Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

0123456789

PHYSICAL SCIENCE **0652/05**

Paper 5 Practical Test **For Examination from 2019**

SPECIMEN PAPER

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions
Protractor

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.
Practical notes are provided on page 12.

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.

1 You are going to investigate the identity of some of the substances in a mixture. Solid **A** is a mixture of **three** compounds.

You will separate the three compounds and carry out tests to identify **two** of the cations contained in solid **A**.

Finally, you will suggest how to confirm the identity of the **third** cation.

(a)
- Place the sample of solid **A** in a small beaker and add about $25\,cm^3$ distilled water.
- Stir well for at least one minute, then filter the mixture into a large test-tube.
- Keep the filtrate and residue for further testing in **(a)** and **(b)**.

(i)
- 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.

Record your observations.

....

....

.... [2]

(ii) Use your observations in **(a)(i)** to identify the cation present in the filtrate.

.... [1]

(b) (i)
- 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 on a tripod and gauze for two minutes. Do **not** boil the liquid in the beaker.
- Remove the heat.
- When the mixture has cooled a little, filter it into a large test-tube.
- Keep the filtrate for further testing.

Record the colour of the filtrate and the colour of the residue.

colour of filtrate ....

colour of residue ....

[2]

(ii) • Place about 2 cm^3 of the filtrate from **(b)(i)** in a test-tube and add aqueous ammonia **slowly** until the test-tube is almost full.

• Stir the mixture in the test-tube.

Record your observations.

....

....

.... [2]

(iii) Use your observations in **(b)(i)** and **(b)(ii)** to identify the cation present in the filtrate from **(b)(i)**.

identity of cation .... [1]

(c) The third cation is in the residue from **(b)(i)**. A student who carried out this experiment thinks that this residue might be a compound containing the iron(III) ion. She dissolves the residue in dilute nitric acid.

(i) State the name of a reagent used to identify iron(III) ions.

.... [1]

Do not attempt to carry out this experiment.

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

.... [1]

[Total: 10]

2 You are provided with 1 g of each of three salts **B**, **C** and **D**.

You are going to investigate whether there are any temperature changes when these salts are dissolved in water.

You will also identify some of the ions in salt **D**.

(a) (i)
- Measure 25 cm^3 of distilled water into a beaker.
- Use a thermometer to measure the initial temperature of the distilled water.

Record in Table 2.1 this value, to the nearest 0.5 °C, in the appropriate space in the column for salt **B**. [1]

(ii)
- Add the sample of salt **B** to the distilled water in the beaker and stir well.
- Observe the highest or lowest temperature reached after mixing.

Record in Table 2.1 this highest or lowest temperature to the nearest 0.5 °C, in the appropriate space for salt **B**. [1]

(iii)
- Discard the solution of **B**.
- Wash out the beaker thoroughly.

Repeat **(a)(i)** and **(a)(ii)** using salt **C** instead of salt **B**. [1]

- Discard the solution of **C**.
- Wash out the beaker thoroughly.

(iv) Repeat **(a)(i)** and **(a)(ii)** using salt **D** instead of salt **B**. [1]

- **Keep** the resulting solution of **D** for use in **(d)**.

Table 2.1

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

(b) Using the initial temperature and either the highest or lowest temperatures in Table 2.1, calculate any temperature changes that occur when each of salts **B**, **C** and **D** dissolve in water.

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]

(c) Suggest **two** limitations of this experiment.

limitation 1 ....

....

limitation 2 ....

....
[2]

(d)
- Pour the solution of salt **D**, from **(a)(iv)**, 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.

(i) Construct a suitable table for your observations and conclusions in the space provided. [1]

(ii) Record your observations and conclusions in your table in **(d)(i)**. [2]

[Total: 10]

3 You are going to find out how the resistance of a wire depends upon its length.

The circuit shown in Fig. 3.1 has been set up for you.

