Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

5932521190

PHYSICAL SCIENCE **0652/51**

Paper 5 Practical Test **October/November 2016**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

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.
Notes for Use in Qualitative Analysis for this paper are printed 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.

For Examiner's Use	
1	
2	
3	
Total	

This document consists of **9** printed pages and **3** blank pages.

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CAMBRIDGE International Examinations

1 Solution **J** contains a mixture of two salts with the same anion. One of the cations in **J** is the ammonium ion. Solid **L** is an element.

You are going to carry out some experiments to identify the anion, the other cation in **J** and the element **L**.

(a) Carry out tests in test-tubes to identify the other cation and the anion in solution **J**, choosing **only** from the following reagents.

barium nitrate solution
dilute nitric acid
silver nitrate solution
sodium hydroxide solution

Use only small amounts of solution **J** for each test.

Record the tests, observations and conclusions which identify the other cation and the anion in **J**.

cation

test ....

....

....

observations ....

....

....

conclusion ....

anion

test ....

....

....

observations ....

....

....

conclusion ....

[4]

(b) **(i)**
- Place a spatula-full of solid **L** in a test-tube. Add dilute hydrochloric acid until the test-tube is half-full.
- Warm the test-tube gently for a short time to increase the rate of reaction.
- Test the gas produced.
- Stir carefully and allow the mixture to react for a further three minutes.
- Record your observations, the gas test and result of the gas test and the name of the gas produced.
- **Keep the mixture for (b)(ii).**

observations ....

....

....

gas test and result ....

....

....

gas produced ....
[4]

(ii) Filter the mixture from **(b)(i)** into a large test-tube.

Slowly add sodium hydroxide solution to the filtrate in the large test-tube until there are no further changes.

Record your observations and identify the element **L**.

observations ....

....

....

....

element **L** is ....
[3]

(c) **(i)** Place one spatula-full of magnesium powder in a test-tube. Add solution **J** to the magnesium powder until the test-tube is half-full.

Shake once.

Record your observations.

observations ....

....

....

After three minutes, filter the mixture into a large test-tube and record the appearance of the filtrate.

Keep the filtrate for (c)(ii).

appearance of filtrate ....

.... [2]

(ii) Add sodium hydroxide solution **slowly** to approximately 2 cm^3 of the filtrate from **(c)(i)** in a test-tube until there is no further change.

Record your observations.

observations ....

....

....[1]

(d) Using your observations and conclusions in **(a)** and **(c)**, suggest what has happened to the other cation (not ammonium) in solution **J**.

....

....

....[1]

2 You are going to investigate the period of a simple pendulum and determine a value for the acceleration due to gravity.

The period of a pendulum is the time for one complete swing (oscillation) of the pendulum. This is shown in Fig. 2.1, where the period is the time taken for the bob to swing from **P** to **Q** and back to **P** again.

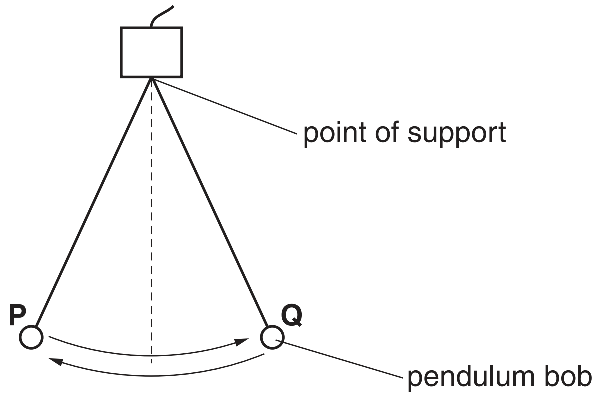


Fig. 2.1

The pendulum has been set up for you as shown in Fig. 2.2.

