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Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

9300100574

COMBINED SCIENCE **0653/62**

Paper 6 Alternative to Practical **February/March 2020**

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Blank pages are indicated.

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1 **(a)** A student investigates the differences between two types of bean, **A** and **B**.

They are provided with the beans shown in Fig. 1.1.

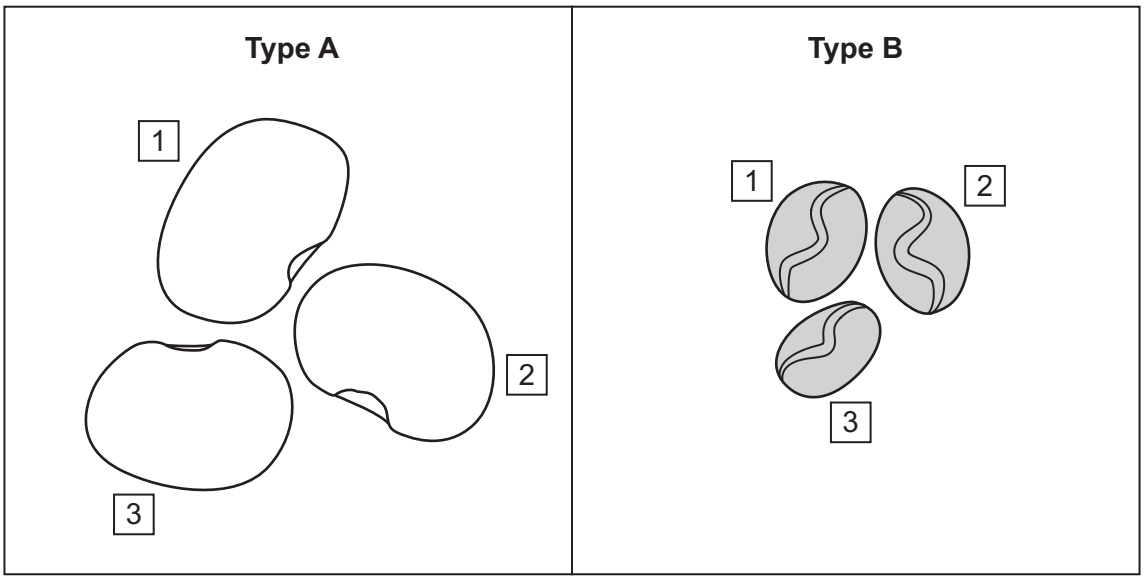

Fig. 1.1

(i) Measure the **longest** length of each bean and record your measurements in Table 1.1.

Table 1.1

bean number	type **A** length /	type **B** length / .....
1		
2		
3		

[2]

(ii) Complete the headings for Table 1.1 by adding the units. [1]

(iii) Calculate the average length of each type of bean. Give your answers to an appropriate number of significant figures.

average length of type **A** .....

average length of type **B** .....

[1]

(iv) Suggest why the average length of the three beans is used instead of measuring the length of just one bean.

.....

..... [1]

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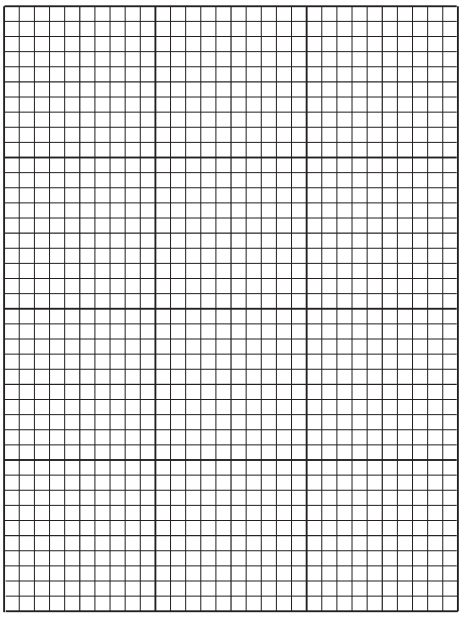
(v) Plot a bar chart of the average length of the two **types** of bean.



[2]

(vi) Suggest a different measurement the student could take for comparing the size of beans.

..... [1]

(vii) Apart from size, state **one** other **visible** difference between the types of bean shown in Fig. 1.1.

