Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2019

Single Award Science

Unit 4

Booklet B

Foundation Tier

[GSA42]

GSA42

TUESDAY 28 MAY 2019, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all** questions.

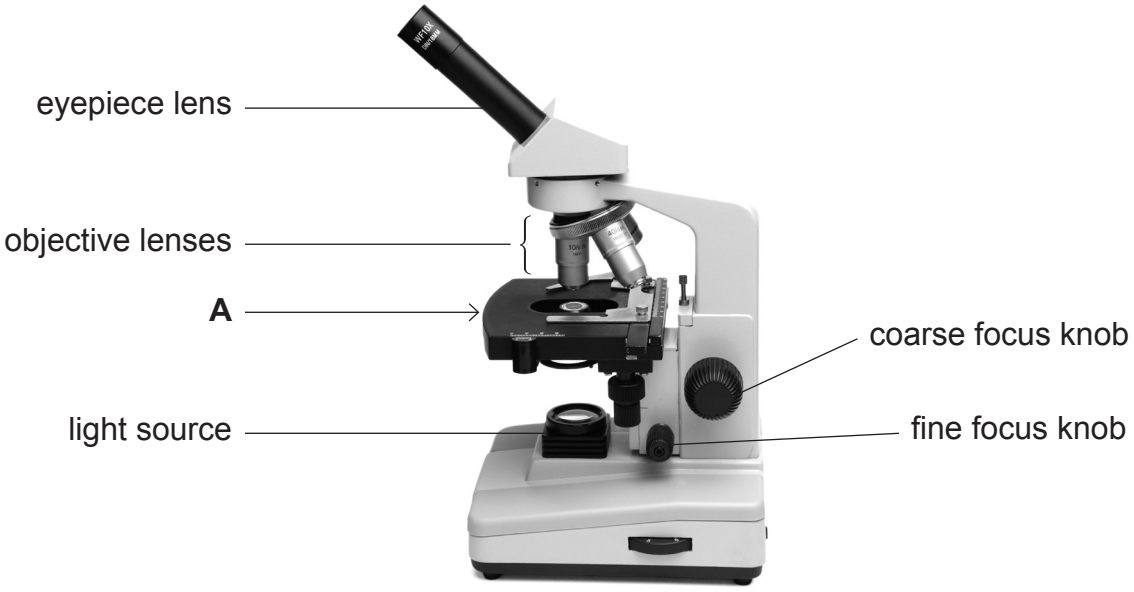
INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **3(a)(i)**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

12287.07**R**

Section A – Biology

1 **(a)** The diagram below shows a microscope that can be used to look at onion cells.



(i) Name the part of the microscope labelled **A**.

_____ [1]

(ii) The eyepiece lens has the label '×10'.
What is the effect of using this lens on the appearance of the cells?

Circle the correct answer.

appear 10 times bigger

appear 10 times smaller

appear 10 times brighter

[1]

(iii) Complete the following sentences to describe good practice when using a microscope.

Choose from:

close to : fine : coarse : far away from

Start with the objective lens _____ the slide.

Then turn the _____ focus knob until the

image is nearly in focus. Finally use the _____

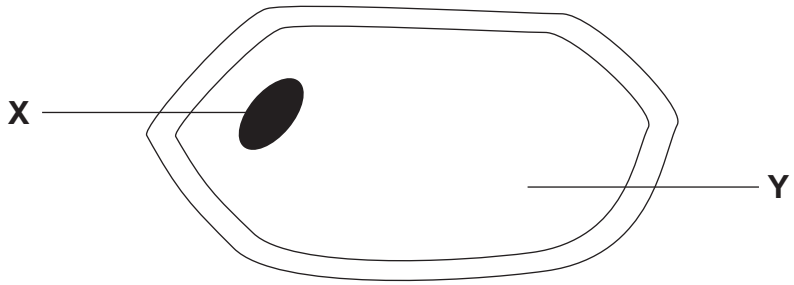
focus knob to produce a clearer image. [2]

(b) When making a slide of onion cells, a thin layer of onion skin should be used.

(i) Suggest **one** reason why it is important that the layer is thin.

_____ [1]

The diagram below shows the sketch of one onion cell as viewed under a microscope.



(ii) Name the parts labelled **X** and **Y**.

