Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

0123456789

PHYSICAL SCIENCE **0652/06**

Paper 6 Alternative to Practical **For Examination from 2019**

SPECIMEN PAPER

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

CAMBRIDGE
International Examinations

1 A student is given a solid **A** which is a mixture of **three** compounds.

The student is asked to carry out a series of tests to separate the compounds and identify the cations they contain.

At the start the student places a sample of solid A in a beaker and adds about 25 cm^3 distilled water. He stirs for one minute and then filters the mixture into a large test-tube. The filtrate and residue are kept for testing.

(a) (i) Complete Fig. 1.1 to show the equipment used.

(ii) On your diagram label the filtrate and residue.

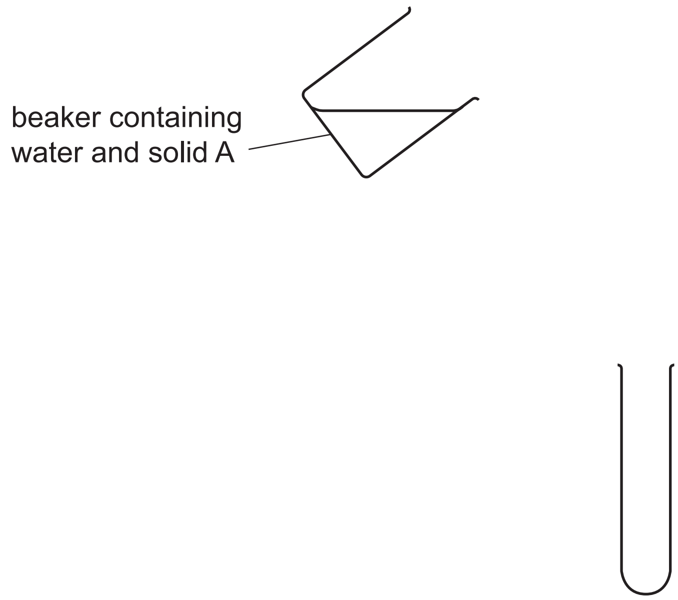


Fig. 1.1

[3]

The student is then asked to carry out a test on the **filtrate**.

Test 1 • Place about 2 cm^3 of the filtrate from the large test-tube into a test-tube. • Add aqueous ammonia **slowly** until the test-tube is almost full. • Stir the mixture in the test-tube carefully.

(iii) The student observes that a white precipitate forms which is soluble in excess ammonia.
Use the observations from this test to identify the cation present in the filtrate.

.... [1]

(b) The student then carries out a different test on the original residue from **(a)(i)**.

Test 2

- Place the residue and filter paper into a clean small beaker.
- Add 25 cm^3 of dilute hydrochloric acid. Stir carefully.
- Warm the beaker gently for two minutes. Do **not** boil the liquid.
- When the mixture has cooled a little, filter it into a large test-tube.
- Observe the colour of the filtrate and residue.

The student's results are shown below.

	Colour
Filtrate	*green/blue*
Residue	*brown/black*

Test 3

- Place 2 cm^3 of the green-blue filtrate, from **Test 2**, into a test-tube.
- Add aqueous ammonia **slowly** until the test-tube is almost full.
- Stir the mixture in the test-tube carefully.

He notices that a blue precipitate forms which dissolves in excess ammonia solution to form a dark blue solution.

(i) Use the student's observations to identify the cation present in the filtrate from **Test 2**.

.... [1]

(ii) Name another test that could be used to confirm the identity of this cation and describe a positive result.

test ....

positive result .... [2]

(iii) Fig. 1.2 shows a hazard symbols on the student's bottle of aqueous ammonia.

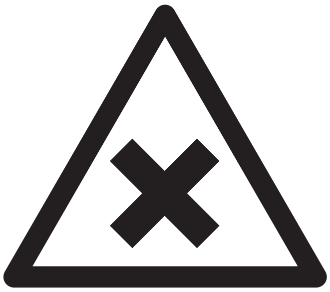


Fig. 1.2

State **one** precaution that should be taken when handling aqueous ammonia.

.... [1]

(c) The third cation in solid **A** is in the brown/black residue from **Test 2**.
The student thinks that this residue might be a compound containing the iron(III) ion.
He dissolves the residue in dilute nitric acid.

(i) State the reagents used to identify iron(III) ions.

.... [1]

(ii) State the result which would identify the presence of iron(III) ions.

.... [1]

[Total: 10]

Question 2 starts on page 6

2 A student is provided with 1 g of each of three salts, **B**, **C** and **D**.

He investigates whether there are any temperature changes when these salts are dissolved in water.

He places a 1 g sample of salt **B** into a beaker of 25 cm^3 distilled water and stirs well.

A digital thermometer probe is used to measure the temperature continuously for the first 15 seconds.