..... [1]

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(b) One of each type of bean is crushed and five drops of iodine solution are added.

The observations are shown in Fig. 1.2.

colour of iodine solution after mixing
• with bean **A** = blue/black
• with bean **B** = brown

Fig. 1.2

(i) State a conclusion for this test.

.....

..... [1]

(ii) Describe how the student could test a bean for the presence of reducing sugars.

Include the colour for a positive result.

method .....

.....

.....

positive result .....

[3]

[Total: 13]

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2 A student investigates the reactivity of four metals **G**, **H**, **J** and **L**.

(a) The student:

- places a 2 cm depth of dilute sulfuric acid into a clean large boiling tube
- measures the initial temperature of the sulfuric acid and records this in Table 2.1
- adds a small amount of metal **G** to the boiling tube
- stirs and records his observations in Table 2.1
- measures the highest temperature reached and records it in Table 2.1
- repeats the procedure for metals **H**, **J** and **L** using dilute sulfuric acid from the same bottle.

Table 2.1

metal	initial temperature / °C	highest temperature / °C	observations
G	25.5	42.0	fast bubbling
H	21.0	77.5	very fast bubbling
J			slow bubbling
L	21.0	21.0	no bubbling

(i) The thermometer readings for metal **J** are shown in Fig. 2.1.

Read these values and record them in Table 2.1 to the nearest 0.5 °C.

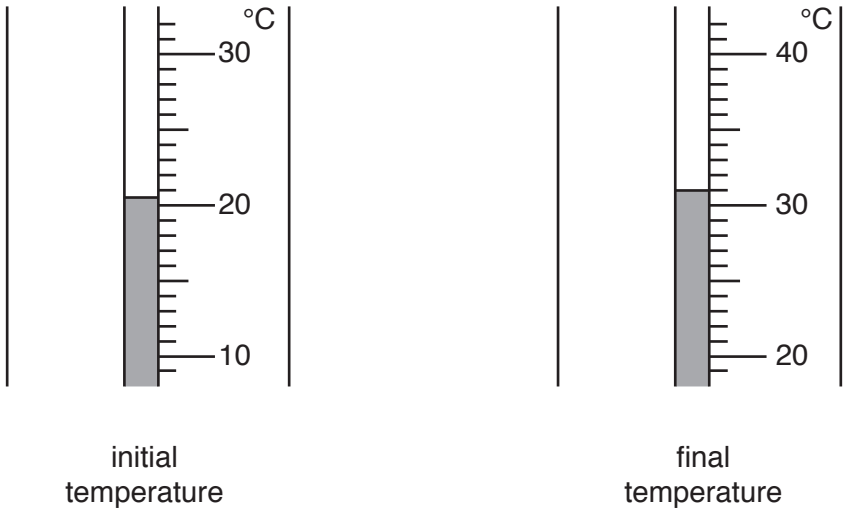

Fig. 2.1

[2]

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(ii) Identify which **one** of the four metals **G**, **H**, **J** and **L**, is the most reactive.

..... [1]

(iii) State **two** reasons for your choice in **2(a)(ii)**.

reason 1 .....

.....

reason 2 .....

.....

[2]

(iv) Suggest how the experiment could be changed so that the highest temperatures reached can be compared more reliably.

Do **not** include repeating the experiment.

.....

..... [1]

(v) Explain how the results show that the reaction of metal **H** and sulfuric acid is exothermic.

..... [1]

(vi) The student thinks that one of the initial temperature readings is anomalous.

Suggest which temperature reading is anomalous.

..... [1]

(vii) Suggest what might have happened for the student to get an anomalous temperature reading.

.....

..... [1]

(viii) The student thinks that the gas formed in the investigation is hydrogen.

State the test for hydrogen gas and give the result for a positive test.

test .....

.....

positive result ..... [1]

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(b) The student:

- places a 3 cm depth of aqueous copper sulfate into each of four test-tubes
- adds a small amount of metal **G** into one of the test-tubes
- adds metal **H** into the second test-tube, metal **J** into the third test-tube and metal **L** into the fourth test-tube
- leaves the test-tubes for 15 minutes
- records in Table 2.2 his observations after 15 minutes.

