Rewarding Learning

General Certificate of Secondary Education

Centre Number

Candidate Number

Single Award Science

Unit 4

Booklet B

Foundation Tier

[GSA42]

GSA42

Assessment

Assessment Level of Control:
Tick the relevant box (✓)

Controlled Conditions	
Other	

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 **9(b)**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

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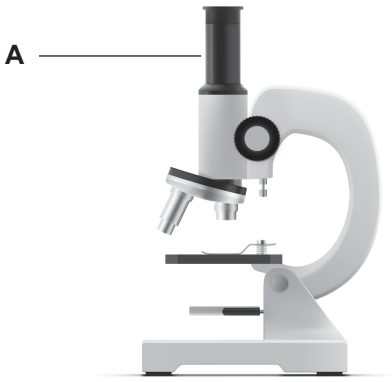
Section A – Biology

1 The diagram below shows a simple microscope.

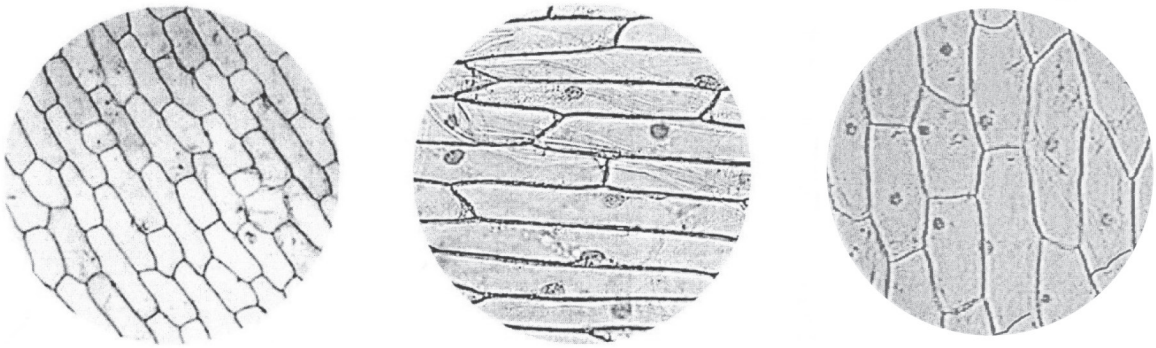


Source: © Getty Images

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

_____ [1]

(b) The photographs below show onion cells seen under a microscope at different magnifications.



A **B** **C**

Source: Chief Examiner

(i) Which photograph (**A**, **B** or **C**) shows the cells under the lowest magnification?

_____ [1]

(ii) Why is it good practice to focus using a low magnification first and then increase to a higher magnification?

_____

_____ [1]

(iii) Count the number of **complete** cells shown in photograph **C**.

_____ [1]

[Turn over

(c) A student wants to prepare a microscope slide of cheek cells. The steps are given below but they are **not** in the correct order.

A Carefully put a coverslip on top of the cells.
B Add a drop of methylene blue to stain the cells.
C Gently scrape the inside of your cheek.
D Smear the cells onto the centre of a microscope slide.

(i) Using the letters **A**, **B**, **C** and **D** put the steps in the correct order.

_____

_____

_____

_____ [2]

(ii) Suggest why the cells need to be stained in step **B**.

Circle your answer.

to show the parts of the cell more clearly

to make the parts of the cell look bigger

to keep the cells moist

[1]

(iii) Why is a coverslip put on top of the cells in step **A**?

Circle your answer.

to make the cells clearer

to stop the cells drying out

to keep the cells in position

[1]

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(Questions continue overleaf)

2 Three students are planning an investigation to compare their pulse rates after exercise. The students describe what exercise they will do as shown below.

Their teacher explained that if they carry out the investigation in this way it will not be a fair test.

(a) Give **two** reasons why their investigation will **not** be a fair (valid) test.