Choose from:

cytoplasm chloroplast nucleus

X _____

Y _____ [2]

[Turn over

2 **(a)** Paul tested a sample of food and found it contained both protein and sugar.

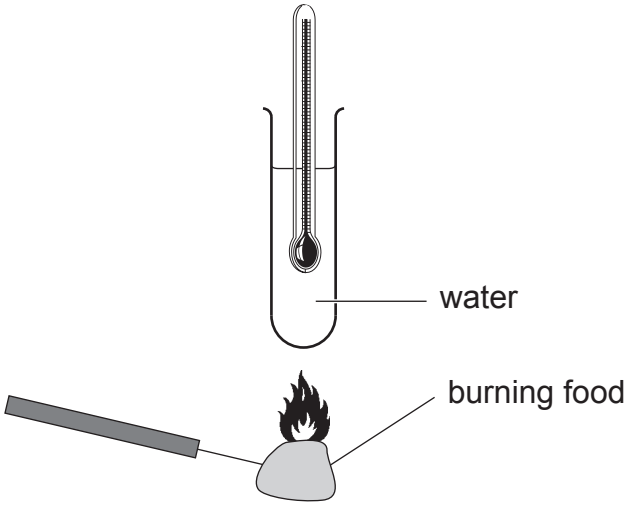
(i) Complete the table below. [2]

Food type	Reagent	Initial colour	Final colour
protein	Biuret	blue	
sugar		blue	brick red

(ii) Paul then tested a different sample of food for sugar. How could he tell that it did **not** contain sugar?

_____ [1]

(b) Jane investigated the energy content in two different foods (**A** and **B**) using the apparatus shown below.



She used the burning food to heat the water. Her results are shown below.

	Temperature of water/°C	
Food	**At start**	**At end**
A	13	21
B	18	23

(i) Name the piece of apparatus she used to measure temperature.

_____ [1]

(ii) Calculate the temperature rise produced by food **A**.

(Show your working out.)

_____ °C [2]

(iii) Jane thought that food **B** contained more energy than food **A**.
Explain why her conclusion is **incorrect**.

_____

_____ [1]

[Turn over

3 **(a)** During photosynthesis a plant produces glucose which is stored as starch.

(i) Describe how you would show that a leaf taken from a plant contained starch.

Your answer should include:

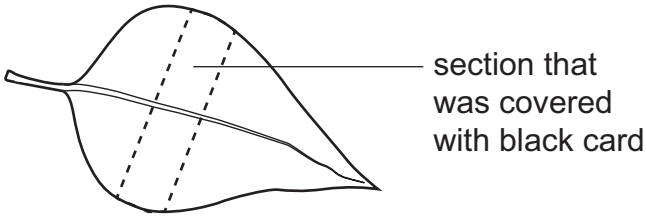
- the steps involved in the test
- **one** reason for each step
- **one** safety precaution (apart from wearing safety goggles).

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

The diagram below shows a leaf which has been partially covered with black card and left in bright light.

(ii) On the diagram below shade the parts of the leaf that would contain starch.



[1]

(b) A gardener wants to investigate factors that affect the rate of photosynthesis. She thinks the amount of light the plant gets is important.

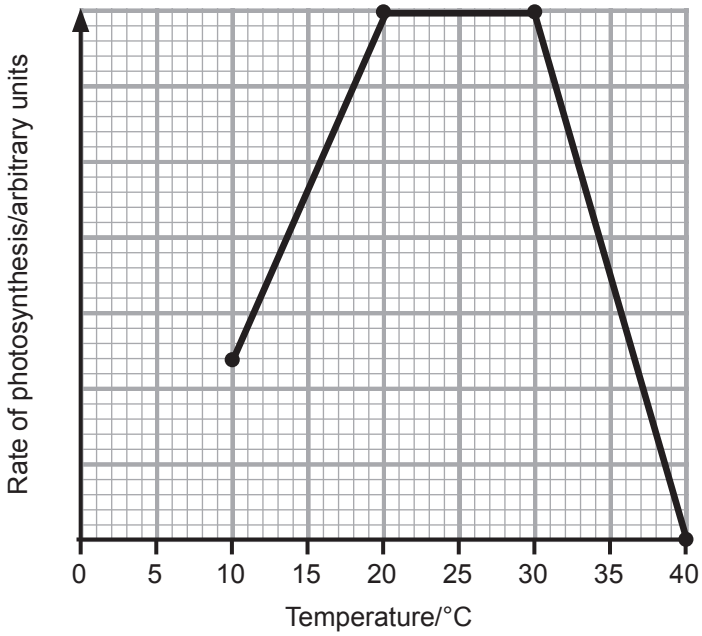
Place a tick (✓) beside the most suitable hypothesis to test this idea.

