Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

COMBINED SCIENCE **0653/51**

Paper 5 Practical Test **October/November 2018**

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.

CAMBRIDGE International Examinations

1 You are going to investigate a leaf.

(a) In the box, make a large detailed pencil drawing of the leaf.

[3]

(b) (i) Measure the longest length of the leaf, not including any stalk.

Record this length in millimetres to the nearest millimetre.

length of leaf = ... mm [1]

(ii) Draw a line to show this longest length on your drawing.

Measure and record the length of this line, in millimetres, to the nearest millimetre.

length on drawing = ... mm [1]

(iii) Use your measurements from **(b)(i)** and **(b)(ii)** to calculate the magnification of your drawing.

magnification = ... [1]

(c) **(i)** Describe in detail the steps involved to test the leaf for starch.

.....

.....

.....

.....

.....[3]

(ii) State the observation for a positive result.

.....[1]

2 You are going to investigate the temperature changes when solid **H** reacts with solution **J**.

(a) (i) Use the thermometer to measure the temperature *T* of solution **J**.

Record, in Table 2.1, this value to the nearest 0.5 °C for time = 0. [1]

Table 2.1

time / min	temperature *T* / °C
0	
0.5	
1.0	
1.5	
2.0	
2.5	
3.0	
3.5	
4.0	

(ii)
- Place all of solid **H** into the plastic cup which should be supported in a beaker.
- Measure 25 cm^3 solution **J** using the measuring cylinder.
- Add the measured volume of solution **J** to the solid **H** in the plastic cup.
- Start the stopclock.
- Stir the mixture thoroughly.
- Continue stirring and measure the temperature of the mixture every half minute for four minutes.
- Record, in Table 2.1, these values to the nearest 0.5 °C.

After the final reading, record in Table 2.2 the appearance of the solid and the solution. [4]

Table 2.2

observations	solid **H**	solution **J**
before the reaction	grey	blue
after the reaction		

(b) **(i)** Use the data in Table 2.1 to estimate the maximum rise in temperature, ΔT, of the mixture during the reaction.

ΔT = ... °C [1]

(ii) Explain why the value in **(b)(i)** is only an estimate.

.....

.....[1]

(iii) Suggest how you could improve the procedure in **(a)(ii)** to achieve a more accurate value of the maximum rise in temperature for this experiment without modifying the apparatus or chemicals.

.....

.....[1]

(c) Calculate the energy E released in this reaction using the equation shown:

$$E = \text{volume of solution } \mathbf{J} \times 4.2 \times \Delta T$$

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

E = ... joules [2]

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3 You are going to use a spring to determine the acceleration *g* due to gravity.

(a) Measure the unstretched length l_0 of the spring to the nearest millimetre.

Do not include the loops at the end of the spring in your measurement.

l_0 = ... mm [1]

(b) Attach the spring to the clamp as shown in Fig. 3.1.

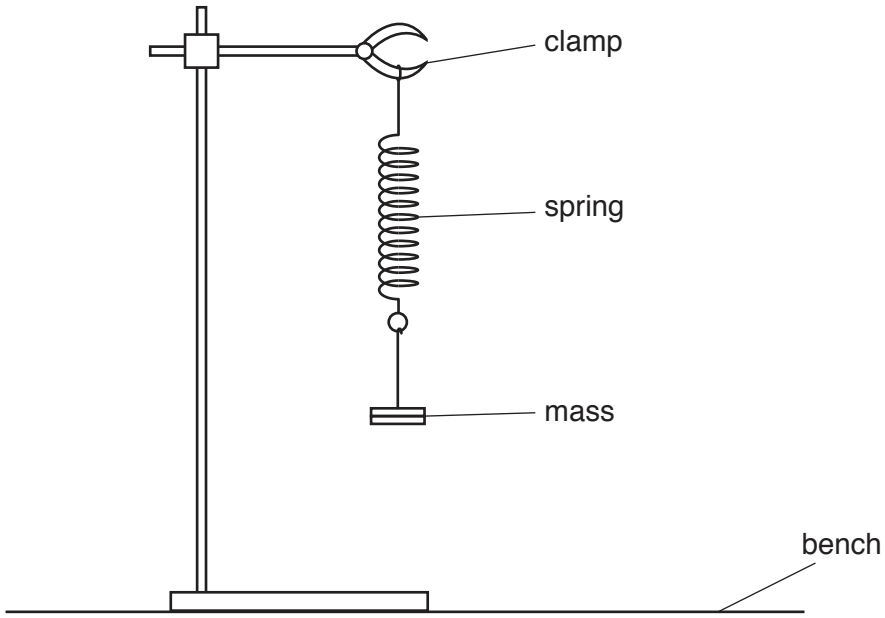


Fig. 3.1

- Hang a 200 g mass on the spring.
- Measure the stretched length l_1 of the spring.
- Record your value in Table 3.1.
- Calculate the extension *e* of the spring produced by the mass. Use the equation shown:

$$e = l_1 - l_0$$

- Record your value in Table 3.1 on page 8.

[1]

Table 3.1

mass m/g	stretched length l_1/mm	extension e/mm	time for 20 oscillations t/s	period T/s	T^2/s^2
200					
300					
400					
500					

(c) Pull the mass down a **small** distance and release it. The mass oscillates up and down. The period T of the oscillations is the time taken for **one** oscillation.

One oscillation is one complete up-motion and one complete down-motion of the mass, as shown in Fig. 3.2.

