Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3413797694

CO-ORDINATED SCIENCES **0654/61**

Paper 6 Alternative to Practical **May/June 2015**

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.

This document consists of **15** printed pages and **1** blank page.

IB15 06_0654_61/3RP

CAMBRIDGE International Examinations

1 A student investigates plant transport systems using a celery stalk and coloured water.

He cuts a piece of celery stalk and places it into some coloured water for five minutes with the freshly cut end downwards as shown in Fig. 1.1.

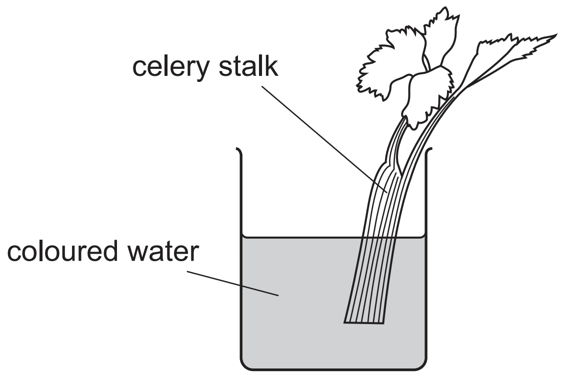


Fig. 1.1

After five minutes he removes the stalk from the coloured water and cuts a slice from the end. Fig. 1.2 shows what the cross section looks like.

Fig. 1.2

(a) **(i)** In the space below make a pencil drawing of the piece of celery stalk in Fig. 1.2 to show the shape of the outline. Label **two** of the stained areas.

[2]

(ii) Name the tissue that has become coloured and state what can be concluded about its function.

name ....

function ....

[2]

(b) The student crushes a piece of the celery with distilled water using a pestle and mortar.

- He divides the mixture between three test-tubes.
- To one test-tube he adds an equal amount of Benedict's solution and then places it in a hot water-bath for about five minutes.
- To a second test-tube he adds biuret solution.
- To the third test-tube he adds iodine solution.

His observations are shown in Table 1.1.

Table 1.1

test	observation	conclusion
Benedict's solution	orange	
biuret solution	blue	
iodine solution	orange	

Complete Table 1.1 by writing a conclusion for each of the three tests. [3]

(c) Plan an experiment based on the method described above, to investigate the effect of temperature on the speed of movement of the coloured water in pieces of celery stalk.

....

....

....

....

....

.... [3]

2 A student is finding the spring constant k of a spring. The spring constant of a spring is a measure of the spring's stiffness.

She sets up the apparatus as shown in Fig. 2.1.

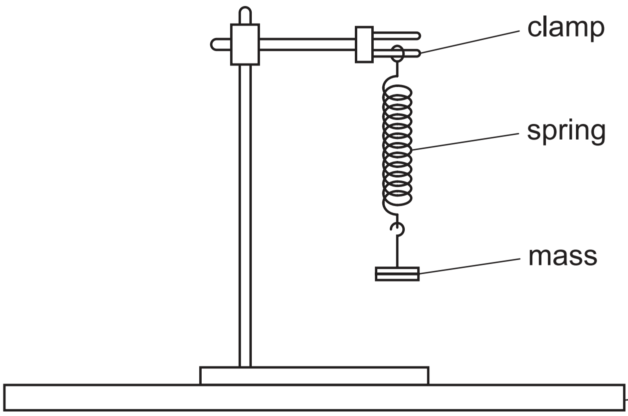
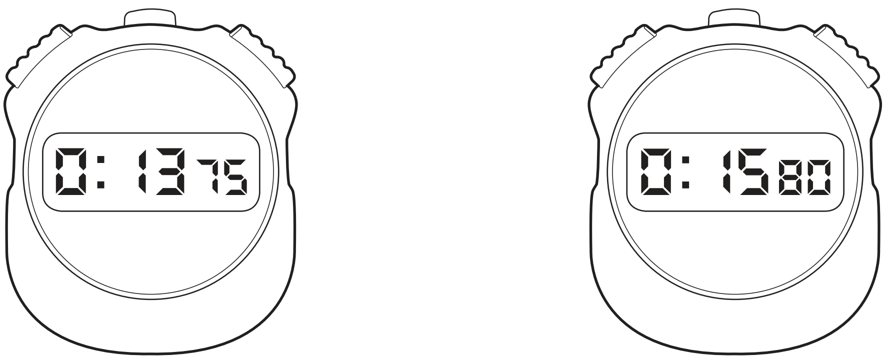