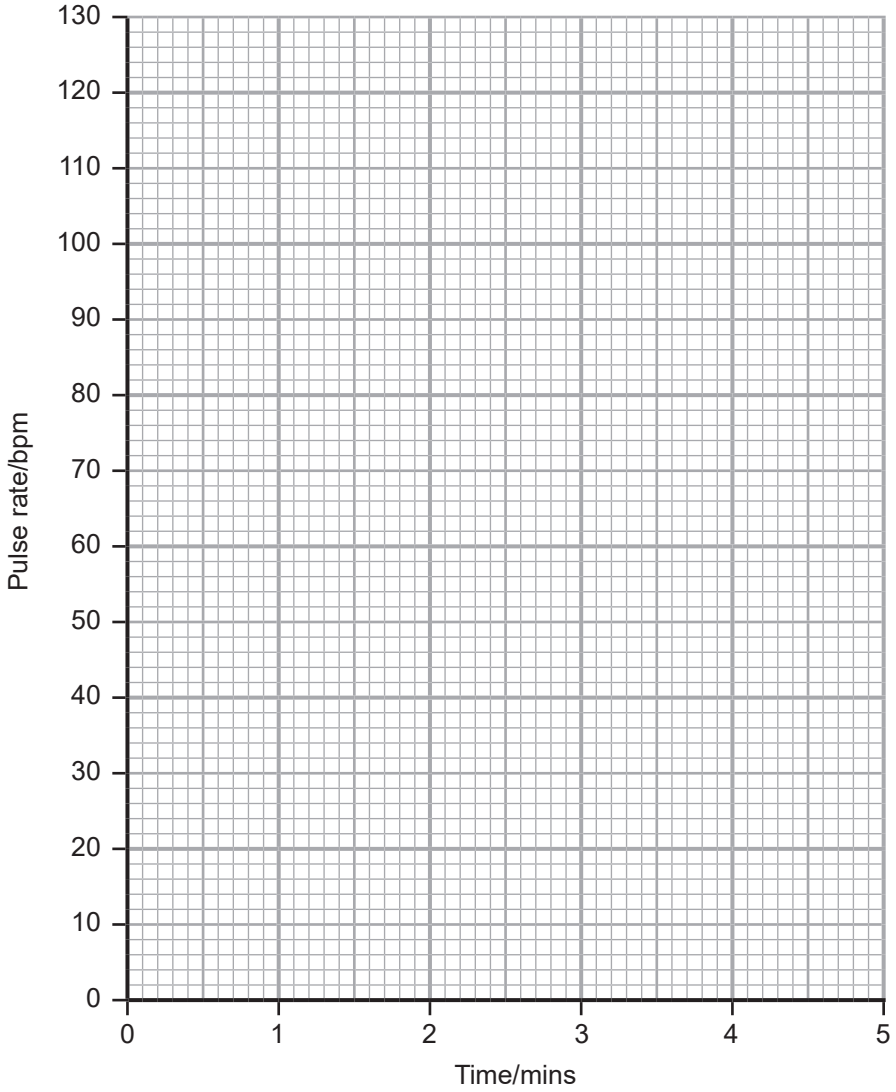
1. _____

2. _____ [2]

(b) Another student exercised and recorded her pulse rate every minute during exercise. The table below shows her results.

Time/mins	Pulse rate/bpm
0	70
1	78
2	88
3	100
4	115
5	130

(i) Use the grid below to plot and draw a line graph of these results.



[3]

(ii) Describe the trend shown by these results.

_____

_____ [1]

[Turn over

3 A student wants to find out if starch is produced during photosynthesis in plants. He tests a leaf for the presence of starch using the method below.

1. Boil the leaf in water.
2. Remove the leaf from the boiling water and place it in a test tube of ethanol.
3. Heat the test tube of ethanol by placing it in a beaker of boiling water.
4. Remove the leaf and rinse it with water.
5. Place the leaf on a white tile and add reagent **X** to test for starch.

(a) Why is the leaf boiled in water in step **1**?

Circle your answer.

to kill the leaf and stop any further reactions

to kill the germs on the leaf

to remove the green colour of the leaf

[1]

(b) Explain why a Bunsen burner is **not** used in step **3** to heat the ethanol.

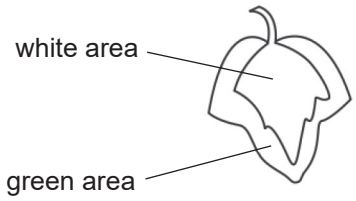
_____ [1]

(c) Name the reagent **X** that is used to test for starch in step **5**.

Circle your answer.

iodine solution : **Benedict's solution** : **biuret solution** [1]

(d) The diagram below shows a leaf from a variegated plant.



The leaf is taken from a plant that had been in light for 24 hours.

(i) On the diagram below shade the area of the leaf that **will** contain starch after 24 hours.

[1]

(ii) What is being tested by using a variegated leaf in this investigation?

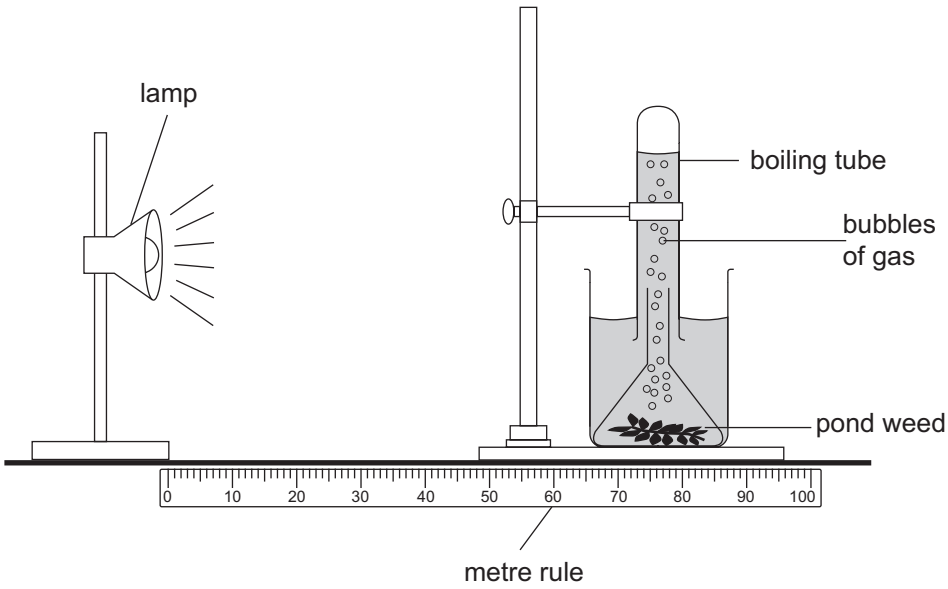
Place a tick (✓) beside the most suitable statement.

