Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

COMBINED SCIENCE **0653/62**

Paper 6 Alternative to Practical **October/November 2018**

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 **18** printed pages and **2** blank pages.

CAMBRIDGE International Examinations

[Turn over

1 A student investigates the nutrient content of three solutions, **A**, **B** and **C**.

He tests **A**, **B** and **C separately** with Benedict's solution, biuret solution and iodine solution.

(a) Name the test solution which requires him to use a hot water-bath.

.....[1]

(b) His results are shown in Table 1.1.

Table 1.1

solution	observation with Benedict's solution	observation with biuret solution	observation with iodine solution
A	blue	purple	blue-black
B	green	blue	brown
C	blue	blue	blue-black

Use Table 1.1 to state the nutrients present in each of solutions **A**, **B** and **C**.

solution **A** contains .....

solution **B** contains .....

solution **C** contains .....

[3]

(c) State **and** explain **one** safety precaution that the student should use when carrying out these tests.

safety precaution .....

explanation .....

[1]

(d) Describe a method used to test a liquid for the presence of fats. Include the observation for a positive result.

method

.....

.....

observation for a positive result

.....
[2]

(e) Another student carries out an experiment on two different solutions using Benedict's solution.

This allows her to compare the concentration of the nutrient tested for in each solution.

(i) State **two** variables which need to be controlled in this experiment.

variable 1 .....

variable 2 .....
[2]

(ii) Explain how the results will allow the concentrations of the nutrient in the two solutions to be compared.

.....

.....[1]

2 A student investigates the thermal decomposition of metal carbonates.

(a) Procedure

- She places a 1.5 g sample of solid copper carbonate in a test-tube.
- She places about 5 cm depth of limewater in a second test-tube.
- She connects the bung of a delivery tube to the test-tube containing the copper carbonate and places the delivery tube into the limewater.
- She heats the test-tube containing copper carbonate with a hot flame and immediately starts a stopclock.
- When the limewater becomes milky, she stops the stopclock, immediately removes the delivery tube from the limewater and removes the source of heat.
- She records, in Table 2.1, the time to the nearest second.

She repeats the above procedure for magnesium carbonate and zinc carbonate.

Table 2.1

name and formula of metal carbonate	time / s
copper carbonate, $CuCO_3$	39
magnesium carbonate, $MgCO_3$	65
zinc carbonate, $ZnCO_3$	47

(i) Draw a diagram of the apparatus connected together.

Label the **metal carbonate** and the **limewater**.

[2]

(ii) State why it is important to remove the delivery tube from the limewater before removing the source of heat.

.....

.....[1]

(iii) Complete Fig. 2.1 to show the reading on the stopclock for magnesium carbonate.

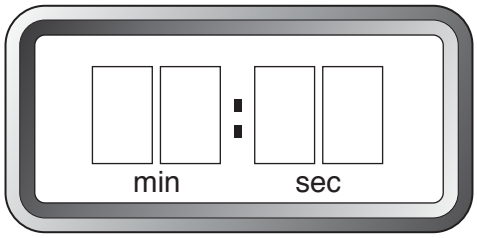


Fig. 2.1

[1]

(b) (i) Use the information in **(a)** to identify the gas produced by the thermal decomposition of a metal carbonate.

.....[1]

(ii) Use the results in Table 2.1 to place the metal carbonates in order of **rate** of turning limewater milky (speed of thermal decomposition).

1 ..... fastest

2 .....

3 ..... slowest

[1]

(iii) The order of reactivity of the three metals in the metal carbonates is shown.

most reactive magnesium

zinc

least reactive copper

Describe the relationship between the reactivity of the metals and the rate of thermal decomposition of their carbonates.

You may wish to use your answers in **(b)(ii)** or the results in Table 2.1.

.....

.....

.....

.....[1]

(c) The rate of gas production when metal carbonates are heated can be measured without the use of limewater.

Suggest an alternative method of measuring the rate of gas production.

Include a diagram to show what replaces the test-tube of limewater and state what should be measured.

.....

.....

.....