Fig. 2.1

- She hangs a mass m of 0.20 kg on the spring.
- She pulls the 0.20 kg mass down a small distance and releases it.
- The mass oscillates up and down.
- The period T of the oscillations is the time taken for **one** oscillation. This is difficult to measure accurately so she measures the time taken t for 20 oscillations.
- She enters this value in Table 2.1.
- She calculates the values of T and T^2 and enters them in Table 2.1.
- She repeats this with masses m of 0.30 kg, 0.40 kg and 0.50 kg.

(a) Fig. 2.2 shows the stopwatches for the time taken for 20 oscillations when m = 0.30 kg and 0.40 kg.

Read the stopwatches and record the times, to the nearest second, in Table 2.1. [1]



m = 0.30 kg m = 0.40 kg

Fig. 2.2

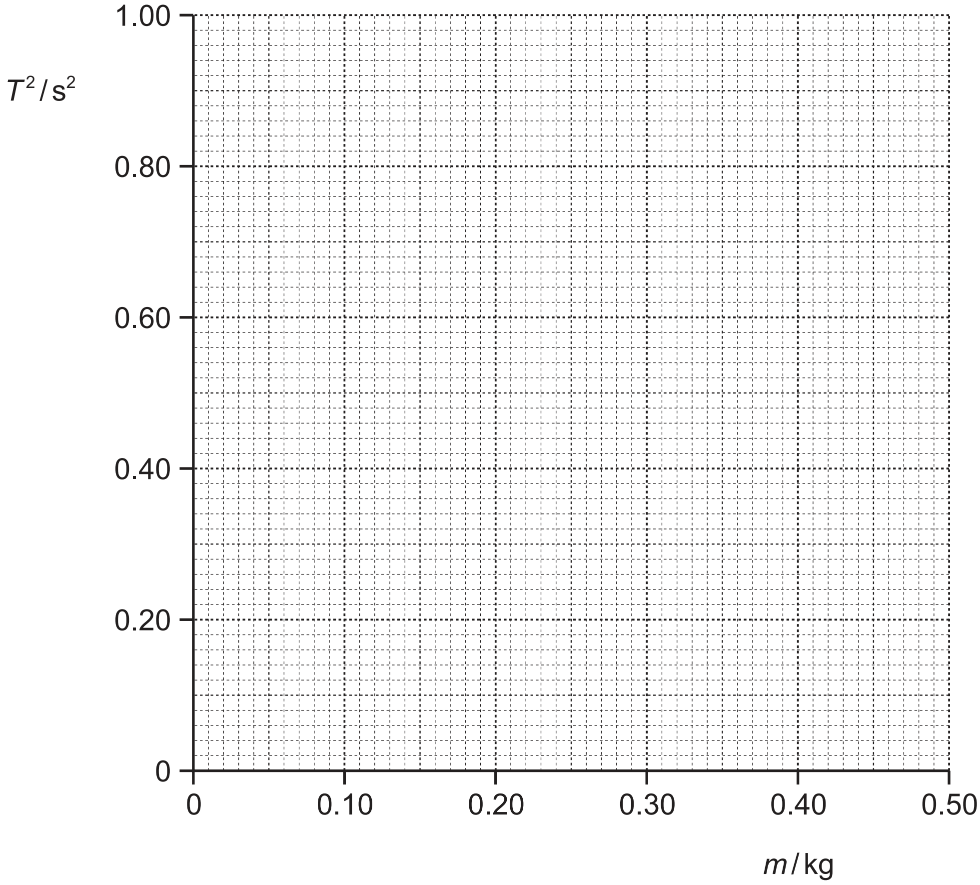
(b) (i) Complete Table 2.1 by calculating T and T^2, for m = 0.30 kg and 0.40 kg to two decimal places. [3]

Table 2.1

mass m / kg	time for 20 oscillations t / s	period T / s	T^2 / s^2
0.20	11	0.55	0.30
0.30			
0.40			
0.50	18	0.90	0.81

(ii) On the grid provided, plot a graph of T^2 against m.