He then repeats these steps for salts **C** and **D**.

Fig. 2.1 shows his results.

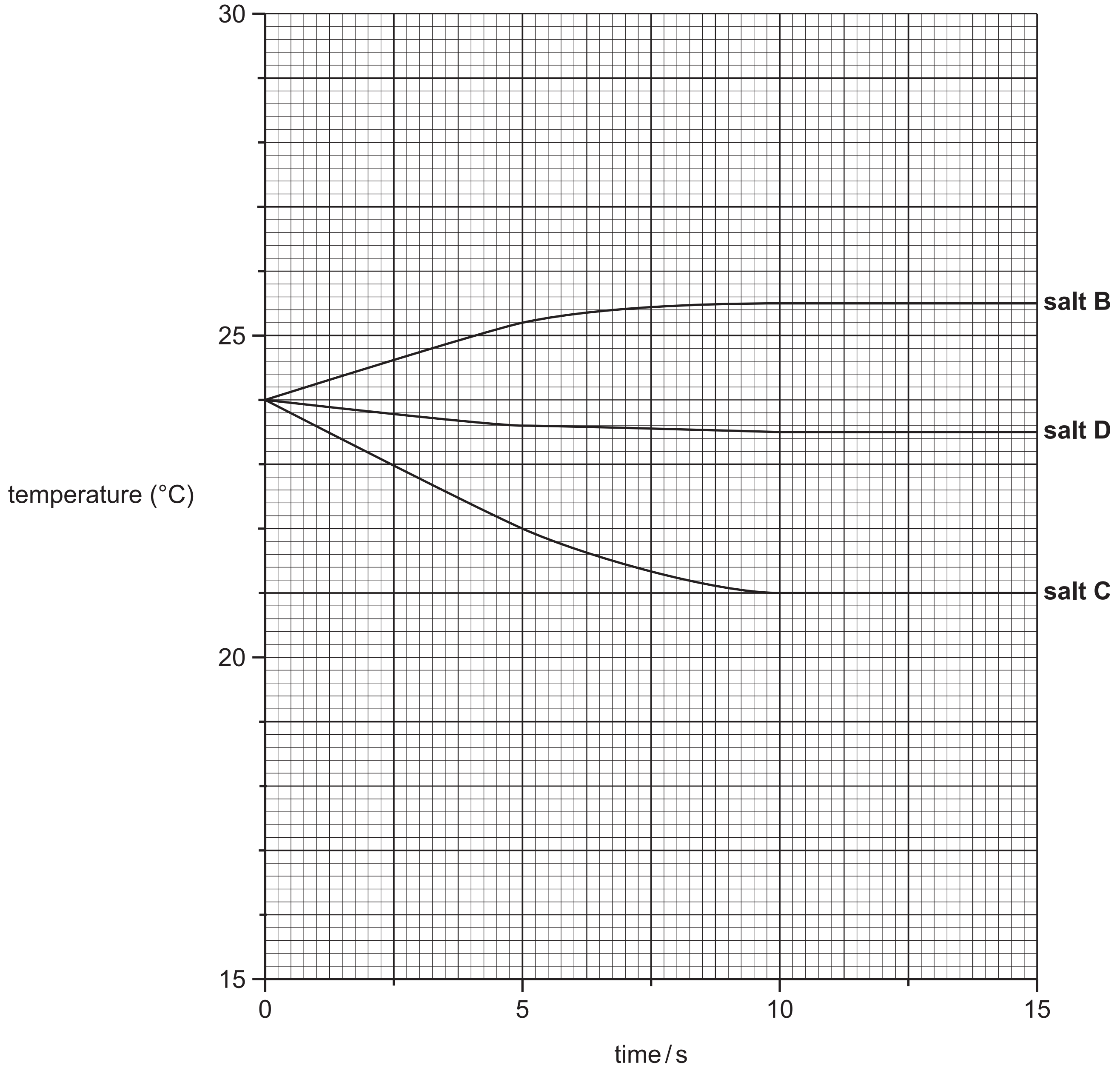


Fig. 2.1

(a) **(i)** Use the information in Fig. 2.1 to complete the first two rows of Table 2.1.

Table 2.1

	salt **B**	salt **C**	salt **D**
initial temperature / °C			
highest or lowest temperature / °C			
change in temperature / °C			

[3]

(ii) Complete the final row of the table by calculating the temperature change for each of the salts **B**, **C** and **D**.

Record these temperature changes in Table 2.1. Place a plus sign (+) in front of a temperature rise and a minus sign (–) in front of a temperature fall. [1]

(iii) Using information in Fig. 2.1, suggest why the student stopped taking readings after 15 seconds.

.... [1]

(iv) The volume of distilled water should always be 25 cm^3 so that the test is fair.
Suggest what apparatus should be used to measure the volume.