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

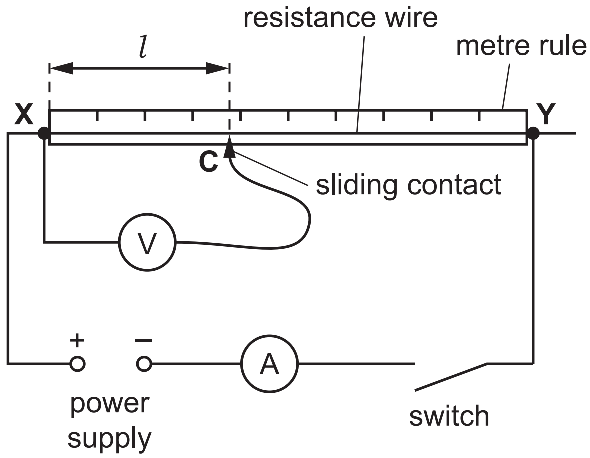


Fig. 3.1

(a) **(i)** • Close the switch.

Record the current I to two significant figures.

I = ... A [1]

• Open the switch.

(ii) • Place the sliding contact, **C**, on the resistance wire at a distance of l = 10.0 cm from end **X**. Close the switch.

Record in Table 3.1 the potential difference (p.d.) V across the wire to the nearest 0.1 V.

Record also the length l.

• Open the switch. [1]

Table 3.1

length l / cm	p.d. V / V	resistance R / Ω

(iii) Calculate the resistance R of the 10.0 cm length of wire using the equation shown.

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

Record this value of R in the space provided and in the appropriate place in the table.

R = ... Ω [1]

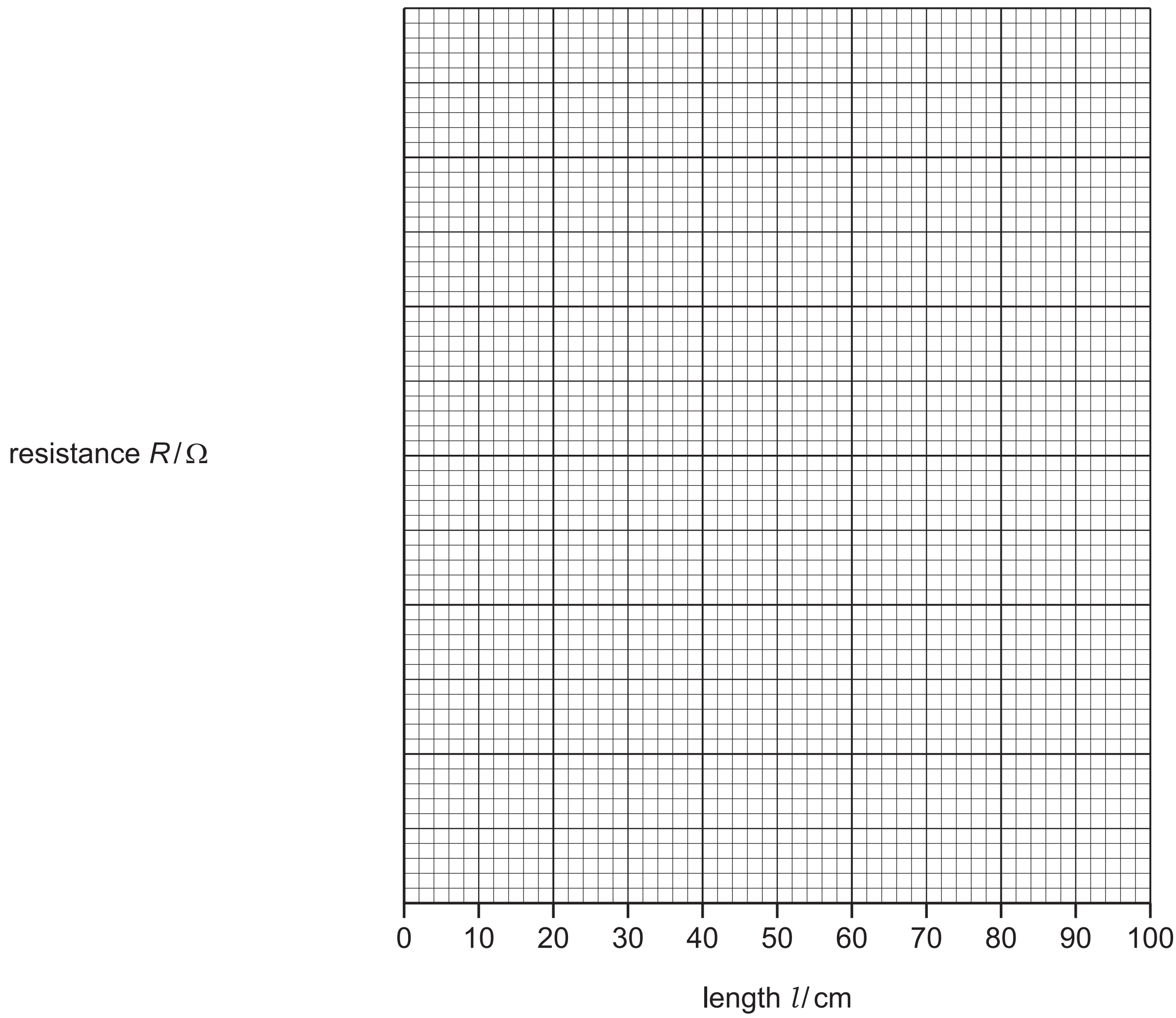
(iv) • Repeat steps in **(a)(ii)** for values of l = 25.0 cm, 40.0 cm, 70.0 cm and 85.0 cm. Open the switch after each measurement.