Statement	**Tick (✓)**
chlorophyll is required for photosynthesis	
light is required for photosynthesis	
carbon dioxide is required for photosynthesis	

[1]

[Turn over

(e) The diagram below shows how a student investigated the effect of light intensity on photosynthesis.



(i) Using this apparatus, suggest how the student could change the intensity of light.

_____ [1]

(ii) To measure the rate of photosynthesis, the student counted the number of bubbles of gas produced in 1 minute. Suggest **one** reason why this method would **not** give accurate results.

_____

_____ [1]

(iii) How could the student more accurately measure the amount of gas produced?

_____

_____ [1]

(iv) Name the gas produced during photosynthesis.

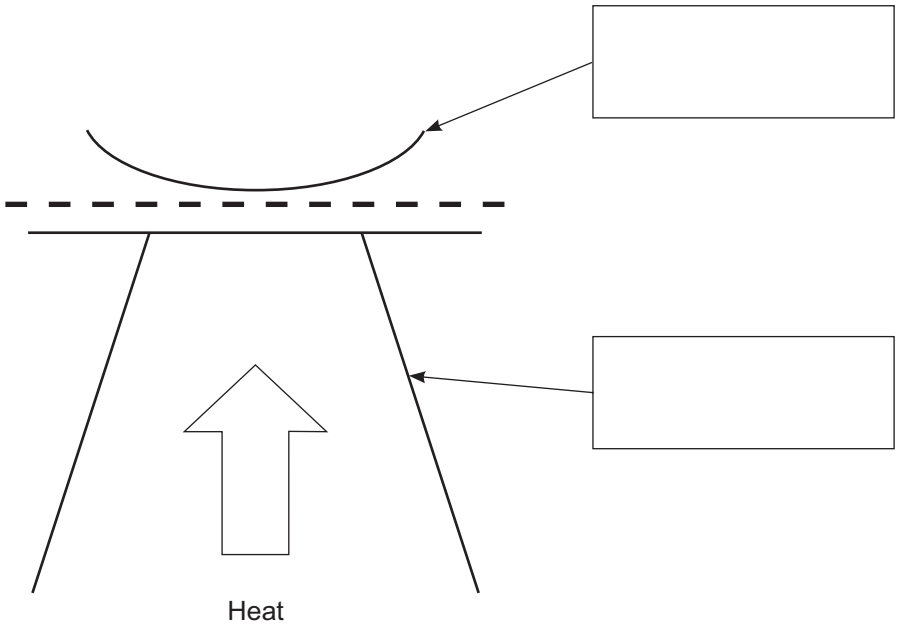
Circle your answer.

oxygen : **carbon dioxide** : **hydrogen** [1]

Section B – Chemistry

4 Students can use different methods to separate different mixtures.

(a) Evaporation can be used to separate a mixture of salt and water as shown below.



(i) Complete the diagram above by adding the names of the two pieces of apparatus.

Choose from:

gauze : **retort stand** : **evaporating dish**

tripod : **beaker** : **test tube**

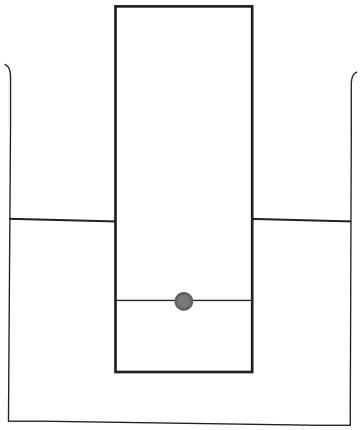
[2]

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

_____

_____ [1]

(b) Another method of separation is chromatography. This is used to separate colours in ink. The diagram below shows a chromatography experiment that has **not** been set up correctly.

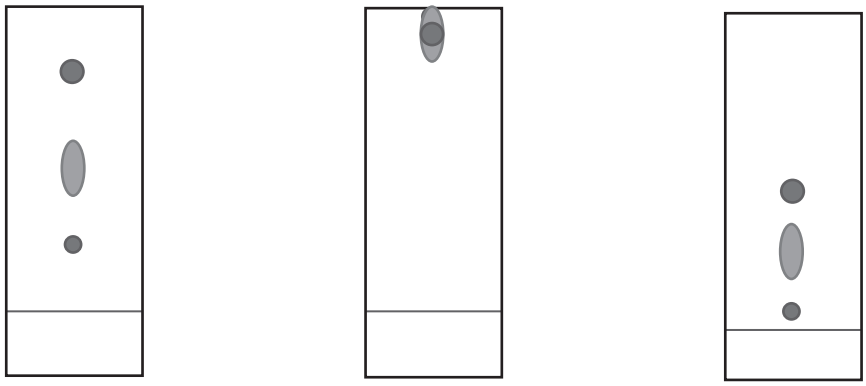


(i) What has been done incorrectly in this set-up?