.....[3]

3 A student investigates how the power produced in a resistance wire **XY** depends upon its length.

(a) She sets up the circuit shown in Fig. 3.1.

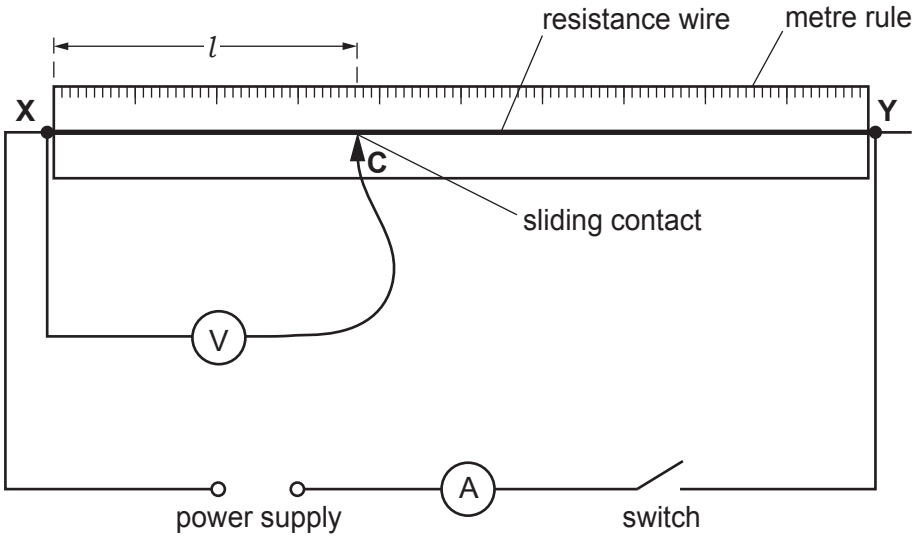


Fig. 3.1

- She closes the switch.
- She places the sliding contact **C** on the resistance wire at a length l = 10.0 cm from end **X**.
- She records, in Table 3.1, the current I flowing through the wire and the potential difference V between **X** and **C**.
- She opens the switch.
- She records her results in Table 3.1.

Table 3.1 shows some of her results.

Table 3.1

length l/cm	current I/.....	potential difference V/V	power P/.....
10.0	0.19		
20.0	0.19	0.31	0.06
40.0	0.19	0.61	0.12
60.0	0.19	0.88	0.17
80.0	0.19	1.20	0.23

(i) Complete the units in the column headings in Table 3.1. [1]

(ii) Fig. 3.2 shows the voltmeter reading for l = 10.0 cm.

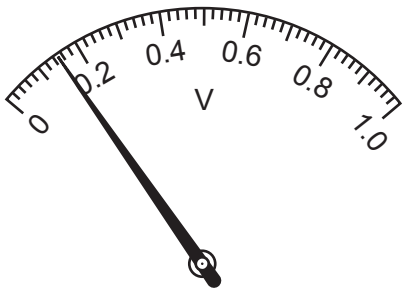


Fig. 3.2

Read the meter and record, in Table 3.1, the potential difference V across the wire. [1]

(iii) Calculate the power P produced in the 10.0 cm length of the wire. Use the equation shown.

$$P = I \times V$$

Record the value of P in Table 3.1. [1]

(b) The student repeats **(a)** for values of l = 20.0 cm, 40.0 cm, 60.0 cm and 80.0 cm.

