Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

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7470681666

COMBINED SCIENCE **0653/63**

Paper 6 Alternative to Practical **October/November 2021**

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 **16** pages. Any blank pages are indicated.

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[Turn over

1 A student investigates the effect of temperature on the amount of water lost (by transpiration) from a cut plant shoot.

The student sets up the apparatus shown in Fig. 1.1.

As water is lost from the plant shoot, the bubble moves along the scale.

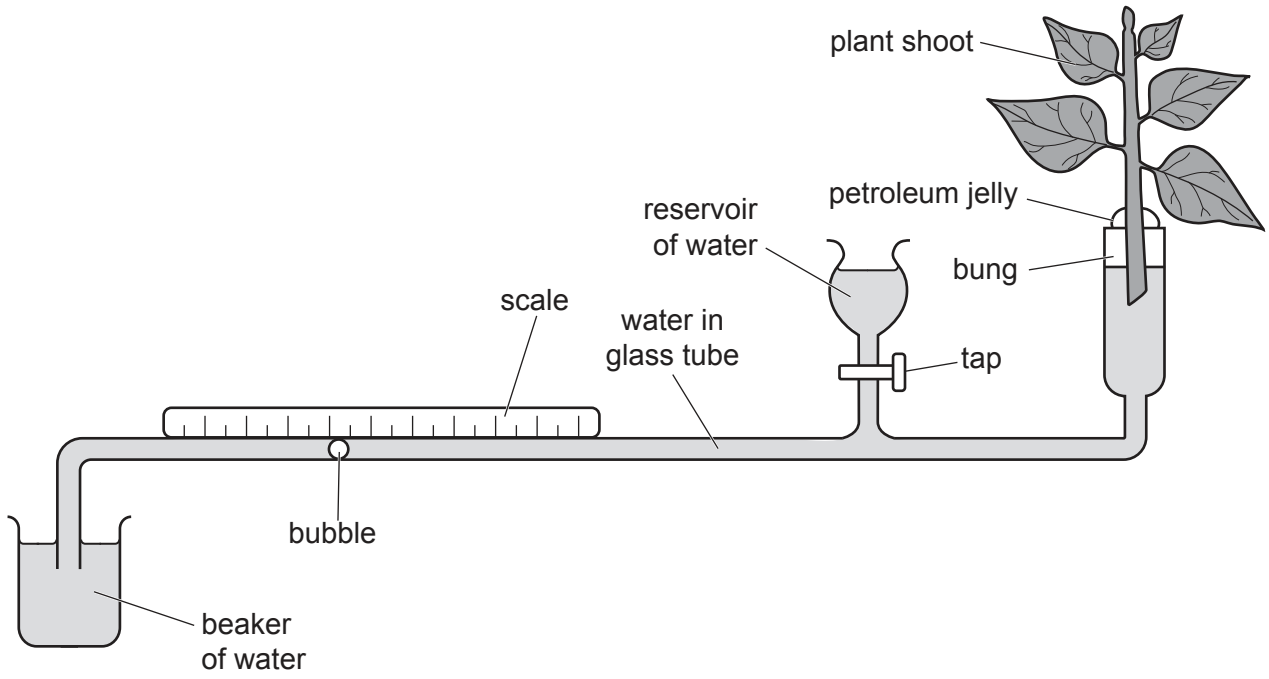

Fig. 1.1

Procedure

The student:

- places the apparatus in a room with a constant temperature of 10 °C
- records in Table 1.1 the start position of the bubble
- leaves the apparatus in the room at 10 °C for one hour
- records in Table 1.1 the final position of the bubble
- repeats the experiment with the room at a constant temperature of 15 °C, 20 °C, 25 °C and 30 °C.

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(a) Fig. 1.2 shows the start position and the final position of the bubble at 25 °C.