_____

_____ [1]

Another student accidentally left his chromatography experiment for 24 hours.



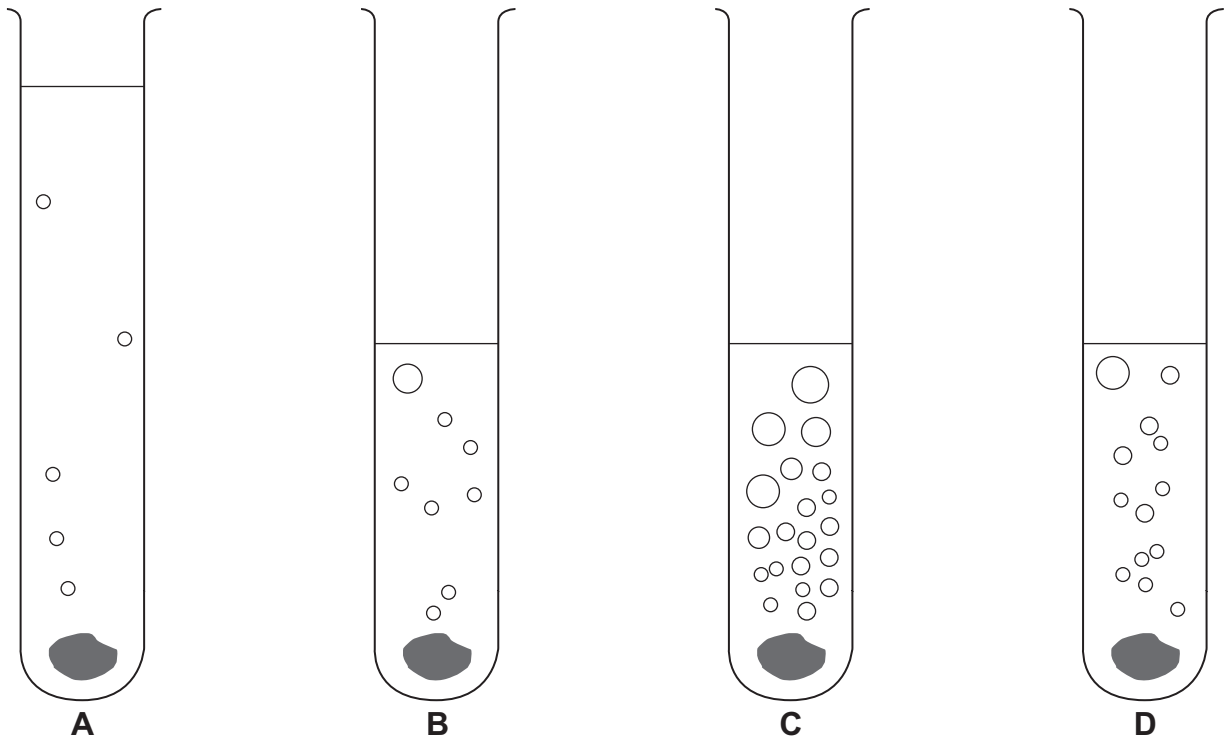
A **B** **C**

(ii) Which chromatogram (**A**, **B** or **C**) would he expect to get after 24 hours?

_____ [1]

[Turn over

5 A student investigated the reactivity of four metals (**A**, **B**, **C** and **D**) by adding them to acid as shown below. The order of reactivity was worked out by counting the number of bubbles produced in 1 minute.



(a) Using information shown in the diagram, put the metals **A**, **B**, **C** and **D** in order of reactivity. Put the most reactive first.

_____ most reactive

_____ ↓

_____

_____ least reactive [2]

(b) Describe one thing shown in the diagram that means this investigation is **not** a fair (valid) test.

_____

_____ [1]

(c) Give **one** way the student would know when the reactions had finished.

_____

_____ [1]

(d) Name the gas produced during these reactions.

Circle your answer.

oxygen : **carbon dioxide** : **hydrogen** [1]

(e) The student repeated the investigation and recorded the starting and finishing temperatures of each reaction. His results are shown below.

Metal	Starting temperature/°C	Finishing temperature/°C	Change in temperature/°C
A	21	27	6
B	24	42	18
C	22	84	
D	21	50	29

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

_____ [1]

(ii) Why is it **not** important that the starting temperature is the same for each reaction?

_____

_____ [1]

(iii) Calculate the temperature change for metal **C**.

(Show your working out.)

_____ °C [2]

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

Circle your answer.

