestion.

_____

_____

_____

1 mark

(ii) Excessive consumption of alcohol can cause liver damage such as cirrhosis of the liver.

Explain a possible effect of alcohol abuse on digestion.

_____

_____

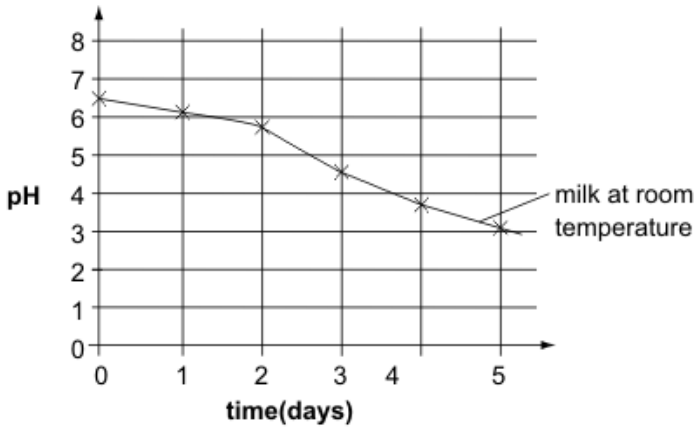
_____

2 marks

Q6. Jane stored some milk at room temperature for five days in a sealed container. She used a pH sensor and data logger to record the pH of the milk for 5 days.

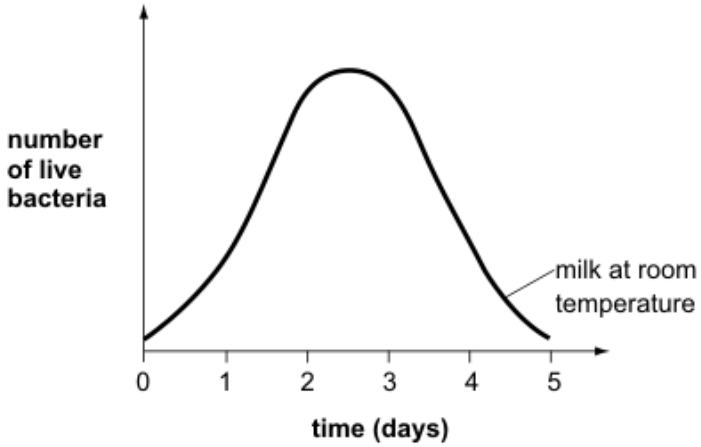
Her results are shown below

graph 1



(a) Jane predicted that the number of live bacteria in the milk would change as shown below.

graph 2



(i) Suggest one reason why the number of live bacteria would start to decrease after 3 days.

.....

.....

1 mark

(ii) What evidence from **graph 1** suggests that there were still some live bacteria in the milk on day 5?

.....

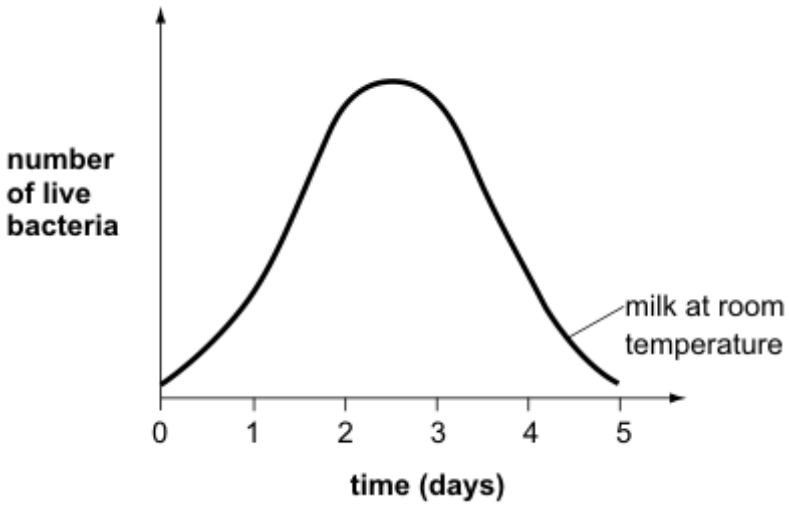
....