Hypothesis	Tick (✓)
if a plant gets plenty of light it will grow well	
the more light a plant gets the healthier it will be	
the more light a plant gets the more it will photosynthesise	

[1]

[Turn over

(c) Another gardener thinks the higher the temperature the more a plant will photosynthesise. To investigate this he measured the rate of photosynthesis at different temperatures.
His results are shown below.



The gardener concluded that the **best** temperature for photosynthesis is between 20 °C and 30 °C.

(i) What evidence from the graph supports his conclusion?

_____

_____ [1]

(ii) The gardener wants to get a more accurate value for the best temperature, so he carries out the experiment again. What temperatures should he investigate?

Circle the correct answer.

20 °C and 30 °C

10 °C, 20 °C, 30 °C and 40 °C

22 °C, 24 °C, 26 °C and 28 °C [1]

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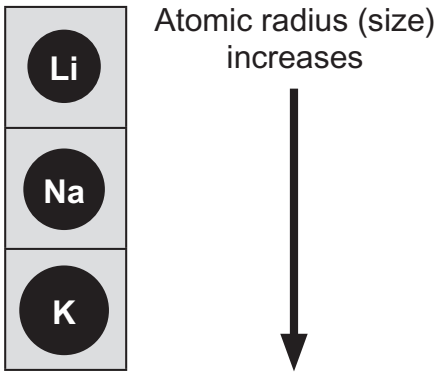
(Questions continue overleaf)

Section B – Chemistry

4 **(a)** James studied the alkali metals (Group 1). He found that the atoms of the elements increased in size going down the group.



He suggested that because the atoms increased in size they could not move as fast and would be less reactive. To investigate this his teacher added a piece of each metal to water and timed how long it took for the metal to disappear.

(i) State **two** safety precautions the teacher would take during the demonstration.

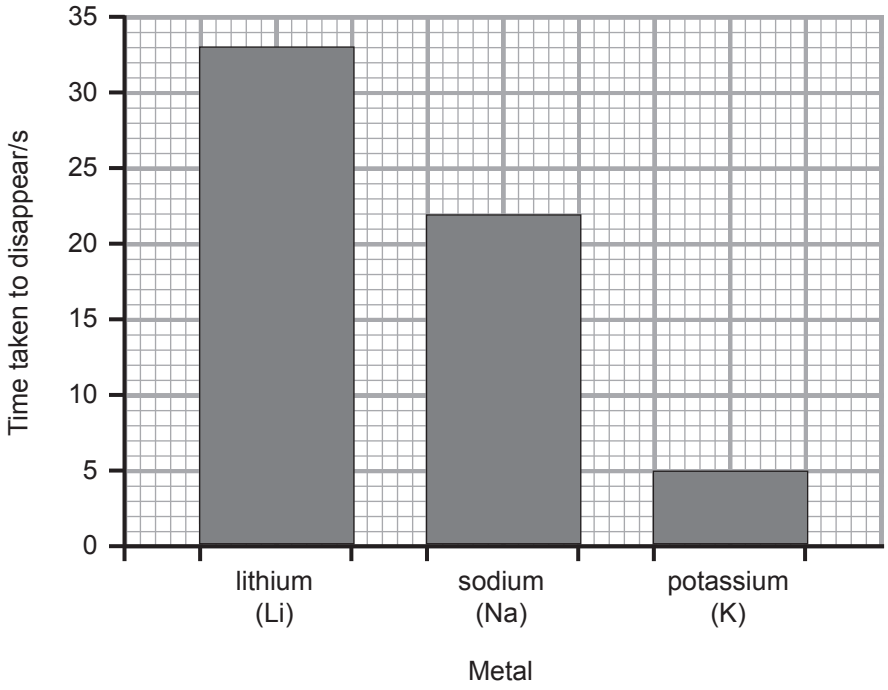
1. _____

2. _____ [2]

(ii) State **one** thing that had to be kept the same to make this a fair test.