Draw the best fit straight line through the origin.



[2]

(iii) Calculate the gradient of the line. Show **clearly**, on the graph, how you did this.

gradient = ... [2]

(iv) Use your value from **(iii)** to calculate the value of the spring constant *k* of the spring from the equation

$$k = \frac{39.5}{\text{gradient}}$$

Give your answer to two significant figures.

k = ... N / m [2]

Please turn over for Question 3.

3 A student is given a solid, **X**, which is a mixture of three metal oxides **A**, **B** and **C**. She is told that one of the oxides is soluble in water.

(a) She places some of the solid **X** into a beaker and adds some distilled water. She stirs the mixture for 30 seconds and then filters it. She keeps the residue for use in **(b)**.

She pours the filtrate into two test-tubes.

(i) To the first test-tube of filtrate she adds Universal Indicator (full range) solution. The student concludes that the filtrate is alkaline.

Suggest the colour observed by the student and hence give the pH.

colour ....

pH .... [1]

(ii) She bubbles carbon dioxide through the other test-tube of filtrate.

A white precipitate forms in the filtrate.

State the name of the filtrate and so deduce the name of one of the oxides present in solid **X**. This is metal oxide **A**.

name of filtrate ....

name of metal oxide **A** .... [2]

(b) The student adds dilute nitric acid to the residue from part **(a)** and warms it gently until it dissolves. She pours the resulting solution into two test-tubes until they are each one third full.

To the first test-tube the student adds aqueous sodium hydroxide until no further changes are observed.

To the second test-tube she adds aqueous ammonia until no further changes are observed.

She concludes that the copper(II) ion is present in the solution and has come from metal oxide **B**.

(i) Describe the observations that confirm the presence of copper(II) ions.

observations with aqueous sodium hydroxide ....

....

....

observations with aqueous ammonia ....

....

....

[3]

(ii) State the formula for the metal oxide **B**.

formula of metal oxide **B** .... [1]

(c) Metal oxide **C** is zinc oxide.

Starting with a pure sample of zinc oxide, describe how the student can confirm the presence of zinc ions. Include any reagents she uses and the observations that she makes.

....

....

....

.... [3]

4 **(a)** A student is looking at a sample of blood using a microscope. Blood has four main components. These are labelled **A** to **D** in Fig. 4.1.