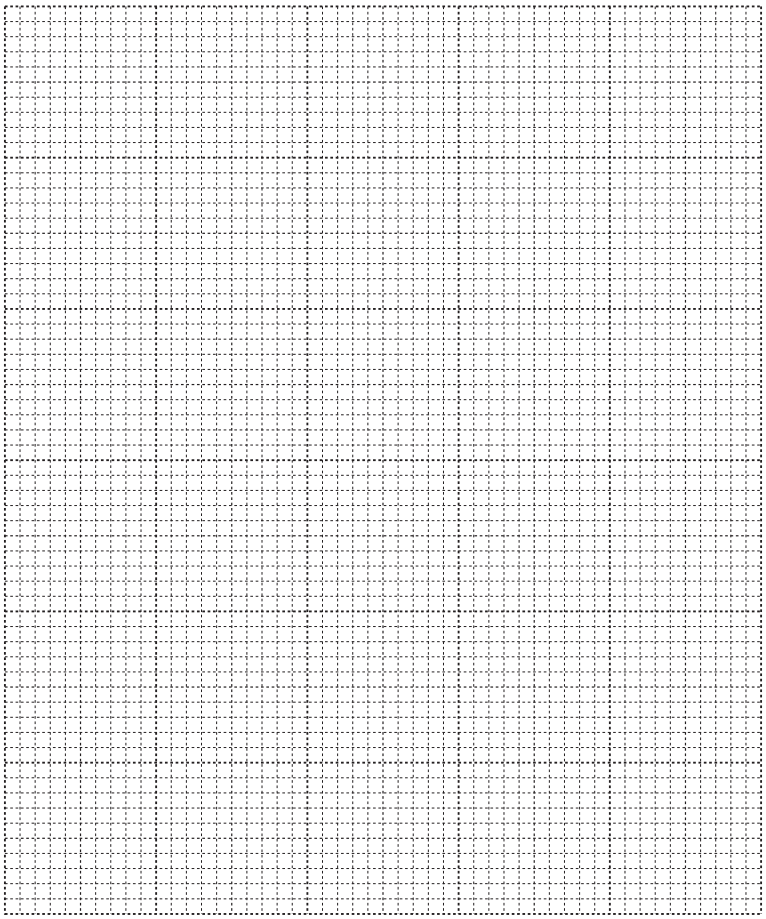
She records, in Table 3.1, her values of I, V and P.

State why it is important to open the switch between taking readings.

.....

.....[1]

(c) **(i)** On the grid provided, plot a graph of P (vertical axis) against l. Start your axes at the origin (0,0).



[3]

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

(d) Use your graph to suggest the relationship between the power P produced in the wire and its length l.

Explain your answer.

relationship .....

.....

explanation .....

.....

[2]

4 A student investigates a blood sample using a microscope.

Fig. 4.1 shows what he sees.

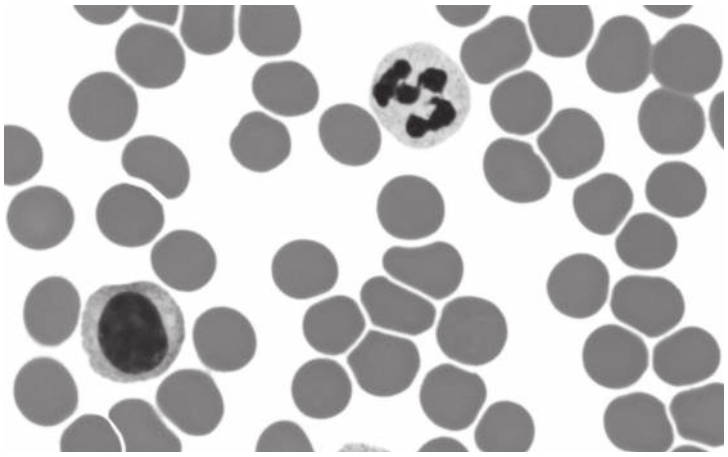


Fig. 4.1

(a) On Fig. 4.1, use label lines to label a red blood cell **R** and a white blood cell **W**. [1]

(b) **(i)** Fig. 4.2 shows a magnified cell.

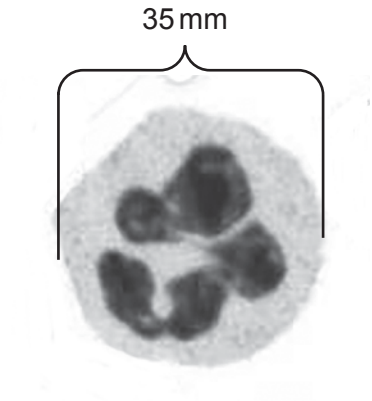


Fig. 4.2

In the box provided, make an enlarged drawing of the magnified cell shown in Fig. 4.2.

[3]

(ii) The width of the cell in Fig. 4.2 is 35 mm.