_____ [1]

(b) The bar chart below shows the results of the investigation.



(i) Complete the sentence below to give the trend shown in these results.

As you go down Group 1 _____

_____ [1]

(ii) James was incorrect in suggesting that bigger atoms would be less reactive. Use the results in the bar chart to explain why he was incorrect.

_____

_____ [1]

(c) Name the gas produced when the alkali metals react with water.

Choose from:

oxygen : **carbon dioxide** : **hydrogen**

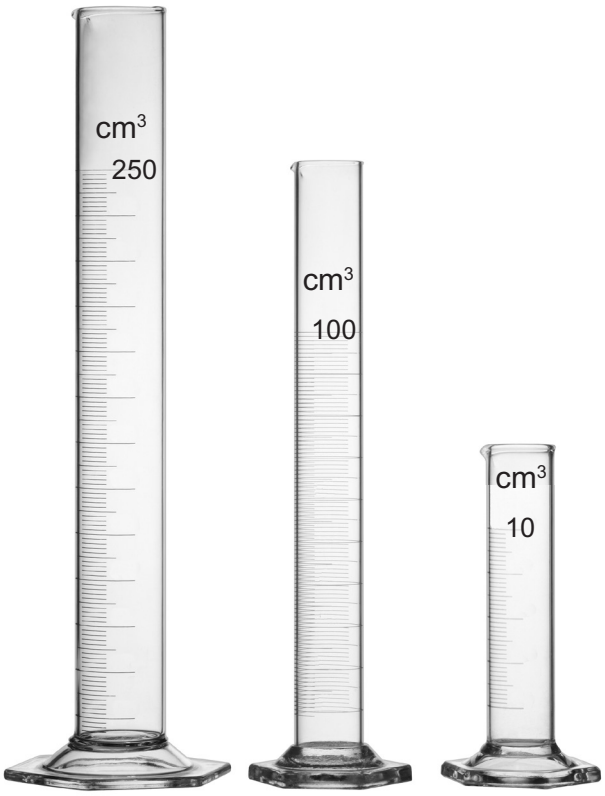
_____ [1]

[Turn over

5 Indigestion tablets are used to neutralise excess acid in the stomach. A student compared the effectiveness of four brands of tablets (**A**, **B**, **C** and **D**) by using the following method.

1. Crush the tablet.
2. Add 50 cm^3 of water and stir to dissolve.
3. Add a few drops of universal indicator solution.
4. Add 5 cm^3 of hydrochloric acid and stir.
5. Continue adding 5 cm^3 of acid until the indicator turns green (pH7).
6. Record the volume of acid needed to neutralise the tablet.

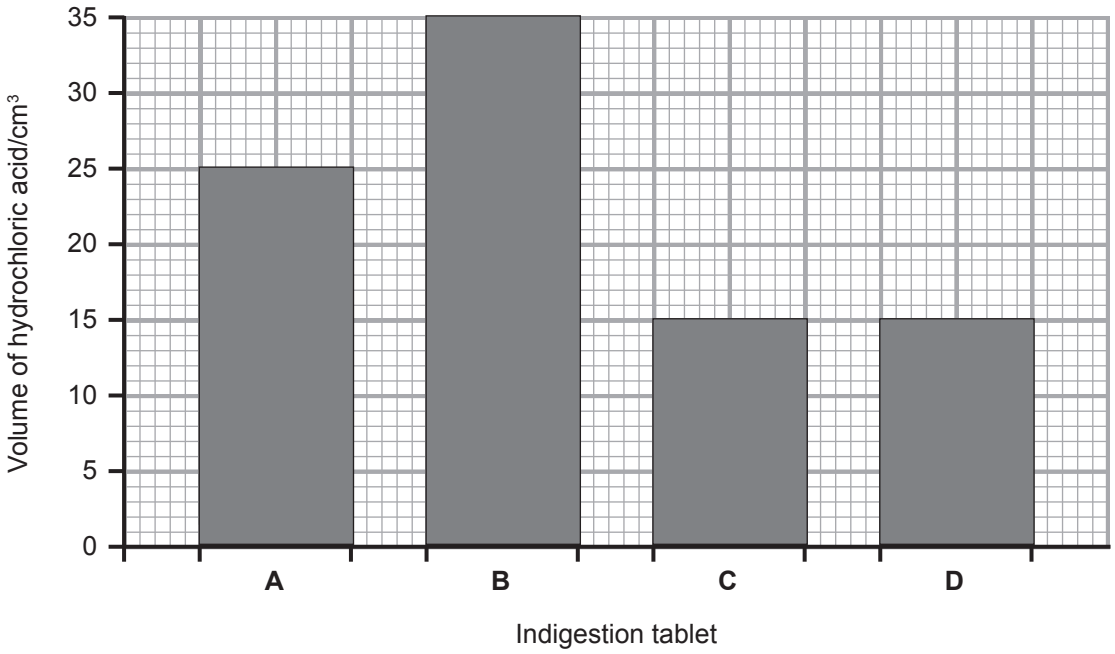
The student used a measuring cylinder to measure the volume of acid.



