



General Certificate of Secondary Education
2019

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--

Single Award Science

Unit 4

Booklet B

Foundation Tier

MV18

[GSA42]

TUESDAY 28 MAY 2019, AFTERNOON

Time

1 hour, plus your additional time allowance.

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 on blank pages.

Complete in black ink only.

Answer **all** questions.

Information for Candidates

The total mark for this paper is 70.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

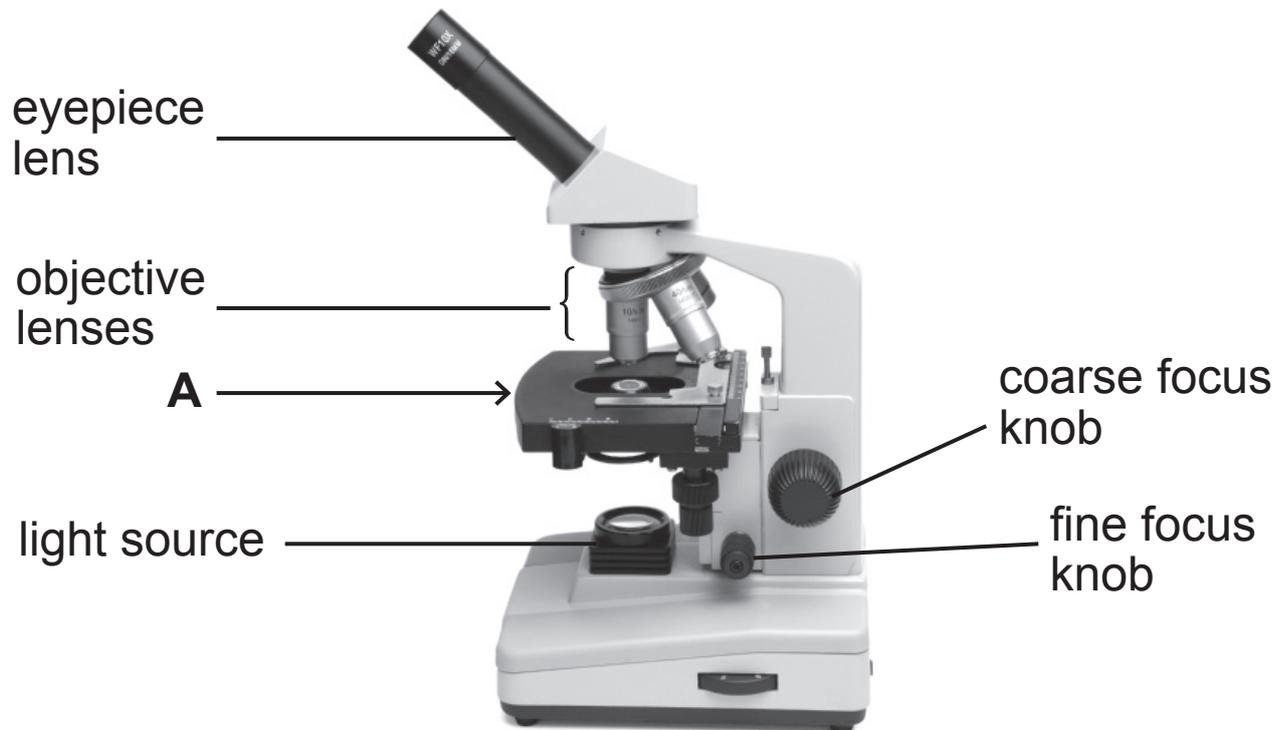
Quality of written communication will be assessed in

Question **3(a)(i)**.

A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper

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 mark]

- (ii) The eyepiece lens has the label '×10'.
What is the effect of using this lens on the appearance of the cells? [1 mark]

Circle the correct answer.

- appear 10 times bigger**
appear 10 times smaller
appear 10 times brighter

(iii) Complete the following sentences to describe good practice when using a microscope. [2 marks]
Choose from:

close to

fine

coarse

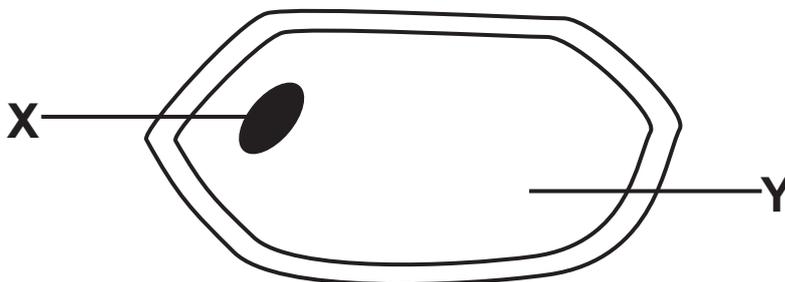
far away from

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.