1 mark

(b) Jane put some fresh milk in a sealed container in the fridge.
She measured the number of bacteria in the milk every day for five days.

On **graph 4** below, draw a line to predict how the number of live bacteria in **refrigerated milk** will change over five days.

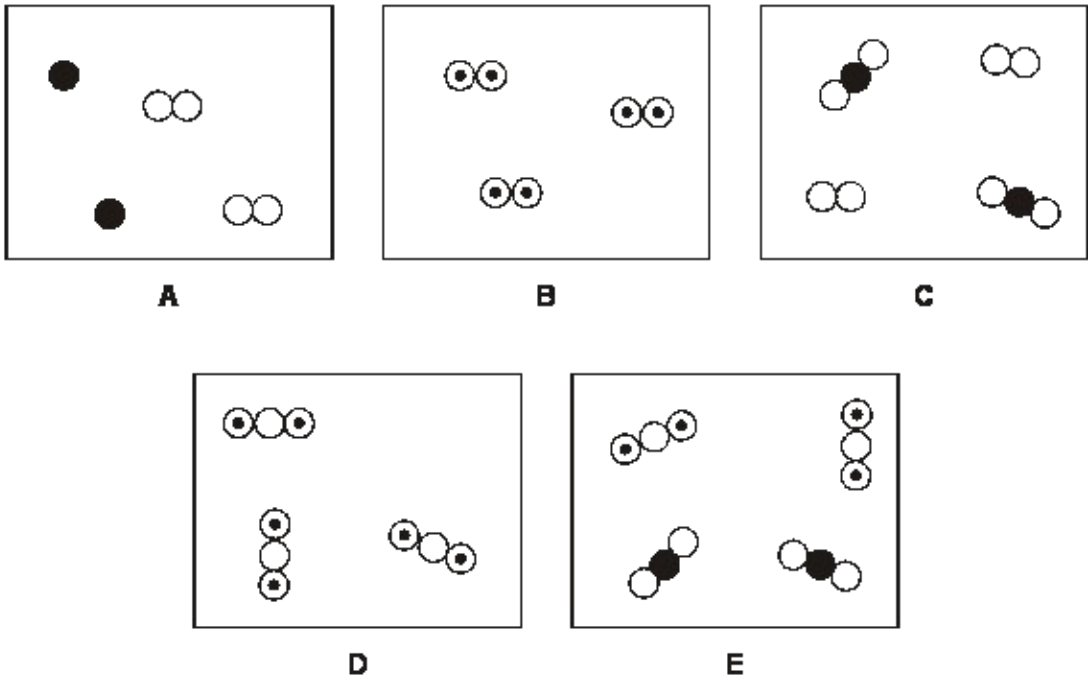
graph 4



1 mark

Q7. In the 19th Century, a scientist called John Dalton used symbols to represent atoms. The symbols he used for atoms of three different elements are shown below.

The diagrams below show different combinations of these atoms.



(a) (i) Give the letter of the diagram which shows a mixture of **two** elements.

.....

1 mark

(ii) Give the letter of the diagram which shows a mixture of **two** compounds.

.....

1 mark

(b) Suggest a name and formula for the substance represented in diagram B.

name .....

formula .....

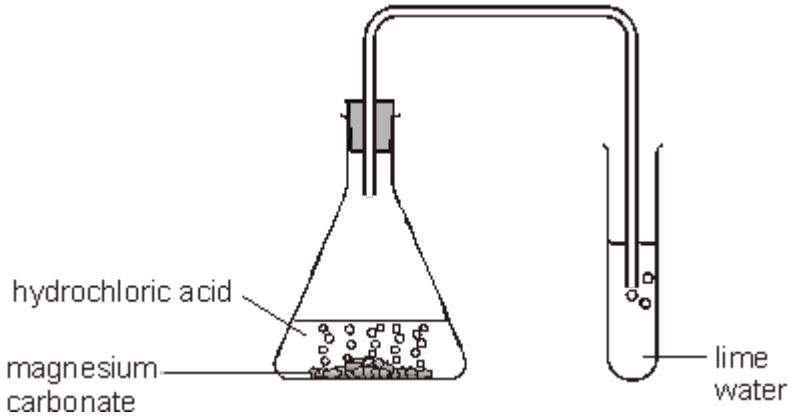
1 mark

Q8.