(a) Which measuring cylinder (**X**, **Y** or **Z**) would be most suitable to measure the volume of acid in steps 4 and 5?

_____ [1]

(b) The bar chart below shows the volume of acid that neutralised each tablet.



(i) State the range of the volume of hydrochloric acid used in this investigation.

_____ cm^3 [1]

The student decided to change his method and retest tablets **C** and **D**.
In step 4 he added 10 cm^3 of acid and then in step 5 he added 1 cm^3 at a time, until the indicator turned green.

(ii) Why did the student decide to retest tablets **C** and **D**?

_____ [1]

(iii) Explain how this new method might help to improve his results for tablets **C** and **D**.

_____

_____ [1]

[Turn over

The diagram below gives some of the colours of universal indicator with the corresponding pH value.

yellow	light green	green	dark green	turquoise	pale blue
5	**6**	**7**	**8**	**9**	**10**

(iv) Using the information above, explain why universal indicator is **not** the best method to find pH7.

_____

_____ [1]

(v) Name a piece of equipment that could be used to give a more accurate pH value.

_____ [1]

When the student retested tablets **C** and **D** he found that tablet **C** needed 13 cm^3 of acid to neutralise it and tablet **D** needed 14 cm^3.

(vi) Using this information and the bar chart, put the tablets **A**, **B**, **C** and **D** in order of effectiveness.

_____ most effective

_____

_____

_____ least effective

[2]

(c) Sodium hydrogencarbonate is one of the chemicals in indigestion tablets.

When this reacts with acid, carbon dioxide is produced. Complete the following sentences about the chemical test for carbon dioxide.

Choose from:

limestone : colourless

lime green : limewater : milky

The chemical used to test for carbon dioxide is called

_____.

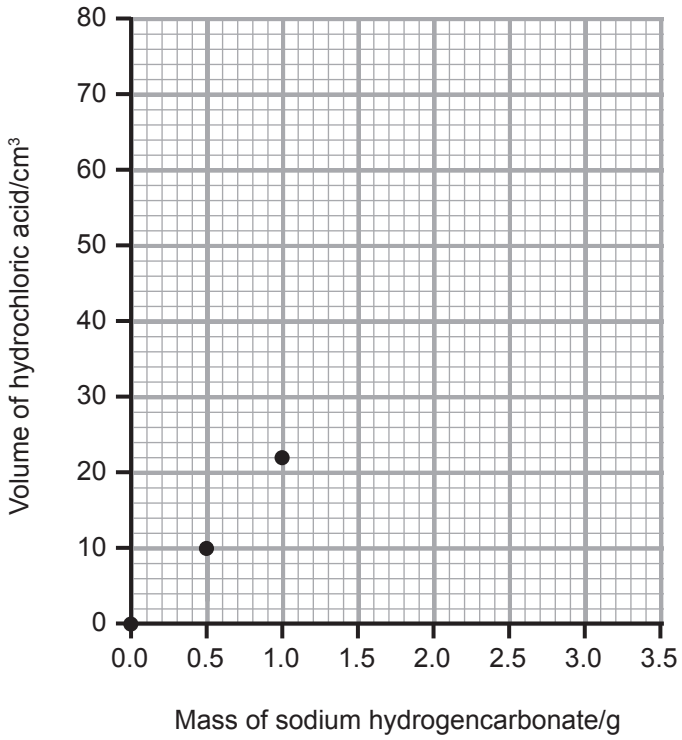
Its colour changes from _____ to

_____ if carbon dioxide is present. [2]

(d) The table below shows how much acid different amounts of sodium hydrogencarbonate will neutralise.