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

[1]

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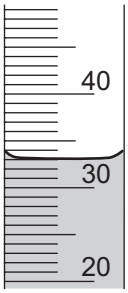
(Questions continue overleaf)

6 **(a)** A student is planning an investigation and needs to measure the volume of acid using a measuring cylinder.

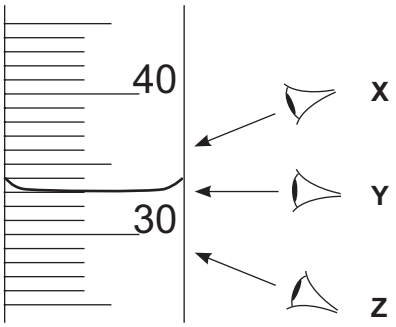


Source: © Giphotostock / Science Photo Library

(i) What volume of acid is shown in the measuring cylinder above?

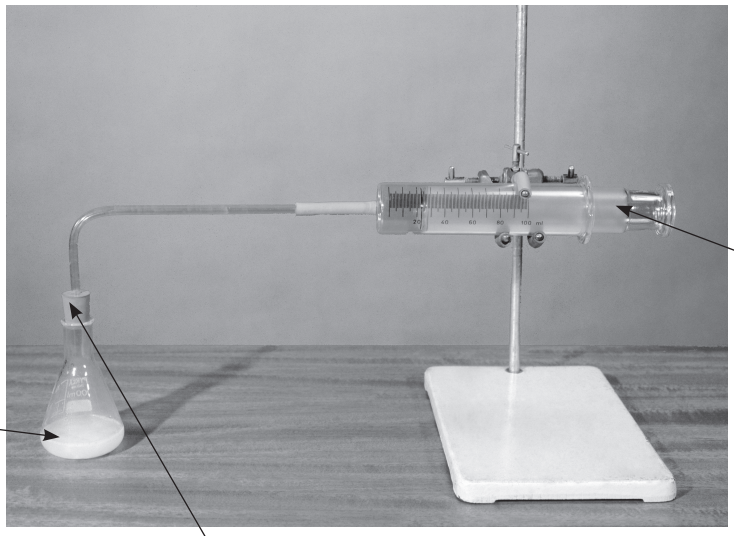
_____ cm^3 [1]

(ii) When the student is reading the value on the measuring cylinder, from which position (**X**, **Y** or **Z**) should she take the reading?



_____ [1]

(b) The rate of reaction between copper carbonate and sulfuric acid was investigated using the apparatus shown below.



Source: © Andrew Lambert Photography / Science Photo Library

The student used the following method:

1. Measure 100 cm^3 of sulfuric acid and pour it into the conical flask.
2. Add 0.25 g of copper carbonate to the conical flask.
3. Insert the bung.
4. Record the volume of gas produced every 20 s.
5. Repeat steps 1 – 4 using increasing concentrations of acid.

(i) Suggest what hypothesis the student is testing in this investigation.

Circle your answer.

the more concentrated the acid, the better the reaction

the more concentrated the acid, the bigger the reaction

the more concentrated the acid, the faster the reaction

[1]

(ii) Name the piece of apparatus the student needs to use in step **4** to accurately measure the time.

_____ [1]

[Turn over

(c) The student recorded the following results.

Reaction	Concentration of acid/ mol dm^{-3}	Volume of gas produced/cm^3					
		0 s	20 s	40 s	60 s	80 s	100 s
A	0.5	0	14	24	35	41	45
B	1.0	0	18	30	37	42	48
C	1.5	0	20	32	41	45	48
D	2.0	0	22	35	45	48	48
E	2.5	0	24	39	48	48	48

(i) State the range of concentration of acid that the student used.

_____ mol dm^{-3} [1]

(ii) Which reaction (**A**, **B**, **C**, **D** or **E**) had **not** finished after 100 s?

_____ [1]

(iii) Which concentration of acid reacted with copper carbonate the fastest?

_____ mol dm^{-3} [1]

(iv) The student wants to get a more accurate value for the finishing time for reaction **E**. She carries out the experiment again. At what times should she record the volume of gas produced?

Circle your answer.

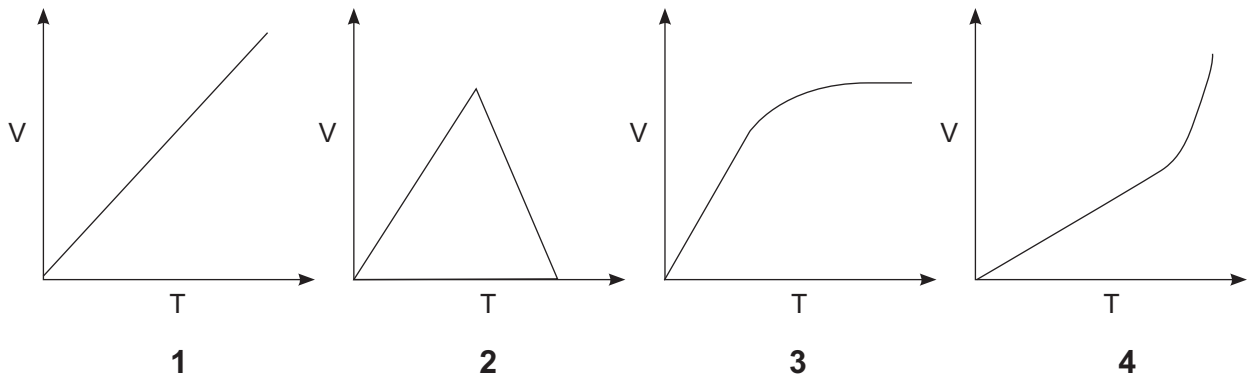
40 s and 60 s

0 s, 20 s, 40 s, 60 s, 80 s and 100 s

40 s, 45 s, 50 s, 55 s and 60 s

[1]