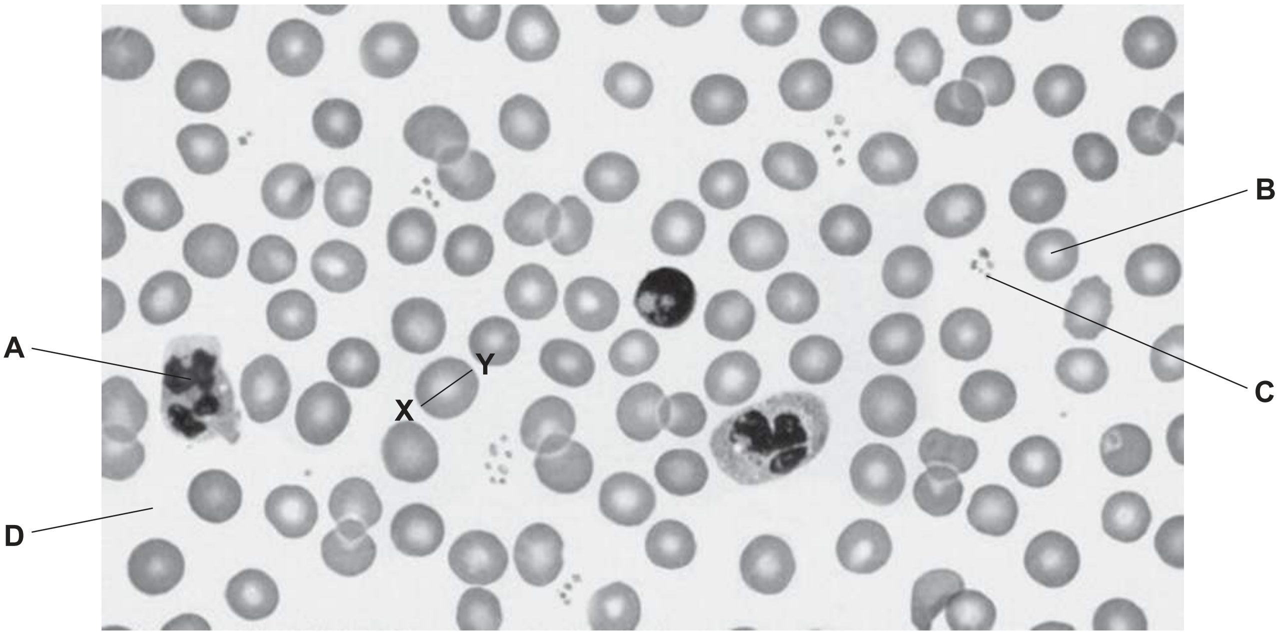


Fig. 4.1

(i) Name the components **A** to **D** in Fig. 4.1.

A ....

B ....

C ....

D .... [4]

(ii) Measure the length of the line **X–Y** in Fig. 4.1 in millimetres.

.... mm [1]

(iii) The magnification of the photograph in Fig. 4.1 is $\times 1000$. Use this information and your measurement in **(a)(ii)** to calculate the actual diameter in millimetres of the component with the line **X–Y** in Fig. 4.1.

Show your working.

actual diameter = ... mm [2]

(b) Some students investigate the effect of physical activity on pulse rate.

- They record their pulse as the number of beats in 15 seconds.
- They each jog on a treadmill for 5 minutes and immediately record their pulse again as the number of beats for 15 seconds.

The students' results are shown in Table 4.1.

Table 4.1

recording	average number of beats in 15 seconds	average heart rate in beats per minute
before jogging	17	
after jogging	35	

(i) Complete Table 4.1 by calculating the average pulse rates in beats per minute. [1]

(ii) Suggest why the pulse rate changes after jogging.

....

.... [1]

(iii) Explain why this method is more reliable than just one student using only their own pulse rate.

....

.... [1]

5 **(a)** The teacher gives a student some lamps. The teacher says that some of the lamps do not work.

Outline a procedure the student can use to identify which lamps are working and which are not. Include the names of the pieces of apparatus that the student must use. You should include a diagram in your answer.

....

....

....

.... [3]

(b) The student finds five lamps are working.

Draw a circuit diagram using **one** lamp only to show how the student can find the current passing through it and the potential difference across it.

[3]

(c) The student repeats the procedure in **(b)** for the other four lamps in turn.

Construct a table, with headings, the student can use to record the current and potential difference for each lamp.

Remember to include units.

[3]

(d) Explain how the student can calculate the resistance of each lamp from the readings in the table.

....

.... [1]

6 **(a)** A student is investigating the reaction between magnesium and hydrochloric acid.

He places a piece of magnesium ribbon 1 cm in length into a test-tube of hydrochloric acid. He sees bubbles of gas given off.

Name the gas.

Describe a test for this gas, including the result which confirms its identity.

name of gas ....

test ....

result ....

[3]

(b) The student investigates how much gas is given off when all the magnesium reacts. He adds hydrochloric acid to a piece of magnesium ribbon in a conical flask and quickly attaches apparatus so he can measure the volume of gas given off.

Draw a labelled diagram of the complete apparatus he uses.