Table 2.2

metal	initial colour of metal	colour of aqueous copper sulfate before the metal is added	final observation
G	grey	blue	the solution turns colourless and a pink solid forms
H	grey	blue	
J	grey	blue	the solution turns a paler blue and a pink solid forms
L	pink	blue	the solution stays the same blue colour and the pink metal remains

(i) Use Table 2.1 to predict the observations expected for metal **H** and aqueous copper sulfate.

..... [1]

(ii) Explain your answer to **2(b)(i)**.

.....

..... [1]

(c) Place the metals in order of reactivity, starting with the most reactive.

Use the results and observations in Table 2.1 and Table 2.2.

metal ..... most reactive

metal .....

metal .....

metal ..... least reactive

[1]

[Total: 13]

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3 A student determines the period *T* of a pendulum.

(a) She uses the apparatus shown in Fig. 3.1.

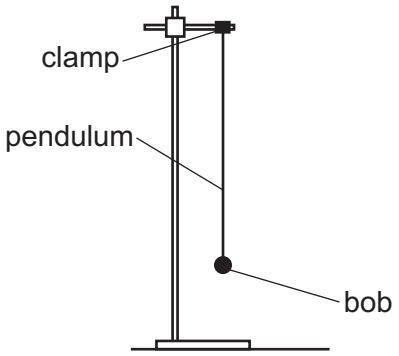

Fig. 3.1

The period *T* is the time it takes for the pendulum to complete one full oscillation (from S to P, P to Q and then from Q back to S), as shown in Fig. 3.2.

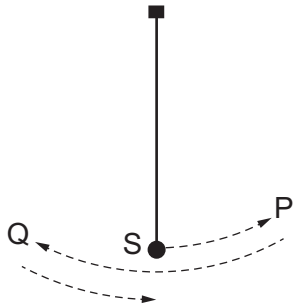

Fig. 3.2

- The student pulls the pendulum a few centimetres to one side and releases it.
- She measures the time for 20 complete oscillations of the pendulum using a stop-watch.
- She records, in Table 3.1, the time for 20 oscillations of the pendulum, to the nearest 0.01 s.
- She repeats this measurement **two more** times, recording the results in Table 3.1.

Table 3.1

time for 20 oscillations / s	period *T* / s
26.72	1.34
26.61	1.33

(i) Explain why the student measures the time for 20 oscillations rather than just one oscillation.

.....

..... [1]

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(ii) Fig. 3.3 shows her final stop-watch reading.

Read and record in Table 3.1 the time to the nearest 0.01 s for 20 oscillations of the pendulum.

Fig. 3.3

[2]

(b) (i) Calculate the period T of the pendulum for this final result.
Use the equation shown.

$$T = \frac{\text{time for 20 oscillations}}{20}$$

Record your answer in Table 3.1. Give your answer to the nearest 0.01 s. [1]

(ii) Calculate the average value of T from the student's results.

average T = ... s
[1]

(c) Describe how the student can use a piece of white card with a thin black line drawn on it to improve the accuracy of the measurements made in this experiment.

.....

.....

..... [2]

[Total: 7]

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4 Fig. 4.1 shows a beam that is balanced by placing masses on opposite sides of a central pivot.

A has a mass of 50 g and is placed a fixed distance from the pivot. The mass of **B** can be changed. **B** can also be moved to different positions on the beam.

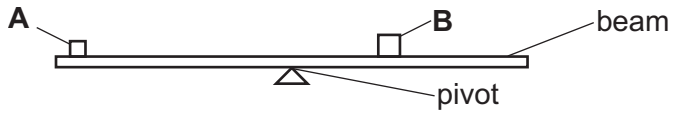

Fig. 4.1

Mass **B** is heavier than mass **A**. It must be placed closer to the pivot than **A** for the beam to balance.

Plan an investigation to find out how the distance of mass **B** from the pivot, when the beam is balanced, depends on its mass.

You are provided with:

- a metre rule which can act as the beam
- a pivot
- 50 g mass **A**
- a selection of 10 g and 100 g masses which can be combined to make different values for mass **B**.

You may use any other common laboratory apparatus in your plan.

In your plan, include:

- a brief description of the method
- how you will ensure that your results are as accurate as possible
- the values of mass that you will use for mass **B**
- the column headings (including any appropriate units) for the table you will use to record your results
- how you will process your results to draw a conclusion.

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