(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 mark]

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



(ii) Name the parts labelled **X** and **Y**. [2 marks]

Choose from:

- cytoplasm
- chloroplast
- nucleus

X _____

Y _____

Blank page
(Questions continue overleaf)

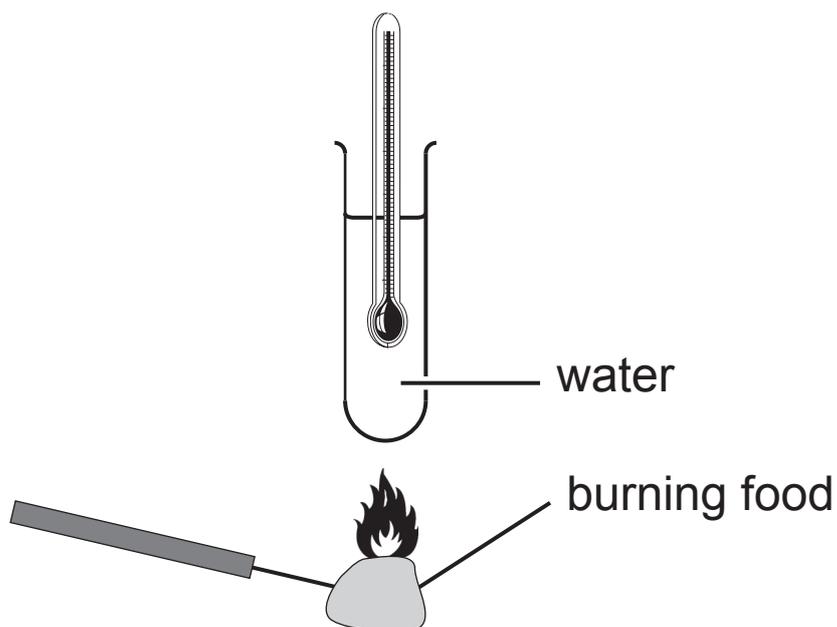
2 (a) Paul tested a sample of food and found it contained both protein and sugar.

(i) Complete the table below. [2 marks]

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 mark]

(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.

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

- (i) Name the piece of apparatus she used to measure temperature. [1 mark]

- (ii) Calculate the temperature rise produced by food **A**. [2 marks]

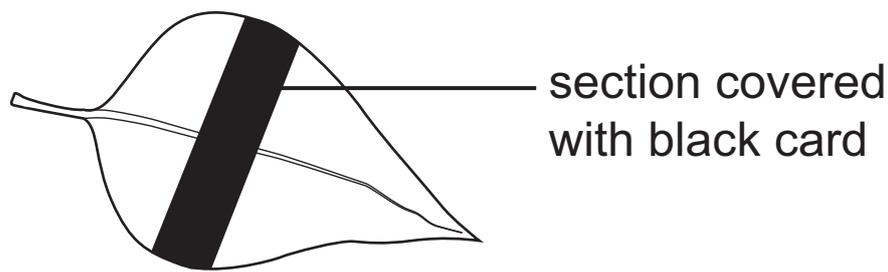
(Show your working out.)

_____ °C

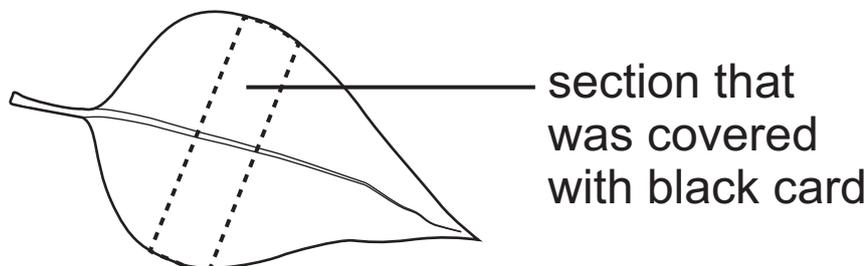
- (iii) Jane thought that food **B** contained more energy than food **A**.

Explain why her conclusion is **incorrect**. [1 mark]

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 mark]



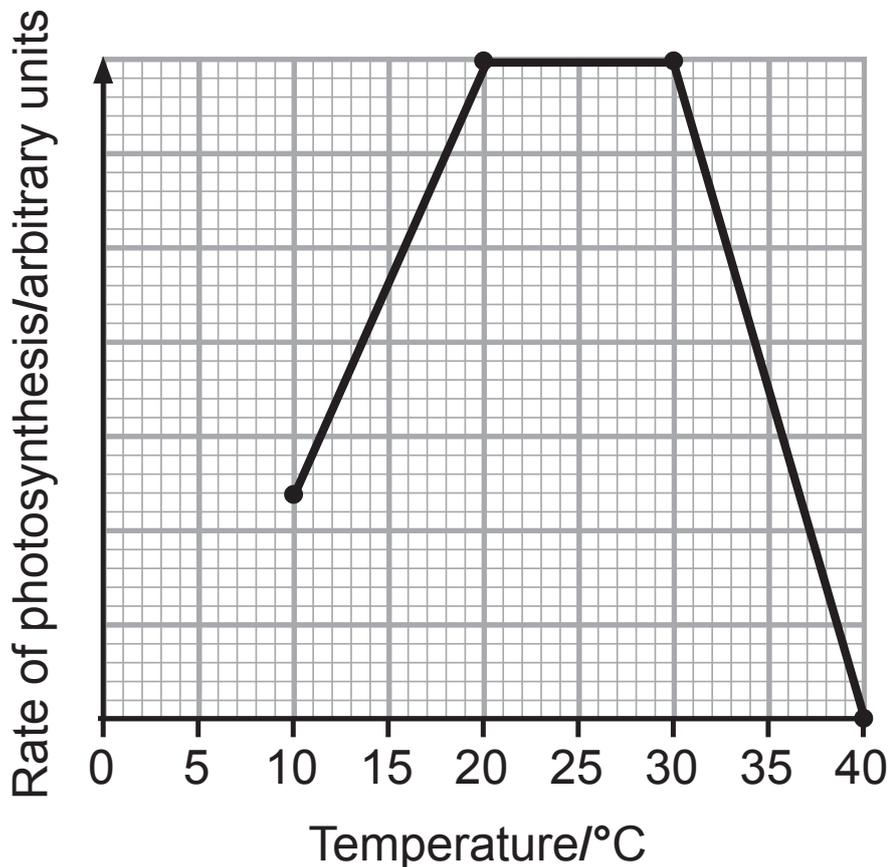
(b) A gardener wants to investigate factors that affect the rate of photosynthesis. She thinks the amount of light the plant gets is important.