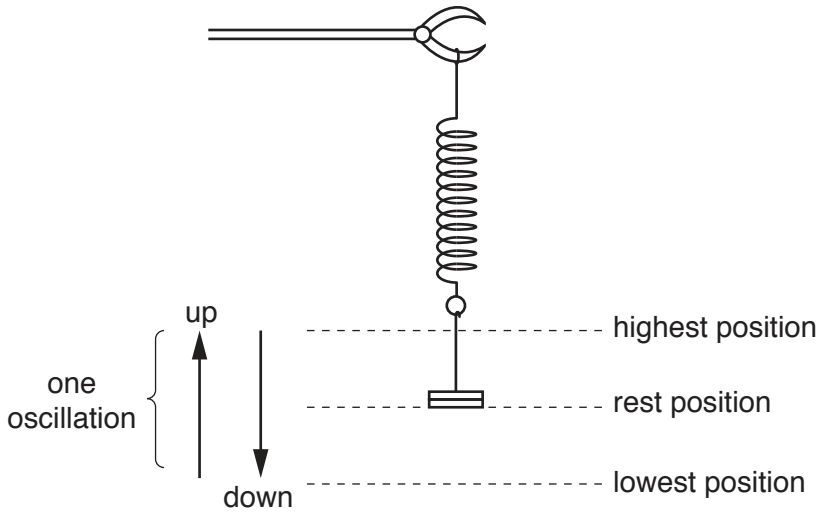


Fig. 3.2

(i) Measure the time t taken for 20 oscillations. Record this time in Table 3.1. [1]

(ii) Repeat **(b)** and **(c)(i)** for masses of 300 g, 400 g and 500 g. [1]

(iii) Use your answers from **(c)(i)** and **(c)(ii)** to calculate the period T (the time for one oscillation) for each of the masses.

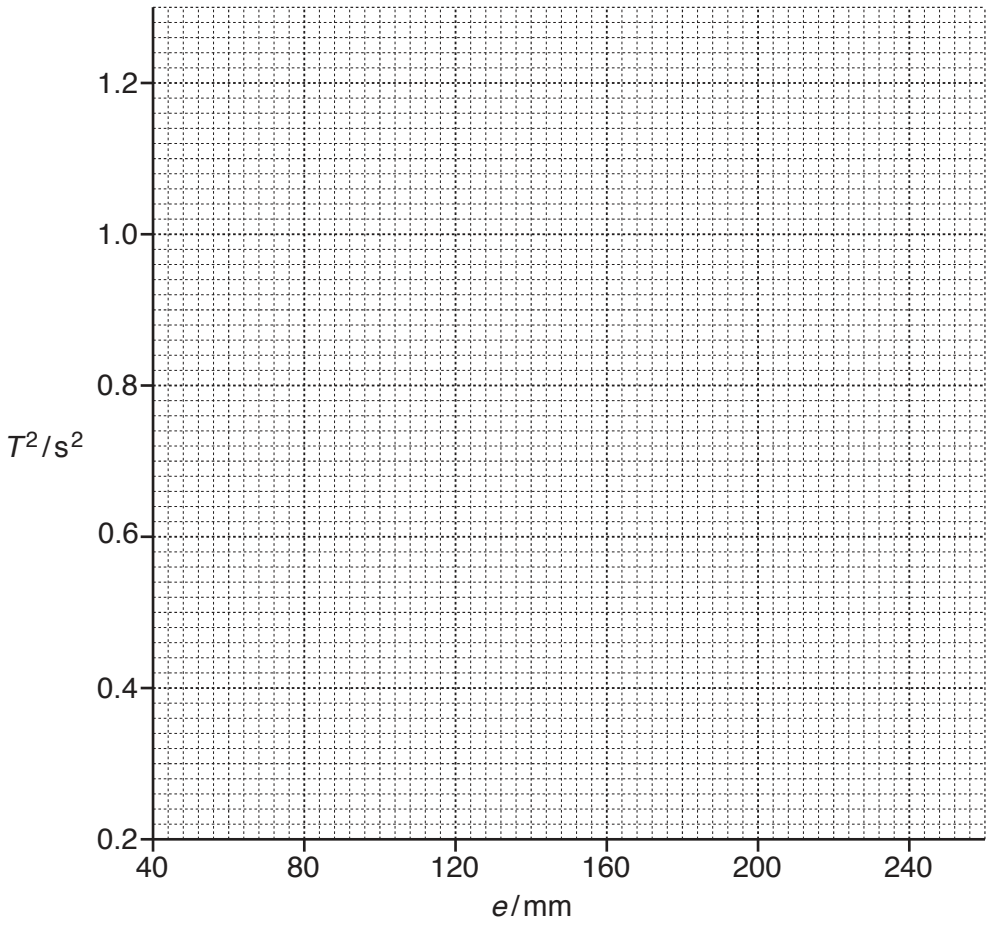
Record, in Table 3.1, your values of T. [1]

(iv) Calculate the values of T^2.

Record, in Table 3.1, your answers to **two** significant figures. [1]

(d) (i) On the grid provided, plot a graph of T^2 (vertical axis) against e. [1]

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



(iii) Calculate the gradient of your line.

gradient = ... [1]

(iv) Use your answer to **(d)(iii)** and the equation shown to determine a value for the acceleration g due to gravity.

$$g = \frac{0.0395}{\text{gradient}}$$

g = ... m/s^2 [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 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