The word equation for the reaction between magnesium carbonate and hydrochloric acid is shown below.

magnesium carbonate + hydrochloric acid → magnesium chloride + carbon dioxide + water

(a) Sadiq added hydrochloric acid to magnesium carbonate in a flask.



(i) Suggest the pH of hydrochloric acid.

.....

(ii) The carbon dioxide produced was bubbled through lime water.

How would the lime water change?

.....

2 marks

(b) Sadiq repeated the experiment by adding **sulphuric acid** to magnesium carbonate.

Complete the word equation for the reaction that took place.

magnesium carbonate + sulphuric acid → ..... + carbon dioxide + water

1 mark

Q9. A long time ago sulphuric acid was made by heating a substance called **blue vitriol**.
The equations below show how sulphuric acid is produced by this method.

blue vitriol ⟶ copper oxide + sulphur trioxide + water

sulphur trioxide + water ⟶ sulphuric acid

(a) Name **three** elements contained in blue vitriol.

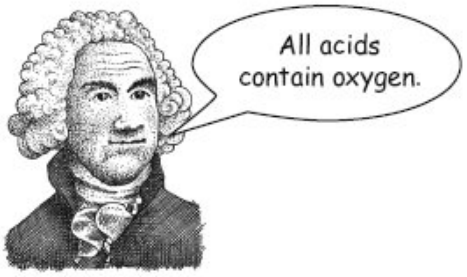
1. .....

2. .....

3. .....

3 marks

(b) (i) Anton Lavoisier was a scientist. He made acids by dissolving oxides like sulphur oxide and nitric oxide in water. They formed two acids; sulphuric acid and nitric acid. From this, he concluded:



Anton Lavoisier

The formulas for these two acids are H_2SO_4 and HNO_3.
How do these formulas support Lavoisier's conclusion about acids?

.....

.....

1 mark

(ii) Some time after Lavoisier's death, hydrochloric acid was identified.
The formula for hydrochloric acid is HCl.

Explain why scientists no longer supported Lavoisier's conclusion about acids.

.....

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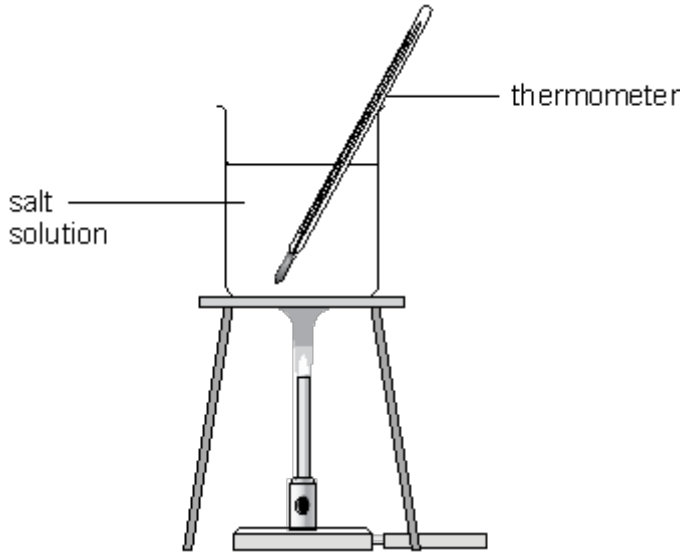
1 mark

Q10. Neera and Tom dissolved different masses of salt in 500 cm^3 of water.

They measured the temperature at which each salt solution boiled.



(a) They wrote down the variables that might affect the investigation.

temperature of the laboratory	mass of salt dissolved in water	starting temperature of the water
boiling point of salt solution	volume of water	type of salt used

(a) What is the independent variable (the variable they changed) in their investigation?

.....