(v) The student plotted a line graph of volume (V) against time (T) for reaction **D**. Which of the following graphs (**1**, **2**, **3** or **4**) shows the shape she should expect?



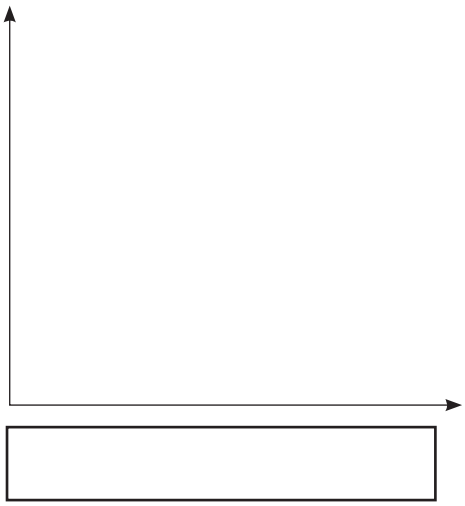
_____ [1]

Section C – Physics

7 A student carried out an investigation to show how the resistance of a metal wire depends on its length. The results are shown below.

Length/m	Resistance/Ω			Average resistance /Ω
	Try 1	Try 2	Try 3	
0.1	2.3	2.4	2.3	2.3
0.3	4.5	4.4	4.3	4.4
0.5	6.9	6.8	6.8	6.8
0.7	9.3	4.2	9.5	9.4
0.9	11.2	11.4	11.3	

(a) The student wants to plot a graph of her results. In the box, on the diagram, below add the label for the x-axis.



[1]

(b) When the student was deciding on the lengths of wire to use, what **interval size** did she choose?

Circle your answer.

0.1 m **0.2 m** **0.8 m** [1]

(c) The student thought one of the results for the length 0.7 m was an anomaly.

(i) Circle the anomalous result in the table opposite. [1]

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

_____

_____ [1]

(iii) Calculate the average resistance for the wire with a length of 0.9 m.

(Show your working out.)

_____ Ω [2]

[Turn over

(d) Another student tested a different wire and calculated the average resistance. The answer he got on his calculator is shown below.

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

_____ Ω [1]

(ii) Why did the student carry out the investigation three times for each length of wire?

Circle your answer.

to improve reliability

to make it a fair test

to improve accuracy

[1]

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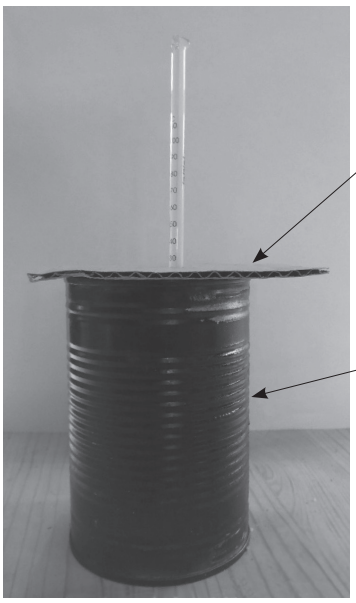
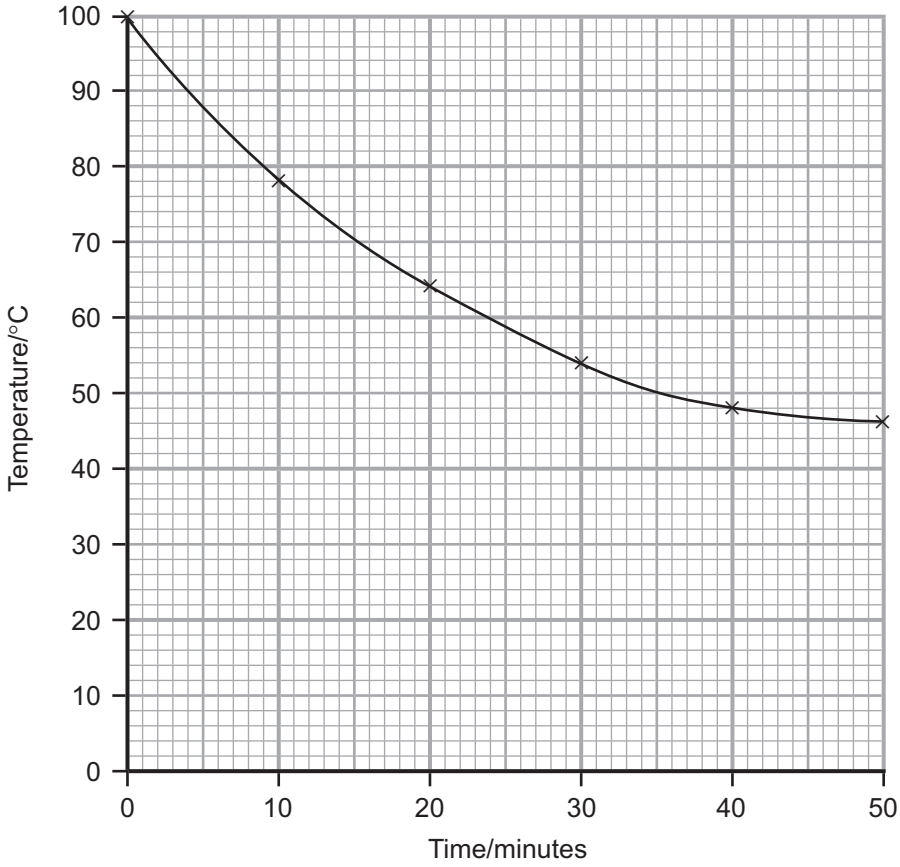
(Questions continue overleaf)