[2]

(c) The student adds a 2 cm length of magnesium ribbon to a fresh supply of hydrochloric acid. He measures the total volume of gas collected every 30 seconds for 3 minutes.

He plots his results as shown in Fig. 6.1.

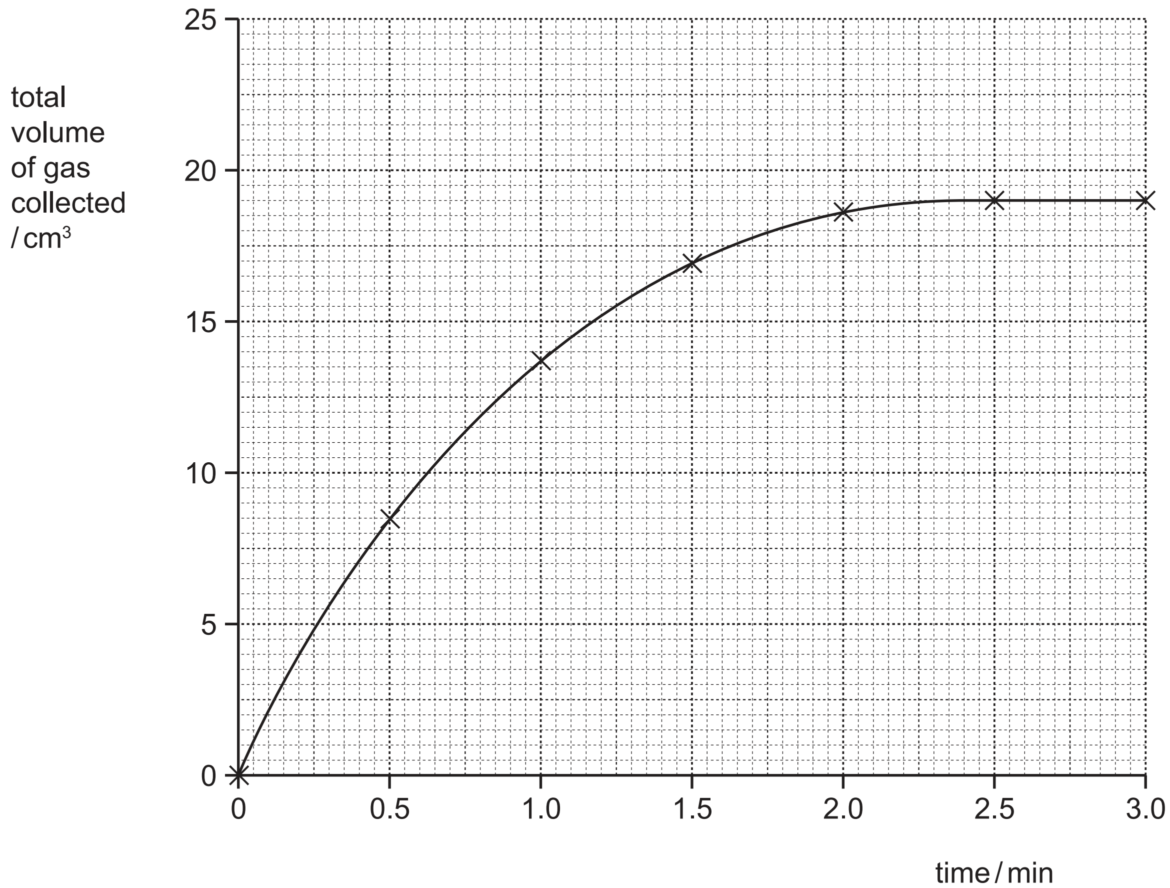


Fig. 6.1

(i) Describe what happens to the rate of this reaction during the 3 minute period.

....

....

.... [2]

(ii) Suggest a reason for the rate of reaction between 2.5 and 3 minutes.

....

....

.... [1]

(d) He does a second experiment with a new 2 cm length of magnesium ribbon and the same volume and concentration of acid, but at a higher temperature.

Draw on Fig. 6.1 the curve that the student draws. **Label your curve T**. [2]

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