1 mark

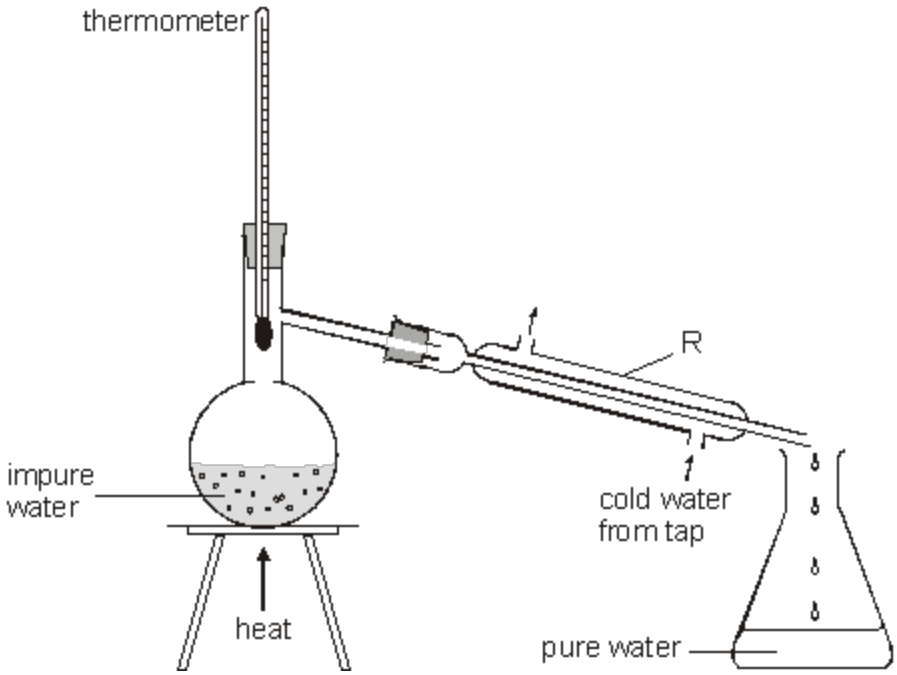
(b) What is the dependent variable (the variable they measured) in their investigation?

.....

1 mark

Q11.

The apparatus in the diagram below is used to obtain pure water from impure water.



(a) What temperature would the thermometer show?

.....°C

1 mark

(b) What is the function of the piece of apparatus labelled R?

.....

.....

1 mark

(c) Give the name of the process which purifies water in this way.

.....

1 mark

Q12.

Six groups of pupils burned magnesium in air. The magnesium reacted with oxygen to form magnesium oxide.

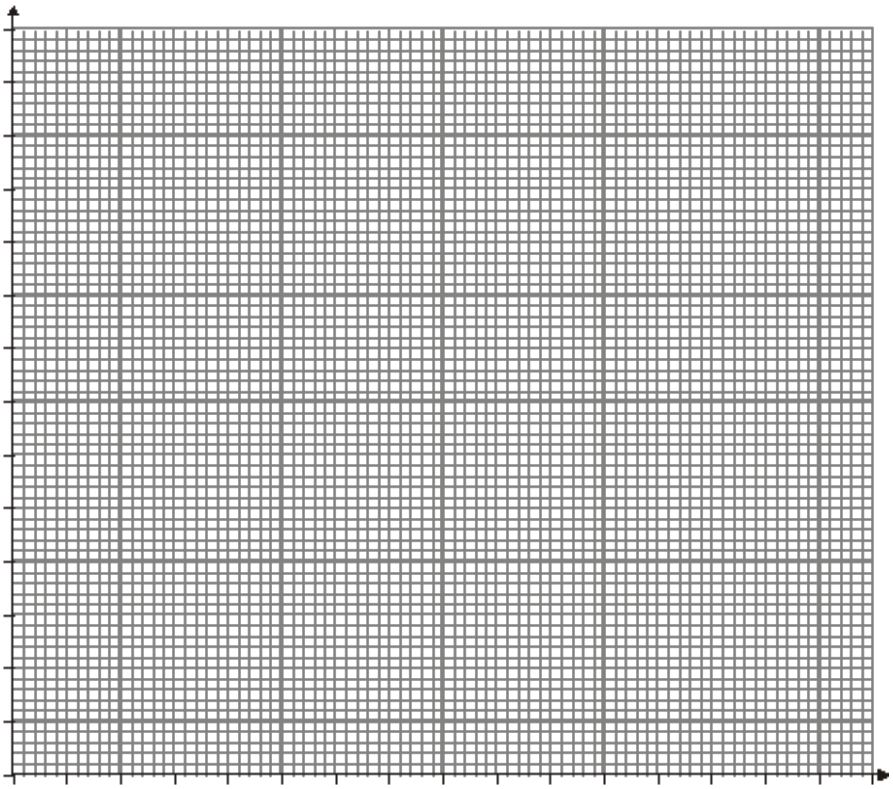
They recorded the mass of magnesium used and the mass of magnesium oxide
formed. Their results are shown in the table.