.... [1]

(b) Suggest **two** limitations of this investigation.

limitation 1 ....

....

limitation 2 ....

....

[2]

(c) The student is asked by his teacher to identify some of the ions in salt **D**.
He tests the solution of salt **D**.

<u>Test</u>

- Pour the solution of salt **D** into two test-tubes.
- Add a few drops of dilute nitric acid to each test-tube.
- To one portion, add aqueous barium nitrate.
- To the other portion, add aqueous silver nitrate.

His results are shown in Table 2.2.

Table 2.2

test	aqueous barium nitrate	aqueous silver nitrate
observation	no reaction	white precipitate
conclusion	....	....

Complete Table 2.2 to show the conclusions that can be made from these results. [2]

[Total: 10]

3 A student does an investigation to find out how the resistance of a wire depends upon its length.

She sets up a circuit as shown in Fig. 3.1.

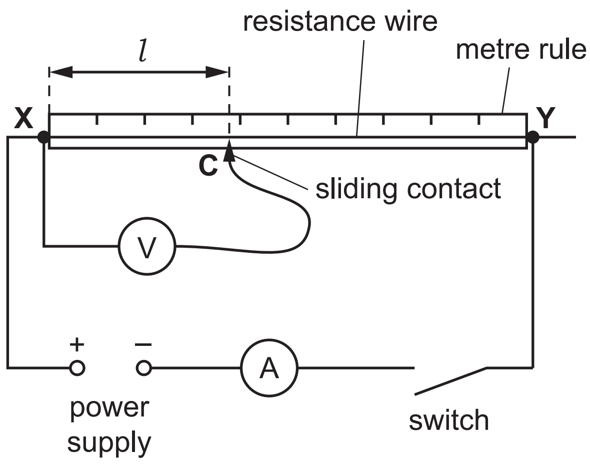


Fig. 3.1

When the switch is closed there is a current I in the circuit. This current remains the same throughout the experiment.

The ammeter reading is shown in Fig. 3.2.

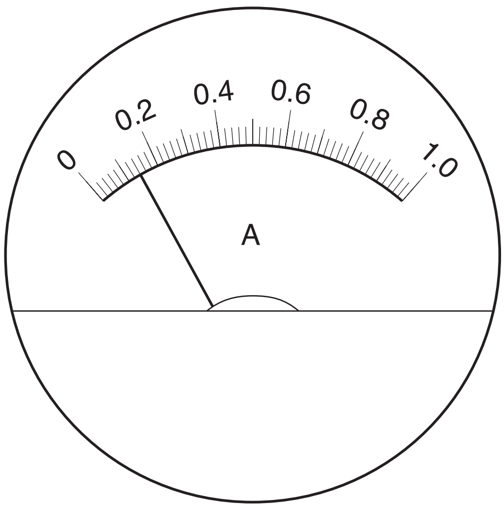


Fig. 3.2

(a) Record the current I to two significant figures.

I = ... A [1]

(b) The student moves the sliding contact **C** along the resistance wire and measures the length, l.

She then closes the switch and measures the potential difference (p.d.) V across the wire to the nearest 0.1 V.

The switch is then opened.

She repeats these steps four more times to get readings for different lengths of the resistance wire.

The results of her experiment are shown in Table 3.1.

Table 3.1

length l/cm	p.d. V/V	resistance R/Ω
10.0	0.1	
25.0	0.3	
40.0	0.4	
70.0	0.7	
85.0	0.9	

(i) Complete Table 3.1 by calculating the resistance R, for each length of wire, using the equation shown.