Measure and record the equivalent width of the cell in your drawing.

width of cell in drawing = ...

Calculate the magnification of your drawing.

magnification = ...

[1]

(c) (i) A 17-year-old student is training for a cycle race.

Calculate his theoretical maximum heart rate during his training. Use the equation shown.

theoretical maximum heart rate in beats per minute = (220 – age in years)

student's theoretical maximum heart rate = ... beats per minute [1]

(ii) The student wants to find his resting heart rate.

The student does not have a heart rate monitor but does have a stopwatch.

Describe how the student determines his resting heart rate.

.....

.....

.....

.....

.....

.....[4]

5 A student investigates the coloured inks in a permanent black marker pen using chromatography.

She takes a piece of chromatography paper and draws a pencil line 1 cm from the bottom of the paper.

She puts spots of red, green, yellow and blue inks onto the pencil line on the paper. She then puts a spot of the black marker pen ink onto the pencil line on the paper.

She rolls the paper into a cylinder, secures it with a paper clip and stands it in a beaker as shown in Fig. 5.1.

She adds ethanol to the beaker and leaves it for several minutes.

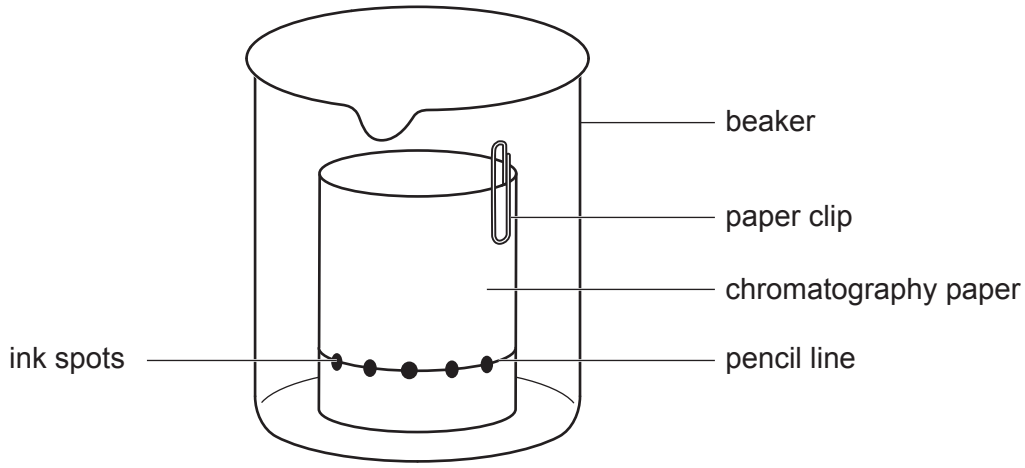


Fig. 5.1

(a) (i) Draw a line on Fig. 5.1 to show where the level of the ethanol in the beaker should be for this investigation. [1]

(ii) Explain why the line, 1 cm from the bottom of the paper, is drawn in pencil.

.....

.....[1]

(iii) The teacher suggests putting a lid onto the beaker.

Explain why the teacher suggests this.

.....

.....[1]

(b) When the ethanol is almost at the top of the paper, the student takes the chromatography paper out of the ethanol and leaves it to dry.

The results are shown in Fig. 5.2.

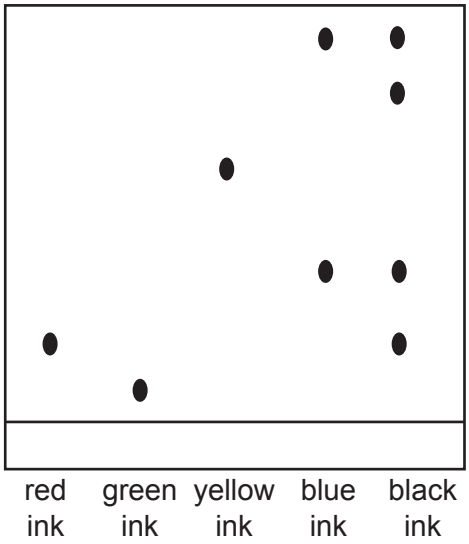


Fig. 5.2

(i) Use Fig. 5.2 to state how many different coloured inks are in the black ink.