group	mass of magnesium (g)	mass of magnesium oxide (g)
A	3.2	5.2
B	3.8	6.5
C	4.2	7.0
D	4.9	8.6
E	5.4	8.0
F	6.1	10.7

Use their results to draw a graph below.

- Decide the scale for each axis.
- Label the axes.
- Plot the points.
- Draw a line of best fit.

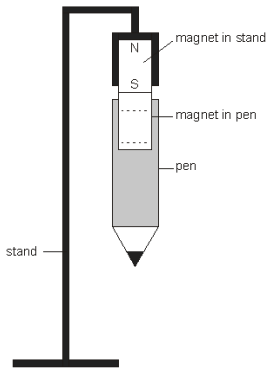
3 marks



Q13.

The diagram below shows a pen.

The pen is held up by two magnets, one in the stand and the other in the pen.

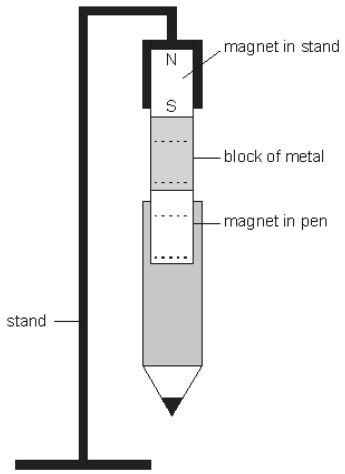


(a) **On the dotted lines above**, label the North pole and the South pole of the
magnet in the pen.

Use the letters N and S.

1 mark

(b) John put a block of metal between the two magnets as shown below.



The block of metal became a magnet.

(i) **On the dotted lines above**, label the North poles and the South poles of
both the block of metal **and** the magnet.

Use the letters N and S.

1 mark

(ii) What metal could the block be made of?

.....

1 mark

(c) John repeated the experiment using a piece of wood instead of a block of metal.
The pen did **not** stay up.
Give the reason for this.

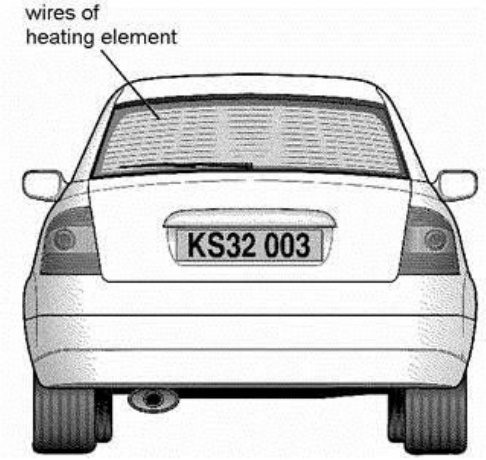
.....

1 mark

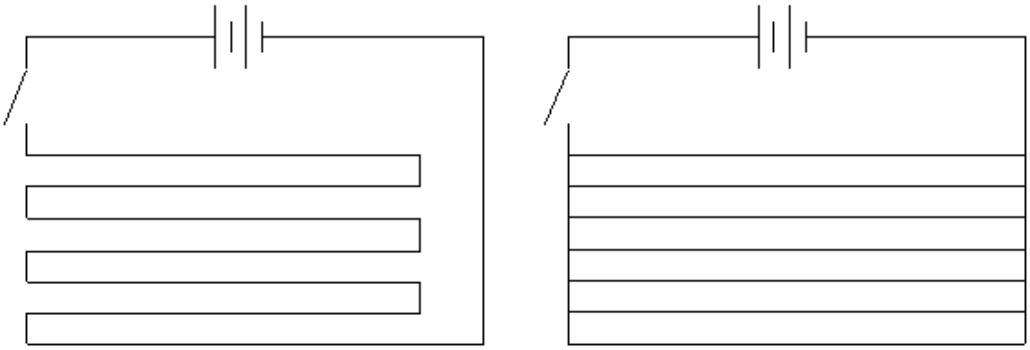
Q14.