Place a tick (✓) beside the most suitable hypothesis to test this idea. [1 mark]

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	

(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 mark]

(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. [1 mark]

20 °C and 30 °C

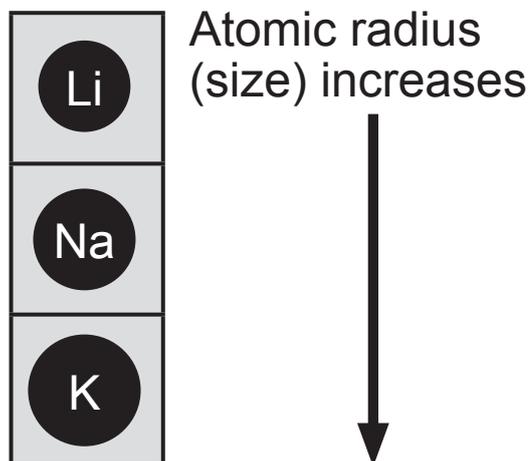
10 °C, 20 °C, 30 °C and 40 °C

22 °C, 24 °C, 26 °C and 28 °C

Blank page

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.

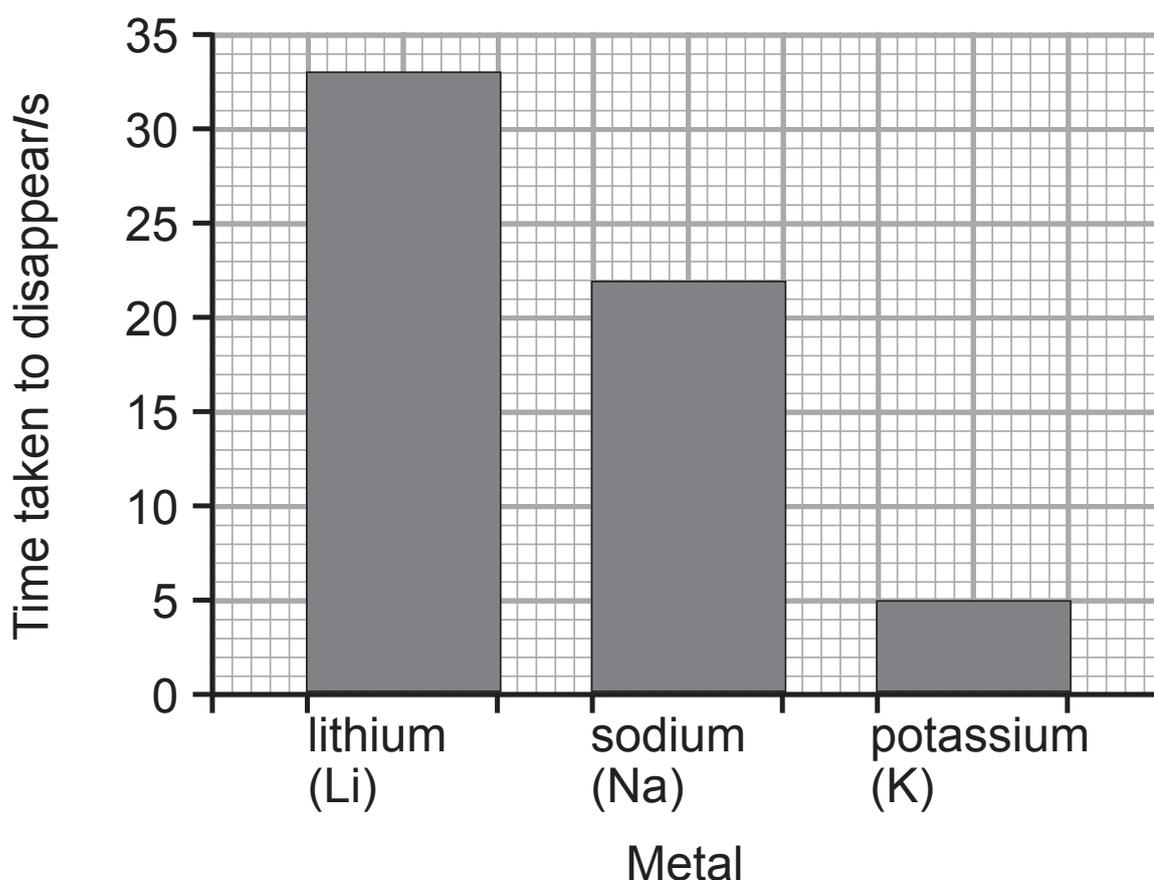
- (i) State **two** safety precautions the teacher would take during the demonstration. [2 marks]