8 A scientist tests a metal can, that has a dark matt surface, to see how quickly heat escapes from it. She fills the can with boiling water and records the temperature every 10 minutes.



Source: Principal Examiner

The graph below shows the results she obtained.



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(a) **(i)** In which ten minute period is the water losing heat most slowly?

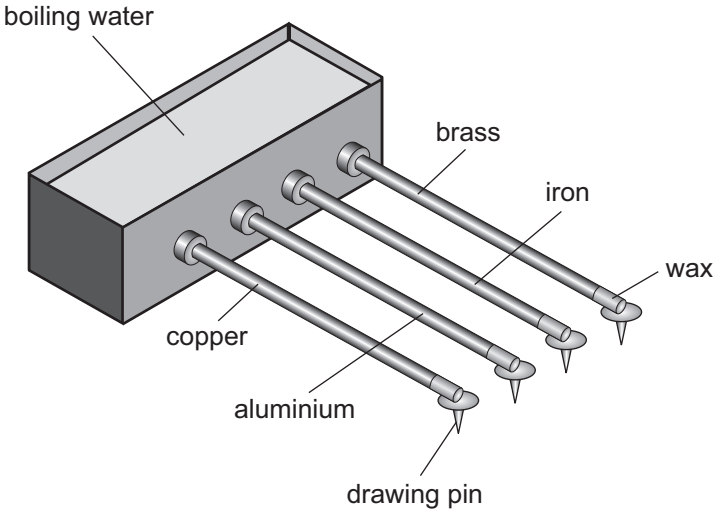
Circle your answer.

0 – 10 minutes : **20 – 30 minutes** : **40 – 50 minutes** [1]

(ii) Why was the lid used in this investigation?

_____ [1]

(b) A student set up the apparatus below to show which metal was the best conductor of heat.



(i) State **one** thing he has done to make sure it was a fair (valid) test.