Mass of sodium hydrogencarbonate/g	Volume of hydrochloric acid/cm^3
0.0	0
0.5	10
1.0	22
1.5	30
2.0	40
2.5	50
3.0	61
3.5	72

(i) On the grid below plot and draw a line graph for these results. The first three points have been plotted for you.



[3]

(ii) Complete the sentence below to give the trend shown by these results.

As the mass of sodium hydrogencarbonate _____

_____ [1]

This graph can be represented by the equation:

$$y = mx + c$$

where **m** is the gradient of the line and **c** is the intercept on the *y*-axis.

(iii) What is the value for **c** on this graph?

Circle the correct answer.

0 cm^3 **40 cm^3** **80 cm^3**

[1]

(iv) Predict the volume of hydrochloric acid that would be needed to neutralise 4.0 g of sodium hydrogencarbonate.

_____ cm^3 [1]

(v) Did this investigation produce any anomalous results?
Explain your answer.

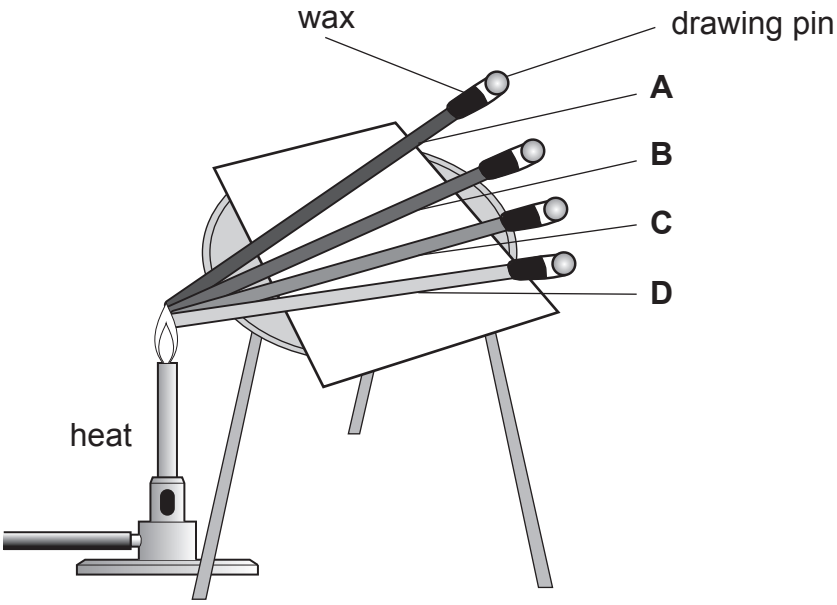
_____

_____ [1]

[Turn over

Section C – Physics

6 **(a)** A student wanted to investigate four metals to find out which was the best conductor of heat. He used the apparatus shown below.



Source: Principal Examiner

The metals were heated using a Bunsen burner and the student timed how long it took for the drawing pins to fall off.

(i) Name the piece of apparatus the student would have used to accurately measure this time.

_____ [1]

(ii) Give **one** variable that was kept the same to make this a fair test.

_____

_____ [1]

(iii) What type of variable is **time** in this investigation?

Circle the correct answer.

dependent **control** **independent**

[1]

(b) The investigation was carried out three times and an average calculated. The results are shown below.

	Time to fall/s			
Metal	**1**	**2**	**3**	**Average**
A	5.7	5.9	5.8	5.8
B	8.2	8.3	8.0	8.2
C	14.9	14.1	14.5	
D	10.7	20.1	10.5	10.6

(i) Why did the student carry out the investigation three times for each metal?

Circle the correct answer.

to improve accuracy

to make it a fair test

to improve reliability [1]

(ii) Calculate the average time for metal **C**.

(Show your working out.)

_____ s [2]

(iii) The student thought **one** of the times for metal **D** was an anomaly. Circle the anomalous result in the table above. [1]

(iv) Look at the student's table of results and state how he dealt with the anomalous result.