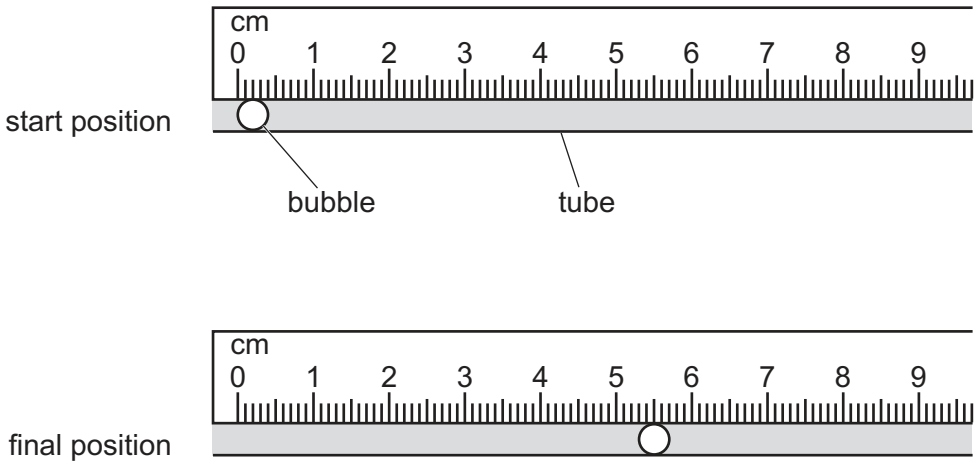


Fig. 1.2

(i) Record in Table 1.1 the start position and final position of the **centre** of the bubble shown in Fig. 1.2.

Record your values in millimetres.

Table 1.1

temperature / °C	start position / mm	final position / mm	distance moved / mm
10	5	15	10
15	5	24	19
20	1	36	35
25			
30	1	67	66

[2]

(ii) Describe your method for determining the centre of the bubble.

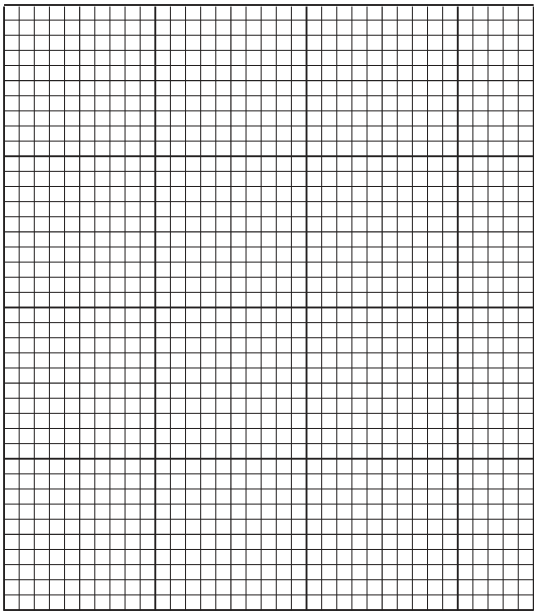
.....

..... [1]

(iii) Calculate the distance moved by the bubble at 25 °C.

Record this value in Table 1.1. [1]

(b) (i) On the grid, plot a graph of distance moved (vertical axis) against temperature.



[3]

(ii) Draw the best-fit straight line. [1]

(c) (i) Describe the relationship between temperature and the distance moved by the bubble.

.....

..... [1]

(ii) Describe the relationship between temperature and the amount of water lost by the plant shoot.

.....

..... [1]

(d) Identify **two** variables to keep constant during this investigation.

1 .....

2 .....

[2]

(e) Petroleum jelly is used to seal the apparatus and prevent water from leaking from the apparatus.

A student repeats the experiment at 10 °C but forgets to seal the apparatus with the petroleum jelly.

Suggest how this affects the distance moved by the bubble.

.....

..... [1]

[Total: 13]

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2 A student prepares a sample of the salt, magnesium sulfate.

The student reacts magnesium ribbon with dilute sulfuric acid.

(a) Fig. 2.1 shows the length of magnesium ribbon and the volume of dilute sulfuric acid the student uses.