1. _____

2. _____

- (ii) State **one** thing that had to be kept the same to make this a fair test. [1 mark]

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



- (i) Complete the sentence below to give the trend shown in these results. [1 mark]

As you go down Group 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 mark]

(c) Name the gas produced when the alkali metals react with water. [1 mark]

Choose from:

oxygen

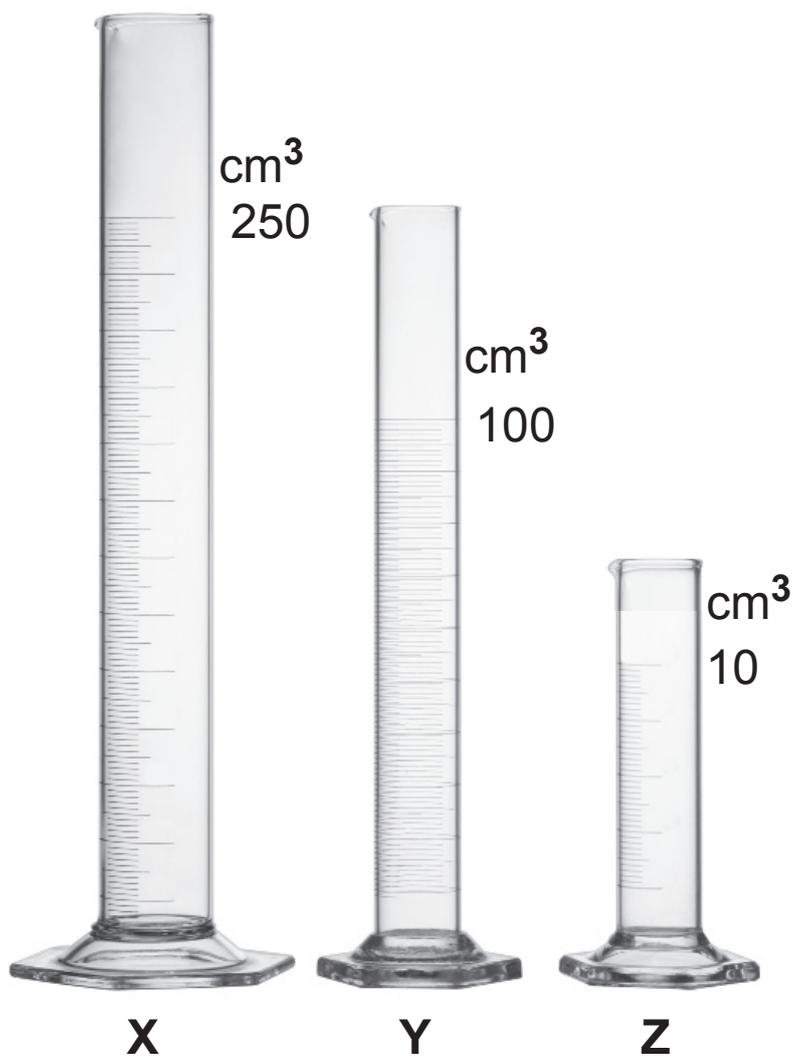
carbon dioxide

hydrogen

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.