.....[1]

(ii) State **and** explain which coloured inks are in the black ink.

coloured inks .....

explanation .....

.....

[2]

(c) **(i)** Explain why ethanol is used rather than water.

.....

.....[1]

(ii) Explain why the ethanol is allowed to reach almost to the top of the paper before the paper is taken out and allowed to dry.

.....

.....[1]

(d) The student thinks that the red-coloured ink is the same colour as the coloured ink in one of her sweets.

Explain how she can use chromatography to test her prediction.

Include in your answer:

- how the student would extract the red colour from the sweets
- what spots she should put on her chromatography paper.

.....

.....

.....[2]

6 A student carries out an experiment to measure her personal power.

- She runs up a flight of stairs as fast as she can.
- She uses a stopwatch to measure the time *t* that she takes.
- She repeats this procedure three more times in rapid succession.
- She measures her weight *W* using bathroom scales.

Fig. 6.1 shows the student and the stairs.

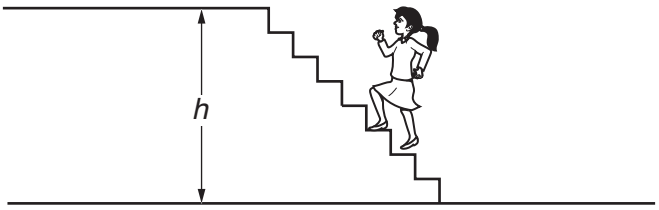


Fig. 6.1

(a) Describe how she measures the vertical height *h* of the stairs, if the only apparatus available to her is a 50 cm ruler.

.....

.....[1]

(b) The times recorded for each run are shown in Table 6.1.

Table 6.1

run number	time / s
1	2.07
2	2.13
3	2.25
4	2.37

(i) Suggest why the time taken for each consecutive run increases.

.....

.....[1]

(ii) Calculate the average time t_{AV} that the student takes to run up the stairs.

Give your answer to 3 significant figures.

t_{AV} = ... s [2]

(c) Fig. 6.2 shows the reading on the bathroom scales when the student stands still on it.

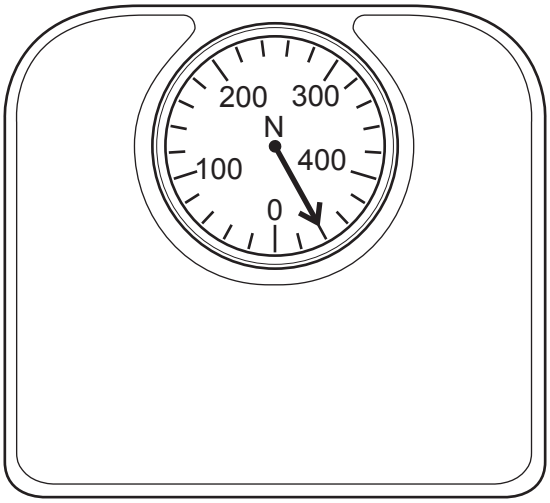


Fig. 6.2

(i) Read the value on the scale in Fig. 6.2 and write down the weight W of the student.

W = ... N [1]

(ii) Explain why she needs to stand still on the scales.

.....

.....[1]

(iii) State why the student should look vertically down at the scale reading, when reading her weight from the scales.

.....

.....[1]

(d) (i) The vertical height h of the stairs is 2.8 m.

Calculate the amount of gravitational potential energy E that the student gains when she runs from the bottom to the top of the stairs.

Use the equation shown.

$$E = W \times h$$

E = ... J [1]

(ii) Calculate the average maximum power P produced by the student.

Use the equation shown.

$$P = \frac{E}{t_{AV}}$$

P = ... W [1]

(e) A second student, who has the same weight as the first student, runs up the same flight of stairs and takes longer to reach the top.

State how the power produced by the second student compares with that of the first student.

Explain your answer.

statement .....

explanation .....

.....
[1]

BLANK PAGE

BLANK PAGE