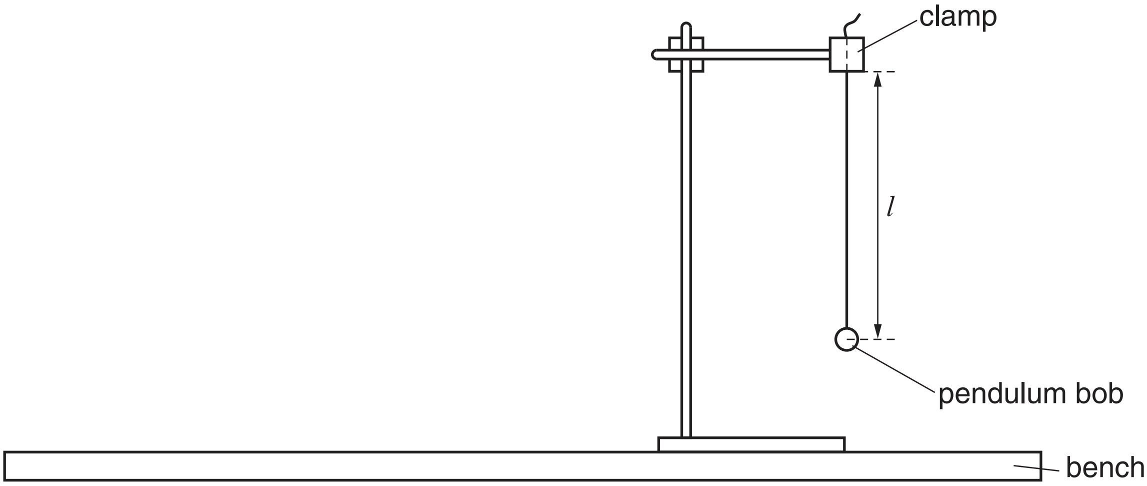


Fig. 2.2

The length l of the pendulum is the distance from the point of support to the centre of the pendulum bob.

(a) (i) Measure the length l of the pendulum to the nearest 0.1 cm. Record your result in the first row of Table 2.1. [1]

(ii) Describe a precaution that you took to measure l as accurately as possible. You may draw a diagram if you wish.

....

....[1]

(b) (i) Give the pendulum bob a small sideways displacement (between 5 cm and 10 cm) and release it so that it oscillates.

Measure and record in Table 2.1 the time taken for 20 oscillations.

Record this time to one decimal place. [2]

(ii) Adjust the length l of the pendulum until it is 50.0 cm.

Repeat the procedure described in **(b)(i)**. [1]

(iii) Repeat the procedure in **(b)(i)** for lengths l of 40.0 cm, 30.0 cm and 20.0 cm. [1]

Table 2.1

l / cm	time for 20 oscillations / s	period T / s	T^2 / s^2
50.0			
40.0			
30.0			
20.0			