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**

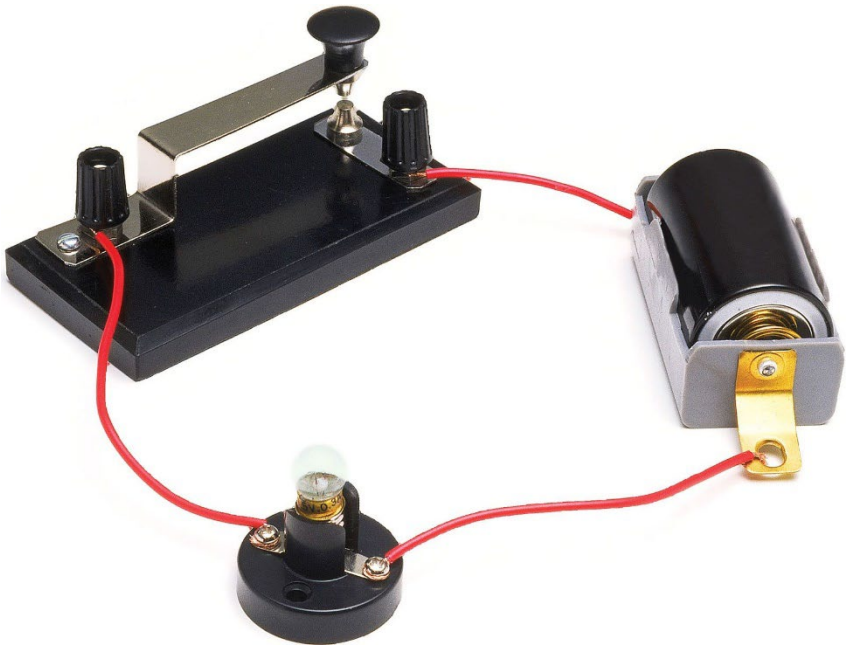
(a) Give the name of each type of circuit:

circuit A .....

circuit B .....

1 mark

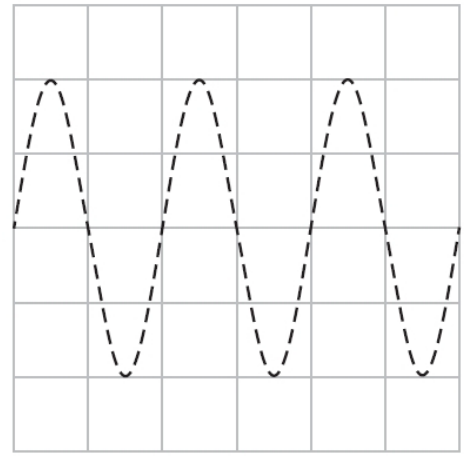
(b) The photograph shows the circuit that a student makes



Draw a circuit diagram to show how the components in the photograph are connected.

3 marks

Q15. On the grid below, sketch the trace of a sound wave with a lower volume and a higher frequency than the wave shown by the dotted line.



2 marks

Q16. Two students investigate the speed of sound waves in air.

They have a bell.
They use a stopwatch that shows times to the nearest 0.1 s.

They use an outdoor running track as their measure of distance.
The track is straight and 100 m long.

Describe what they must do to obtain a value for the speed of sound.

4 marks

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Q17. Here is some information about the sunrise times in a city.

Date	Sunrise time	Sunset time
1st January	5.30 am	9.30 pm
1st April	7.00 am	6.30 pm
1st June	8.30 am	4.00 pm
1st October	7.00 am	6.30 pm

a) Explain how you know that the city is **not** in the UK.

_____

_____

1 mark

b) Explain why the length of the day changes during the year.

_____

_____

1 mark

END OF QUESTIONS