_____

_____ [1]

[Turn over

(v) Of the metals tested, copper was the best conductor.
Suggest which metal (**A**, **B**, **C** or **D**) was copper.

_____ [1]

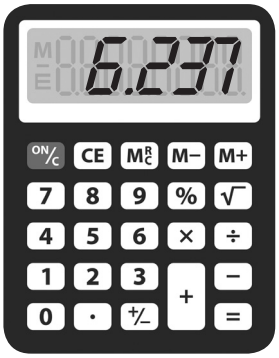
(vi) Which type of graph would be best to display this data?

Circle the correct answer.

bar graph : **line graph** : **pie chart**

[1]

A student tested another metal and the average time calculated is shown below.



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(c) Give this value to **one** decimal place.

_____ s [1]

(d) The student then tested another rod made from glass, which is an insulator.
What is the most likely time it took for the pin to fall off?

Circle the correct answer.

4 s **10 s** **600 s**

[1]

(e) Suggest **one** reason why the student should leave the apparatus for ten minutes before tidying it away.

_____

_____ [1]

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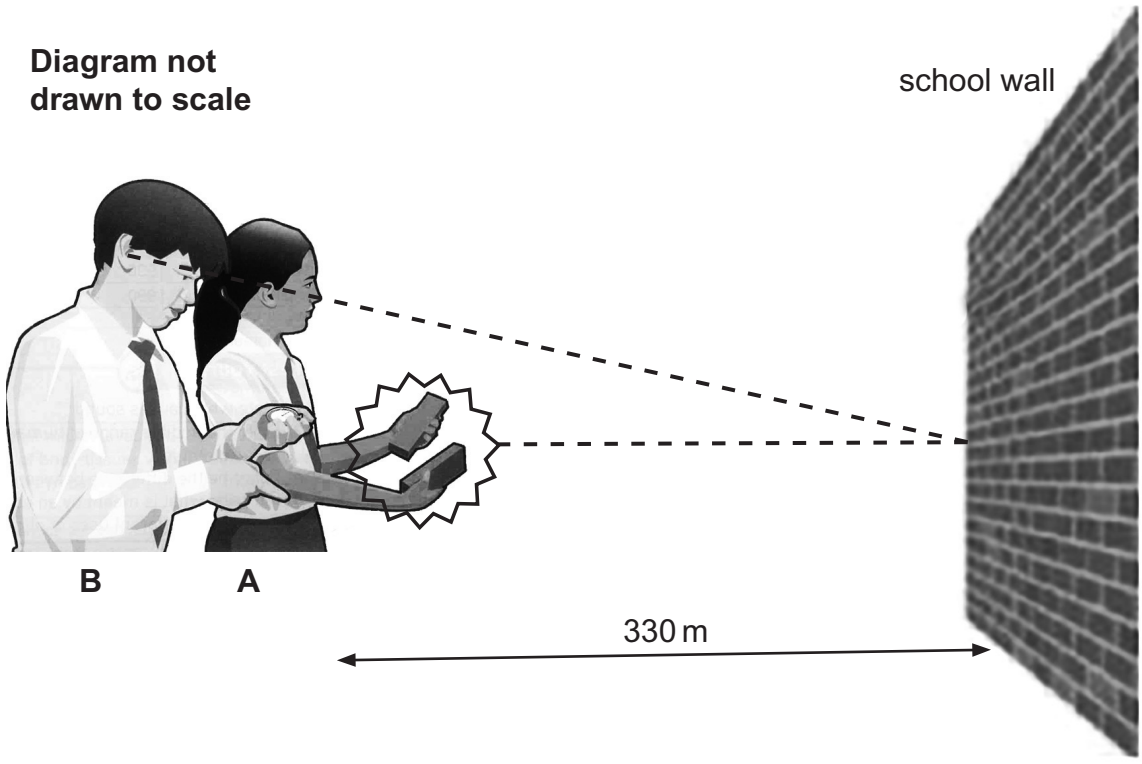
7 The diagram below shows two students **A** and **B** experimenting to find the speed of sound using the echo method.



Source: CCEA

The return time for the echo is measured by student **B**.

(a) When should he:

(i) start the timer?