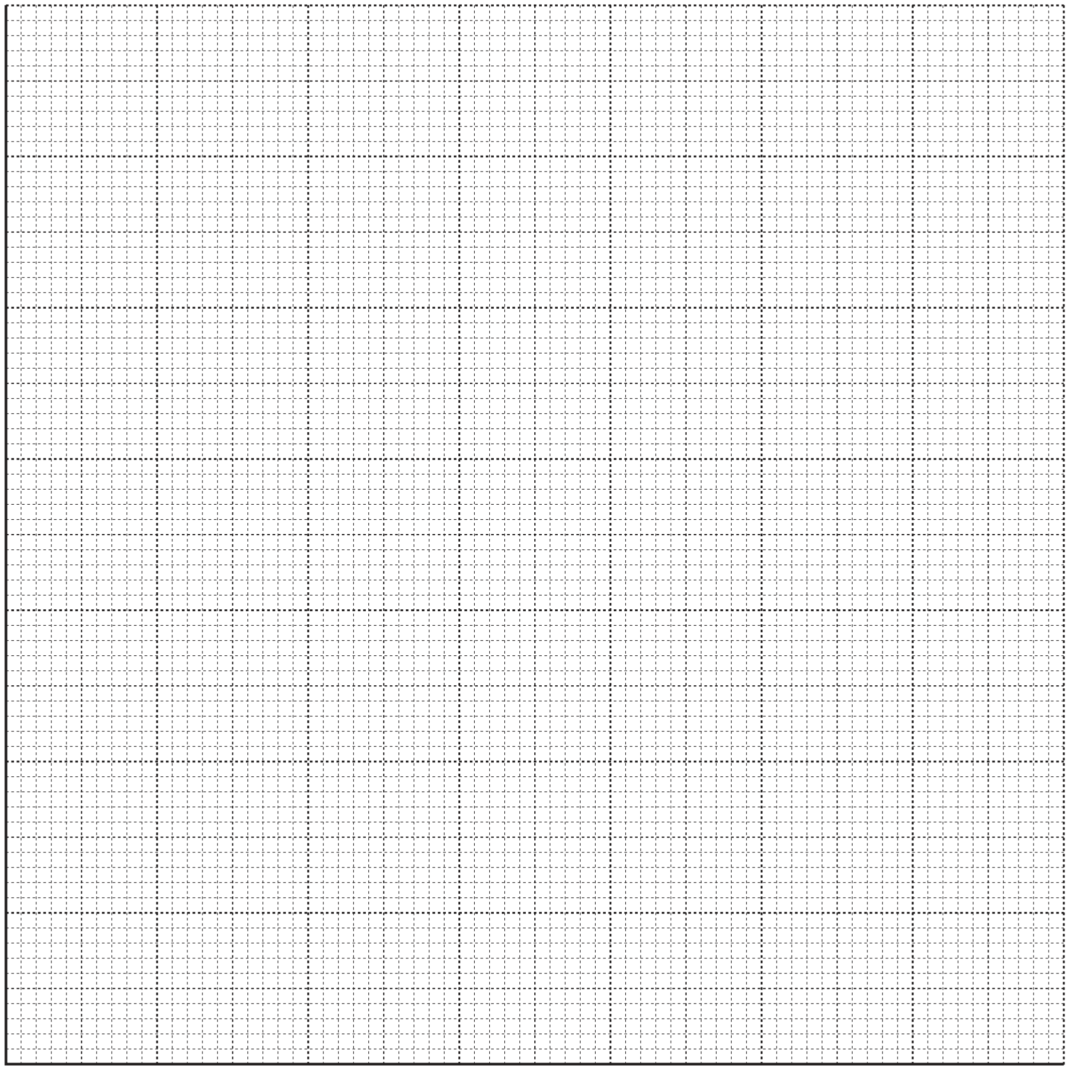
(c) (i) Use your results in Table 2.1 to calculate the period T of the pendulum for each set of readings. Remember that the period is the time for **one** oscillation.

Record your values in Table 2.1. [1]

(ii) Calculate the value of T^2 for each set of readings and record in Table 2.1 your values to one decimal place. [1]

(d) (i) On the grid provided, plot a graph of T^2 (vertical axis) against l (horizontal axis). Start both axes of your graph from the origin (0, 0). Draw the best-fit straight line.

T^2 / s^2



l / cm

[3]

(ii) Calculate the gradient of your line. Show all working and indicate on your graph the values you chose to enable the gradient to be calculated.

gradient of line = ………. ....[2]

(e) The acceleration due to gravity g is given by the equation shown.

$$g = \frac{0.395}{\text{gradient}}$$

Use this equation to calculate a value for g.

g = ...m / s^2 [1]

(f) Compare your measured value of g from part **(e)** with the actual value of 9.8 m / s^2.

Comment on whether or not your measured value of g from part **(e)** agrees with the actual value of 9.8 m / s^2. Justify your answer with reference to your results.

....

....

....[1]

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NOTES FOR USE IN QUALITATIVE ANALYSIS

Tests 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.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide, then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.

Tests for aqueous cations

cation	*effect of aqueous sodium hydroxide*	*effect of aqueous ammonia*
ammonium (NH_4^+)	ammonia produced on warming	–
copper(II) (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

Tests for gases

gas	*test and test result*
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