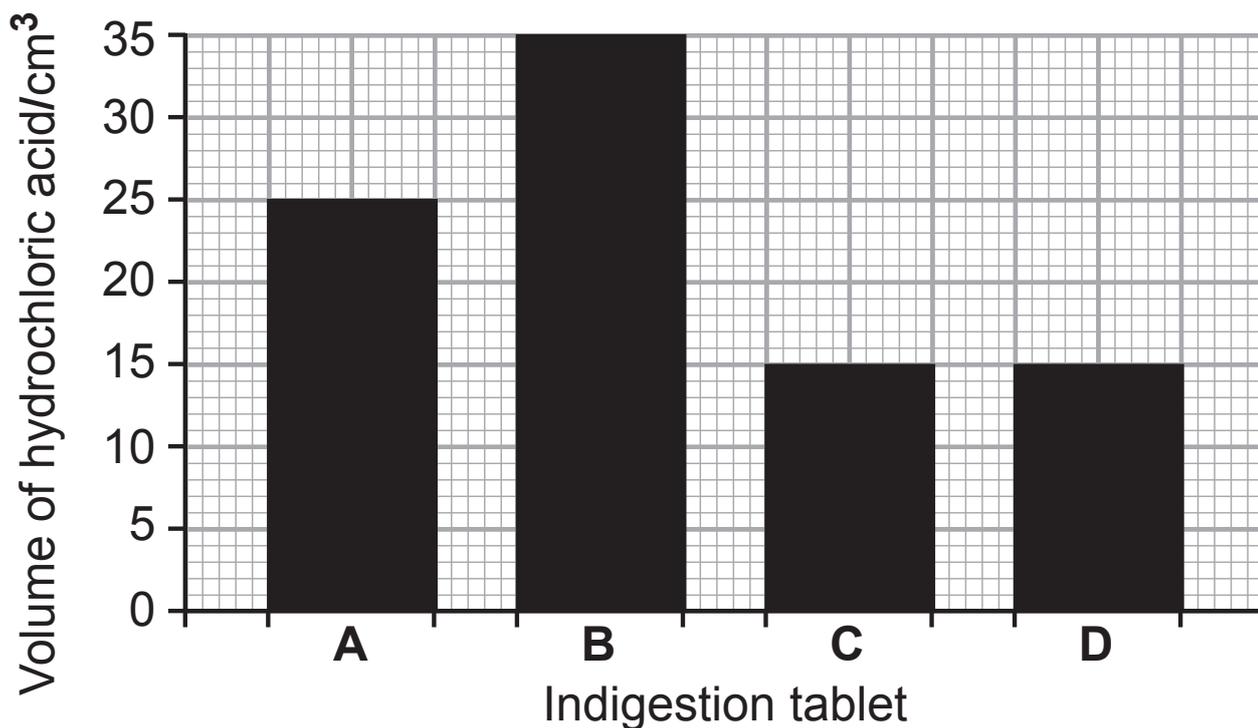
1. Crush the tablet.
2. Add 50 cm^3 of water and stir to dissolve.
3. Add a few drops of universal indicator solution.
4. Add 5 cm^3 of hydrochloric acid and stir.
5. Continue adding 5 cm^3 of acid until the indicator turns green (pH7).
6. Record the volume of acid needed to neutralise the tablet.

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 mark]

(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. [1 mark]

_____ cm³

The student decided to change his method and retest tablets **C** and **D**.

In step 4 he added 10 cm³ of acid and then in step 5 he added 1 cm³ at a time, until the indicator turned green.

(ii) Why did the student decide to retest tablets **C** and **D**? [1 mark]

(iii) Explain how this new method might help to improve his results for tablets **C** and **D**. [1 mark]

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

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

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

[1 mark]

(v) Name a piece of equipment that could be used to give a more accurate pH value. [1 mark]

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.

[2 marks]

_____ most effective

_____ least effective

(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. [2 marks]

Choose from:

limestone
colourless
lime green
limewater
milky

The chemical used to test for carbon dioxide is called

_____ .

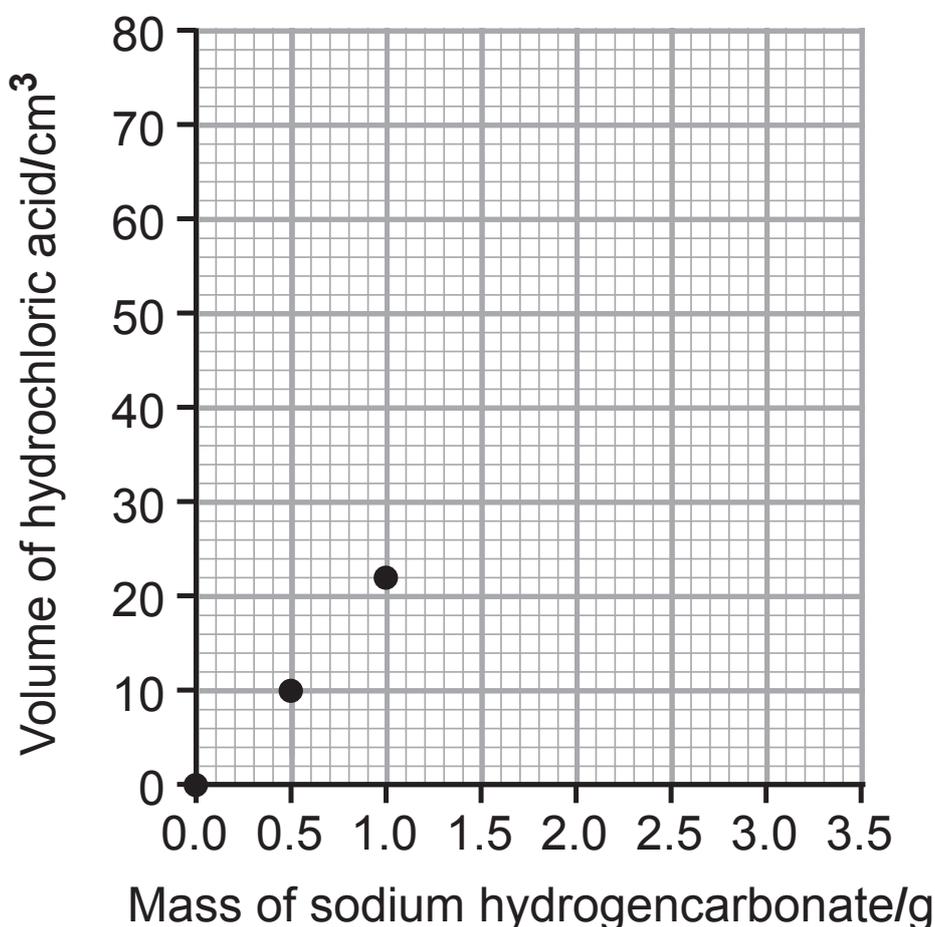
Its colour changes from _____ to

_____ if carbon dioxide is present.

- (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. [3 marks]
The first three points have been plotted for you.