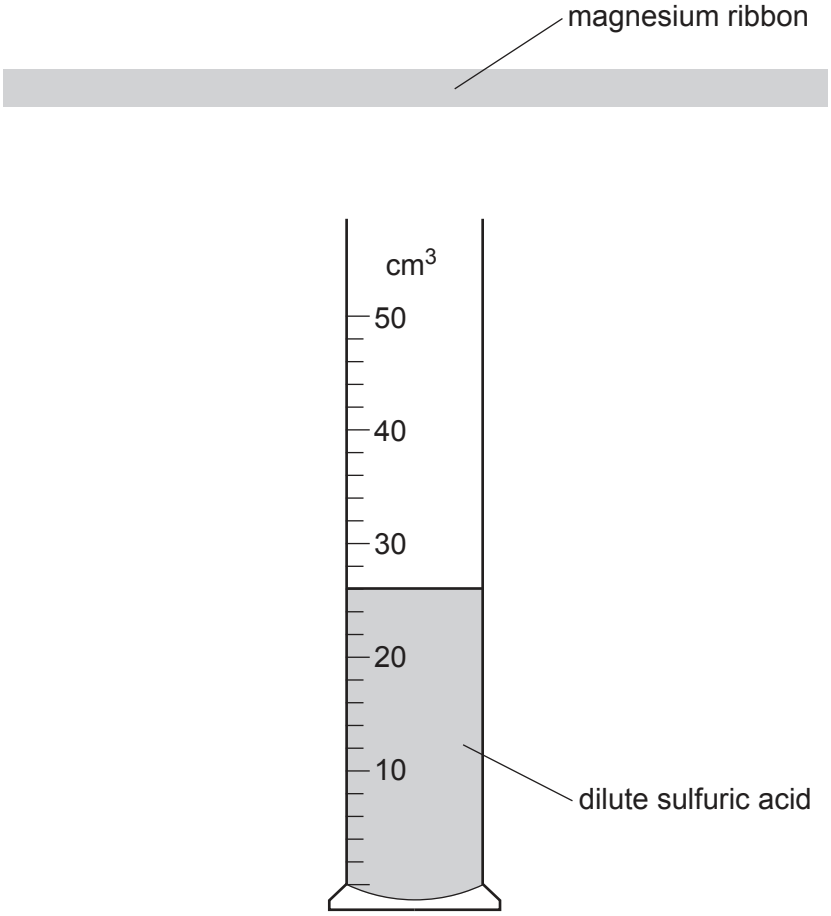

Fig. 2.1

(i) Measure the length of the magnesium ribbon shown in Fig. 2.1.

Record your answer in millimetres to the nearest millimetre.

length = ... mm [1]

(ii) Record the volume, to the nearest cm^3, of dilute sulfuric acid in the measuring cylinder shown in Fig. 2.1.

volume = ... cm^3 [1]

(b) The student pours the dilute sulfuric acid into a beaker and then adds the piece of magnesium ribbon.

The mixture fizzes and makes a gas that gives a squeaky pop with a lighted splint.

A colourless solution and a small piece of magnesium remain when the reaction has finished.

(i) Name the gas produced in the reaction.

..... [1]

(ii) State how the observations show that **all** the dilute sulfuric acid has reacted.

.....

..... [1]

(iii) The mixture in the beaker is filtered into a flask.

Describe the appearance of the residue in the filter paper and the filtrate in the flask.

residue .....

filtrate .....
[2]

(c) The filtrate contains magnesium ions and sulfate ions.

Describe the test to identify sulfate ions.

State the observation for a positive result.

test .....

.....

observation .....
[2]

(d) Describe, in detail, how to make crystals of magnesium sulfate from the filtrate.

.....

.....

.....

.....

.....

..... [3]

(e) The student heats 2.46 g of magnesium sulfate crystals in a test-tube for 10 minutes.

The student allows the test-tube and its contents to cool down.

The mass of the solid left in the test-tube is 1.20 g.

(i) Suggest why the mass of the magnesium sulfate crystals decreases when heated.

.....

..... [1]

(ii) The student uses a blue Bunsen burner flame to heat the test-tube rather than a yellow Bunsen burner flame.

Explain why the student uses a blue Bunsen burner flame.

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..... [1]

[Total: 13]

3 A student uses a simple pendulum to determine the acceleration due to gravity *g*.

Procedure

The student:

- sets up the apparatus shown in Fig. 3.1

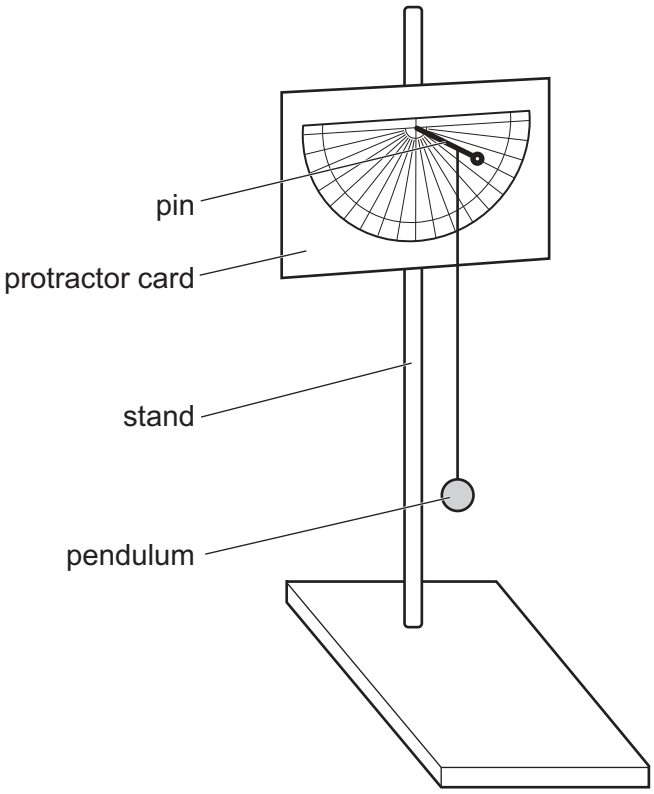
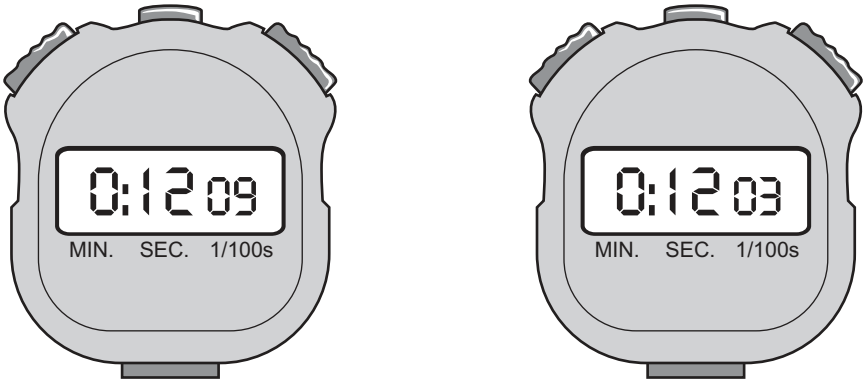