Calculate R for each length l and record your answers in Table 3.1. [3]

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

.... [1]

(b) **(i)** On the grid provided, plot the data points of R against l.



[2]

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

(c) 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]

Question 4 starts on page 10

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.

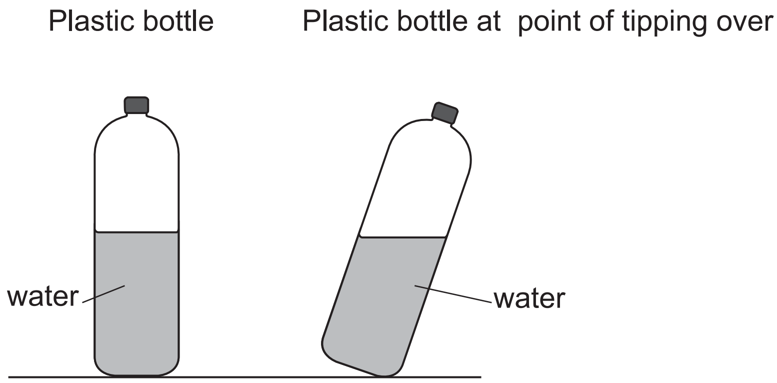


Fig. 4.1

(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.

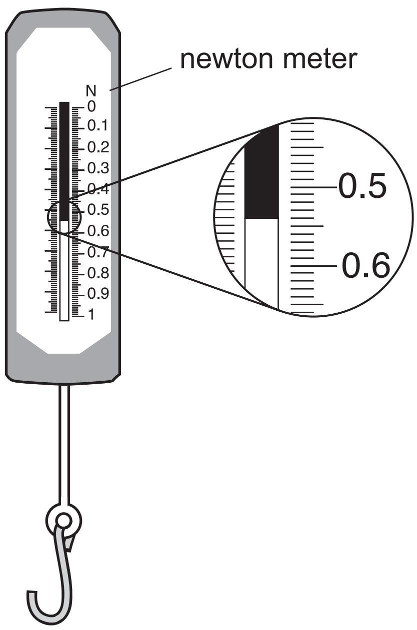


Fig.4.2

(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.

....

....

....

....

....

....

....

....

....

....

....

.... [6]

[Total: 8]

NOTES FOR USE IN QUALITATIVE ANALYSIS

Test for anions

anion	test	test result
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
bromide (Br^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	cream ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify, then add aqueous barium nitrate	white ppt.

Test for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
ammonium (NH_4^+)	ammonia produced on warming	–
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt., or very slight white ppt.
copper (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess, giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

Test for gases

gas	test and test results
ammonia (NH_3)	turns damp, red litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	'pops' with a lighted splint
oxygen (O_2)	relights a glowing splint

Flame tests for metal ions

metal ion	flame colour
lithium (Li^+)	red
sodium (Na^+)	yellow
potassium (K^+)	lilac
copper(II) (Cu^{2+})	blue-green