- (ii) Complete the sentence below to give the trend shown by these results. [1 mark]

As the mass of sodium hydrogencarbonate _____

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? [1 mark]

Circle the correct answer.

0 cm³

40 cm³

80 cm³

- (iv) Predict the volume of hydrochloric acid that would be needed to neutralise 4.0 g of sodium hydrogencarbonate. [1 mark]

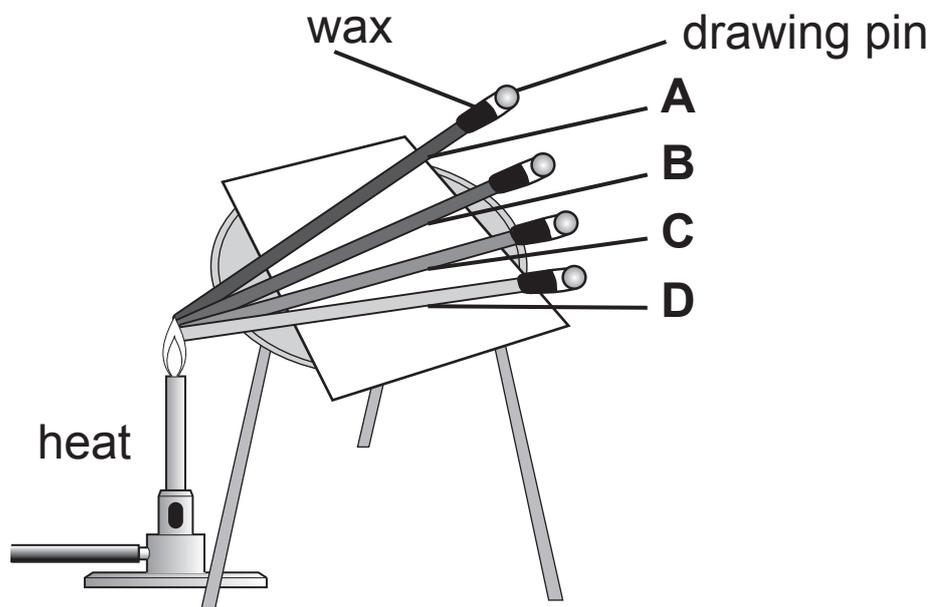
_____ cm³

- (v) Did this investigation produce any anomalous results? [1 mark]
Explain your answer.
-
-

Blank page
(Questions continue overleaf)

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.



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 mark]

- (ii) Give **one** variable that was kept the same to make this a fair test. [1 mark]

(iii) What type of variable is **time** in this investigation?
[1 mark]

Circle the correct answer.

dependent

control

independent

(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. [1 mark]

to improve accuracy

to make it a fair test

to improve reliability

(ii) Calculate the average time for metal C. [2 marks]
(Show your working out.)

_____ s

(iii) The student thought **one** of the times for metal **D** was an anomaly.
Circle the anomalous result in the table on page 26.
[1 mark]

(iv) Look at the student's table of results and state how he dealt with the anomalous result. [1 mark]

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

(vi) Which type of graph would be best to display this data? [1 mark]

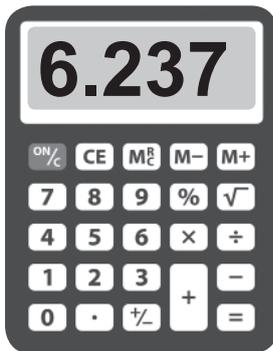
Circle the correct answer.

bar graph

line graph

pie chart

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



(c) Give this value to **one** decimal place. [1 mark]

_____ s

(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? [1 mark]

Circle the correct answer.