Fig. 3.1

- pulls back the pendulum to an angle of 10° from vertical
- releases the pendulum
- records in Table 3.1 the time for 10 complete oscillations of the pendulum
- repeats the experiment four more times.

[Turn over

(a) Fig. 3.2 shows the stop-watch readings for experiments 4 and 5.



experiment 4 experiment 5

Fig. 3.2

Record in Table 3.1 these times to the nearest 0.1 s.

Table 3.1

experiment	time for 10 oscillations / s
1	12.3
2	12.0
3	14.6
4	
5	

[2]

(b) The teacher says that one experiment has an anomalous result.

State which experiment has the anomalous result.
Explain your answer.

experiment .....

explanation .....

..... [1]

(c) Calculate an accurate value for the average time for 10 oscillations.

average time for 10 oscillations = ... s [1]

(d) The period T is the time for one oscillation of the pendulum.

Use your answer to **(c)** to calculate the period T.

T = ... s [1]

(e) Calculate the acceleration due to gravity g. Use the equation shown.

$$g = \frac{14}{T^2}$$

Give your answer to **two** significant figures.

g = ... m/s^2 [2]

[Total: 7]

4 Fig. 4.1 shows a wool cloth being rubbed on a rod made of insulating material. When the rod is rubbed, it becomes charged.

The charged rod attracts small pieces of paper. The more charge the rod gains, the more pieces of paper that stick to the rod.

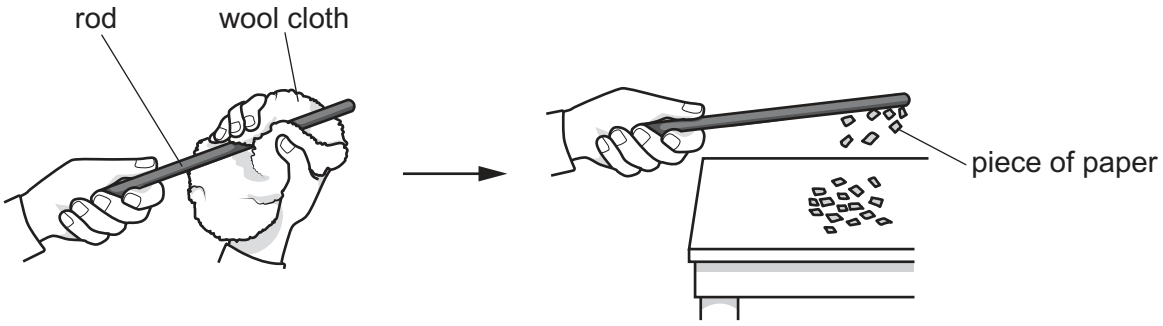


Fig. 4.1

Three rods are made from three different insulating materials: rod A is made from poly(ethene), rod B is made from Perspex and rod C is made from nylon.

Plan an investigation to find out which rod, A, B or C, gains most charge when rubbed with a wool cloth.

You are provided with:

- the three rods, A, B and C
- a wool cloth
- A4 graph paper
- scissors.

You may use any common laboratory apparatus in your plan.

Include in your plan:

- a brief description of the method
- what you will measure
- which variables you will keep constant
- how you will process your results to draw a conclusion.

You may include a labelled diagram.

You may include a results table (you are not required to enter any readings in the table).

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..... [7]

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