$$R = \frac{V}{I}$$

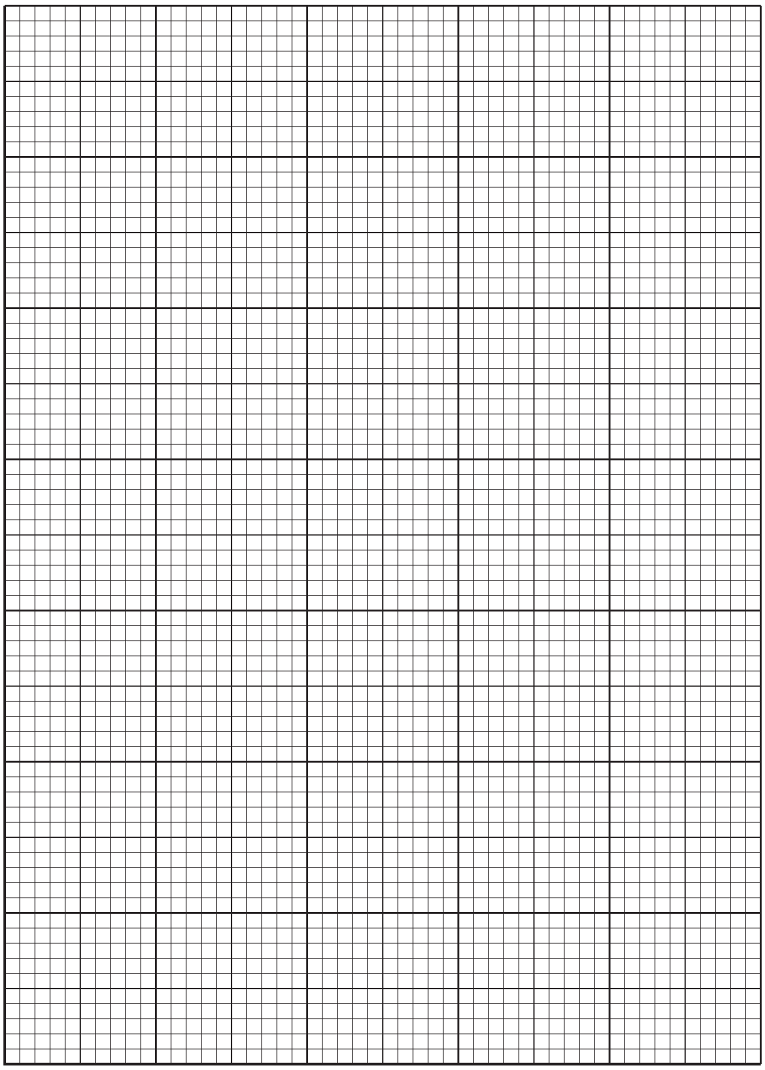
[3]

(ii) Suggest why it is important to open the switch between taking readings.

.... [1]

(c) **(i)** On the grid provided, plot the data points of *R* against *l*.
Choose suitable scales for the axes.

resistance R/Ω



length l/cm

[3]

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

(iii) Use your graph to estimate the resistance *R* of this wire at length 100 cm.

resistance = ... Ω [1]

(iv) Suggest the relationship between resistance *R* of the wire and length *l*. Use the information in the graph to justify your answer.

relationship ....

justification ....

[2]

[Total: 12]

4 A bottle of water tips over.

(a) Fig. 4.1 shows the bottle of water before it tips over and at the point of tipping over.

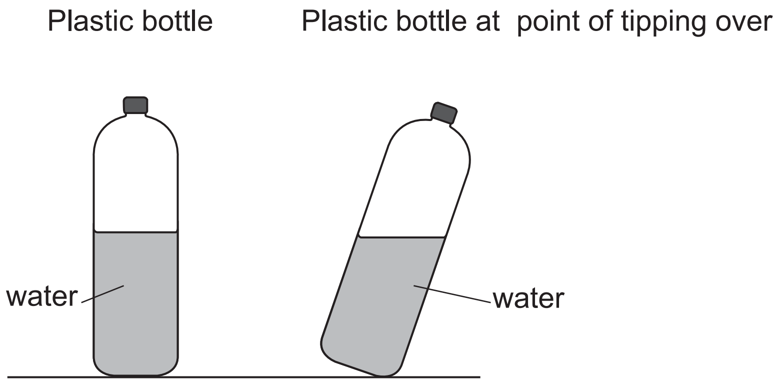


Fig. 4.1

(i) On Fig. 4.1, measure the angle through which the bottle has been tilted.

angle = ... [1]

A student uses a newton meter to measure the force required to tip the plastic bottle over.

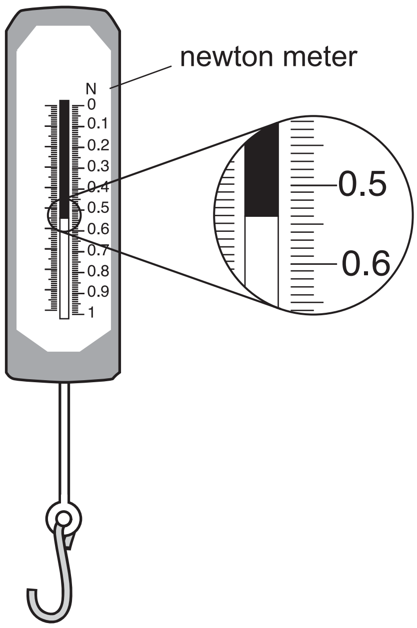


Fig. 4.2

(ii) Record the force shown by the newton meter in Fig. 4.2.

force = ... N [1]

(b) The plastic bottle holds up to 2000 cm^3 of water and has a height of 42 cm.

Plan an experiment to investigate how the volume of water in the plastic bottle affects its stability.

You can assume you have access to laboratory equipment.

In your answer, include:

- the apparatus needed, including a labelled diagram if you wish
- a brief description of the method, including how you will treat variables and any safety precautions
- the measurements you will make
- how you will process your results
- how you will use your results to draw a conclusion.

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.... [6]

[Total: 8]

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