4 s

10 s

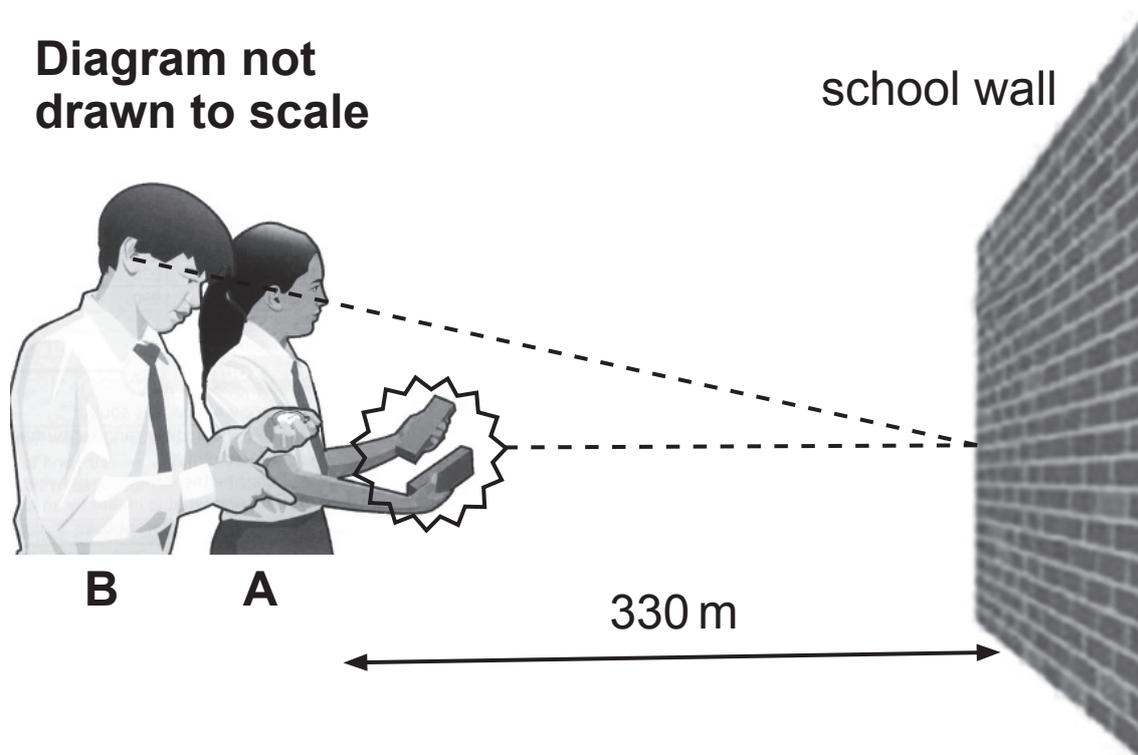
600 s

(e) Suggest **one** reason why the student should leave the apparatus for ten minutes before tidying it away. [1 mark]

Blank page
(Questions continue overleaf)

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

**Diagram not
drawn to scale**



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

(a) When should he:

(i) start the timer? [1 mark]

(ii) stop the timer? [1 mark]

(b) The return time for the echo was 2 s.

How long did it take the sound to travel to the wall?
[1 mark]

_____ s

- (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? [1 mark]

Circle the correct answer.

they could not measure the distance accurately

they could not measure the time accurately

they could not hear the echo

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? [1 mark]

Circle the correct answer.

no effect

longer time

shorter time

(e) Which formula will be used to calculate the speed of sound? [1 mark]

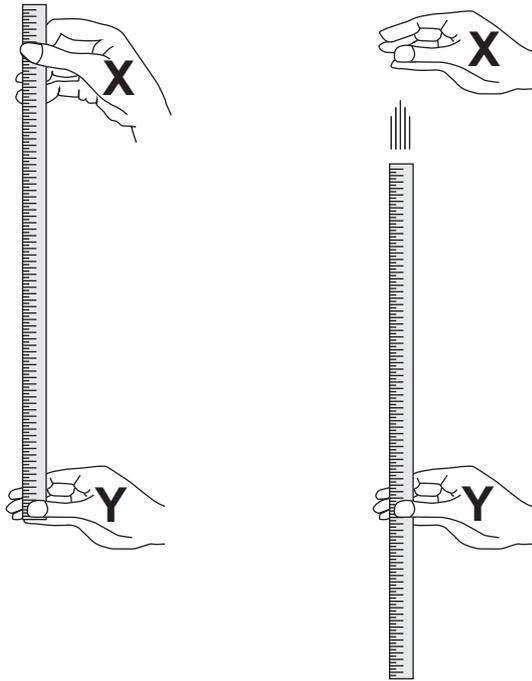
Circle the correct answer.

speed = distance – time

speed = distance + time

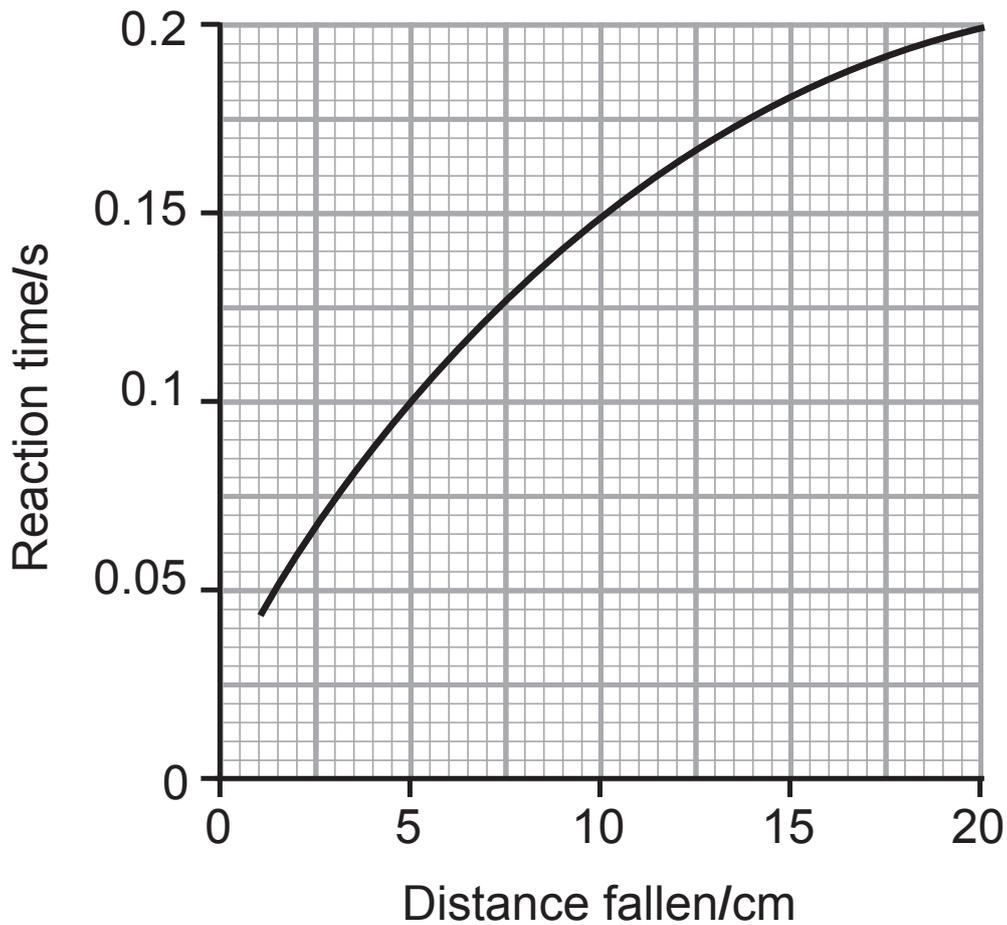
speed = $\frac{\text{distance}}{\text{time}}$