_____ [1]

(ii) stop the timer?

_____ [1]

(b) The return time for the echo was 2 s.
How long did it take the sound to travel to the wall?

_____ s [1]

(c) Other pupils doing this experiment used a wall 150 m away to produce an echo. Their answer for speed was inaccurate. What was the most likely reason for this?

Circle the correct answer.

they could not measure the distance accurately

they could not measure the time accurately

they could not hear the echo

[1]

Slow reactions are a possible source of error in this experiment.
Student **B** takes 0.1 s to react when **starting the timer**.

(d) What effect, if any, will this have on the time he measured for the echo to return?

Circle the correct answer.

no effect : **longer time** : **shorter time**

[1]

(e) Which formula will be used to calculate the speed of sound?

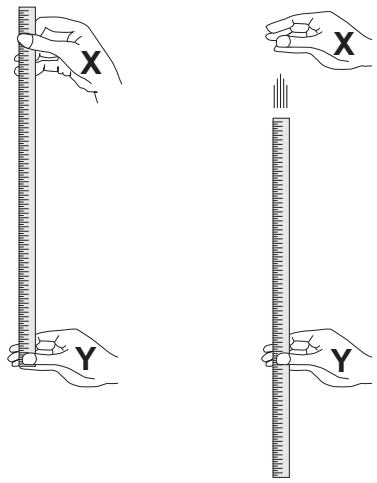
Circle the correct answer.

speed = distance – time : **speed = distance + time** : **speed = $\frac{\text{distance}}{\text{time}}$**

[1]

[Turn over

8 The diagram below shows two students **X** and **Y** using a ruler to test their reactions.



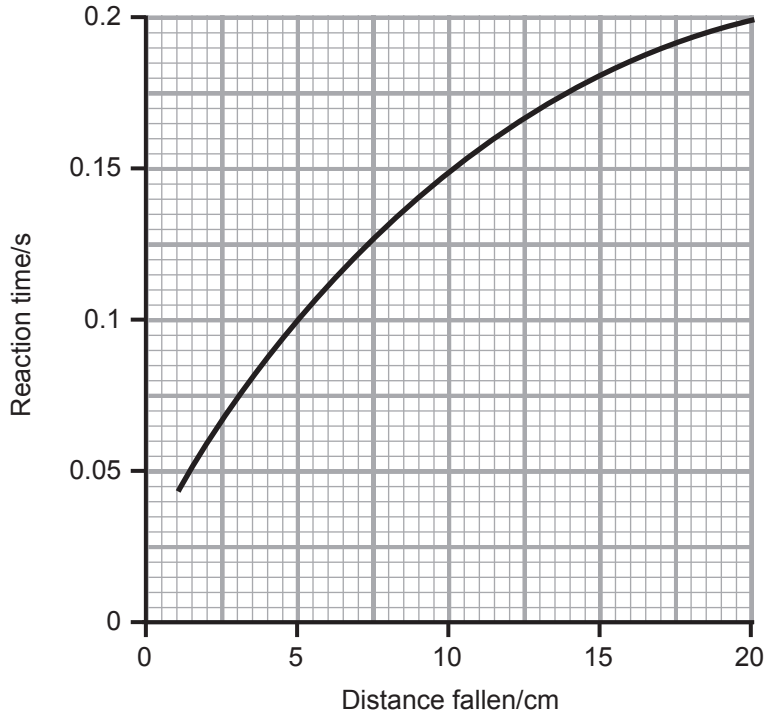
Source: Principal Examiner

(a) The reactions of which student (**X** or **Y**) are being tested?
Explain your answer.

_____

_____ [1]

The graph below shows the relationship between the distance fallen by the ruler and reaction times.



(b) Student **X** caught the ruler at a distance of 5 cm and student **Y** at 10 cm.

(i) Use the graph to compare the reaction times of student **X** and student **Y**.

_____

_____

_____ [2]

(ii) Student **X** was a girl and student **Y** was a boy.
Why is it **not** possible to conclude from this experiment that all girls have faster reactions than boys?

Circle the correct answer.

the test was only done once for each student

the test was only done for one boy and one girl

the test produced results that were too similar

[1]

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For Examiner's use only	
Question Number	Marks
1	
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Total Marks	

Examiner Number