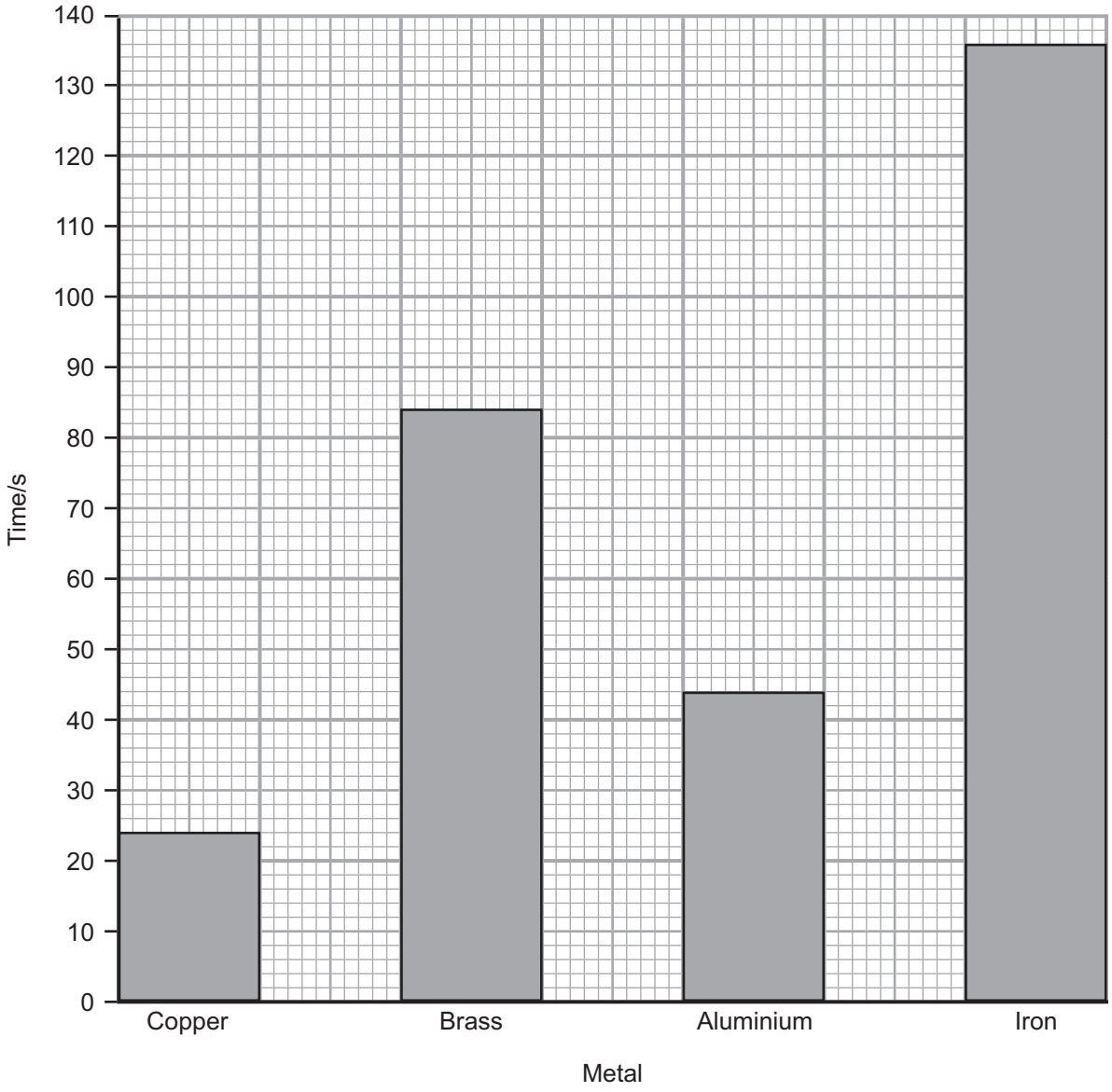
_____

_____ [1]

[Turn over

The student timed how long it took for the wax to melt and each drawing pin to drop.

The bar graph below shows the results he obtained.



(ii) Name the metal that was the best conductor of heat.

_____ [1]

(iii) Use the graph opposite to state the range of times recorded.

_____ s [1]

(iv) Complete the sentence below.

Choose from:

more : **less** : **the same**

If a glass rod had been used instead of a metal rod, it would take

_____ time for the wax to melt and the drawing pin to drop. [1]

9 **(a)** Ohm's law states:

'The current through a wire is directly proportional to the voltage across the wire, provided the temperature remains constant.'

(i) Name the independent variable in this statement of Ohm's law.

Choose from:

current **voltage** **temperature**

_____ [1]

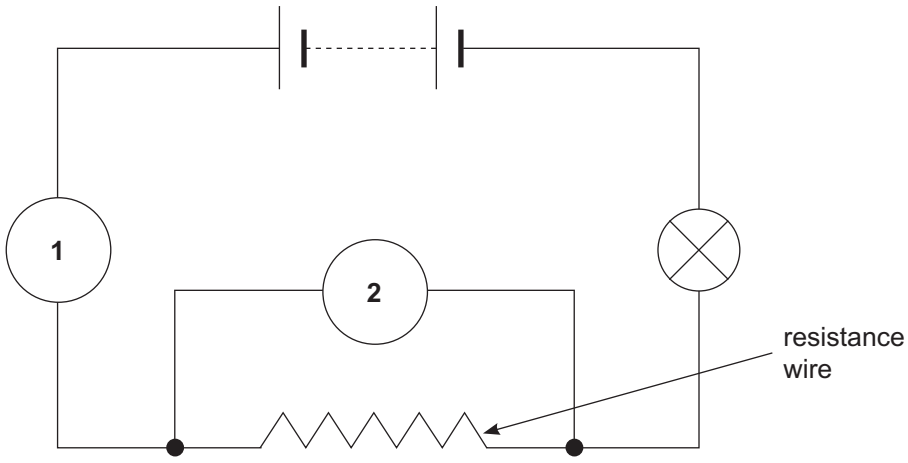
(ii) Name the controlled variable in this statement of Ohm's law.

Choose from:

current **voltage** **temperature**

_____ [1]

The circuit below is set up to prove Ohm's Law.



(b) Describe fully how this circuit can be used to prove Ohm's law.
Your answer should include:

- the names of the meters labelled **1** and **2** and how they are connected in the circuit;
- a description of the method; and
- how a graph of the results would prove Ohm's law.

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

[6]

[Turn over

(c) The results from this investigation can be used to calculate the resistance of the wire. What formula is used to calculate resistance?

Circle your answer.

$$\textbf{resistance} = \frac{\textbf{voltage}}{\textbf{current}}$$

resistance = voltage + current

resistance = current – voltage

[1]

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Question Number	Marks
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Total Marks	

Examiner Number

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