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



(a) The reactions of which student (**X** or **Y**) are being tested? [1 mark]
Explain your answer.

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 marks]

- (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? [1 mark]

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

This is the end of the question paper

SOURCES:

Q1(A)© Martin Shields / Science Photo Library

Q5.....© prill / Thinkstock

Q6(a)Source: Principal Examiner

Q6(b)© Victor_85 / Thinkstock

Q7.....Source: CCEA

Q8.....Source: Principal Examiner

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	

Total Marks	
--------------------	--

Examiner Number

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.



New
Specification

SYMBOLS OF SELECTED IONS

Positive ions

Name	Symbol
Ammonium	NH_4^+
Chromium(III)	Cr^{3+}
Copper(II)	Cu^{2+}
Iron(II)	Fe^{2+}
Iron(III)	Fe^{3+}
Lead(II)	Pb^{2+}
Silver	Ag^+
Zinc	Zn^{2+}

Negative ions

Name	Symbol
Butanoate	$\text{C}_3\text{H}_7\text{COO}^-$
Carbonate	CO_3^{2-}
Dichromate	$\text{Cr}_2\text{O}_7^{2-}$
Ethanoate	CH_3COO^-
Hydrogencarbonate	HCO_3^-
Hydroxide	OH^-
Methanoate	HCOO^-
Nitrate	NO_3^-
Propanoate	$\text{C}_2\text{H}_5\text{COO}^-$
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}

SOLUBILITY IN COLD WATER OF COMMON SALTS, HYDROXIDES AND OXIDES

Soluble
All sodium, potassium and ammonium salts
All nitrates
Most chlorides, bromides and iodides EXCEPT silver and lead chlorides, bromides and iodides
Most sulfates EXCEPT lead and barium sulfates Calcium sulfate is slightly soluble
Insoluble
Most carbonates EXCEPT sodium, potassium and ammonium carbonates
Most hydroxides EXCEPT sodium, potassium and ammonium hydroxides
Most oxides EXCEPT sodium, potassium and calcium oxides which react with water

© CCEA 2017

COUNCIL FOR THE CURRICULUM, EXAMINATIONS AND ASSESSMENT

29 Clarendon Road, Clarendon Dock, Belfast BT1 3BG

Tel: +44 (0)28 9026 1200 Fax: +44 (0)28 9026 1234

Email: info@ccea.org.uk Web: www.ccea.org.uk



Data Leaflet

Including the Periodic Table of the Elements

For the use of candidates taking
Science: Chemistry,
Science: Double Award
or Science: Single Award

Copies must be free from notes or additions of any
kind. No other type of data booklet or information
sheet is authorised for use in the examinations

gcse examinations

chemistry

For first teaching from September 2017

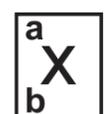
THE PERIODIC TABLE OF ELEMENTS

Group

																		0
																		4
																		He Helium
1	2											3	4	5	6	7		
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10	
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18	
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36	
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	98 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54	
133 Cs Caesium 55	137 Ba Barium 56	139 La [*] Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86	
223 Fr Francium 87	226 Ra Radium 88	227 Ac [†] Actinium 89	261 Rf Rutherfordium 104	262 Db Dubnium 105	266 Sg Seaborgium 106	264 Bh Bohrium 107	277 Hs Hassium 108	268 Mt Meitnerium 109	271 Ds Darmstadtium 110	272 Rg Roentgenium 111	285 Cn Copernicium 112							

* 58 – 71 Lanthanum series

† 90 – 103 Actinium series



a = relative atomic mass (approx)

x = atomic symbol

b = atomic number

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	145 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	242 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	245 Bk Berkelium 97	251 Cf Californium 98	254 Es Einsteinium 99	253 Fm Fermium 100	256 Md Mendelevium 101	254 No Nobelium 102	257 Lr Lawrencium 103