Cambridge IGCSE

**Cambridge Assessment International Education**
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*0817850364*

**COMBINED SCIENCE** **0653/63**

Paper 6 Alternative to Practical **May/June 2019**

**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 **13** printed pages and **3** blank pages.

DC (JM/CB) 168930/1


Cambridge Assessment International Education

**[Turn over**

**1** **(a)** A student uses the apparatus shown in Fig. 1.1 to investigate the composition of inspired air and expired air.

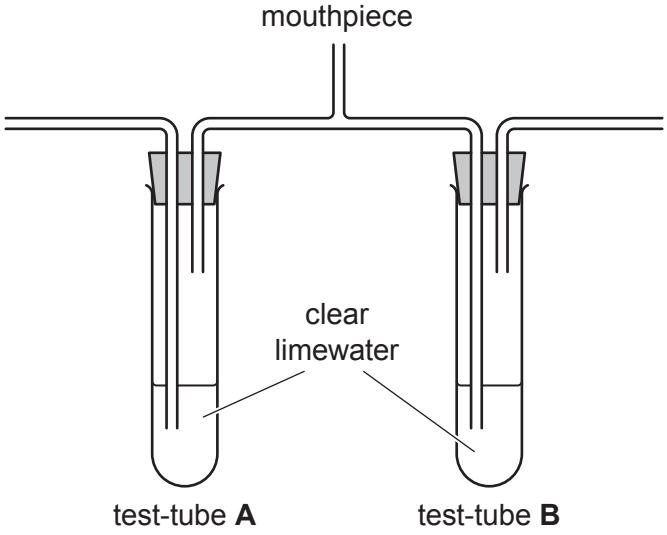


**Fig. 1.1**

Limewater is used to test for carbon dioxide.

**(i)** Add arrows to Fig. 1.1 to show the movement of air through the limewater when a person breathes out (expires) through the mouthpiece. [1]

**(ii)** Describe the appearance of limewater when air with a high percentage of carbon dioxide is passed through it.

..... [1]

**(iii)** State the name of an indicator that could be used to detect the presence of carbon dioxide.

..... [1]

**(iv)** Describe one safety precaution that the student should take when using the apparatus shown in Fig. 1.1.

.....

..... [1]

**(b)** The student wants to test the expired air for the presence of oxygen.

**(i)** Describe a test for oxygen. Include the observation for a positive result.

.....

..... [1]

**(ii)** Table 1.1 shows the relative amount of oxygen in inspired air and expired air.

**Table 1.1**

| air | relative amount of oxygen / arbitrary units |
|---|---|
| inspired | 20 |
| expired | 15 |

Calculate the percentage reduction in the amount of oxygen in inspired and expired air.

Show your working.

percentage reduction = ..... % [2]

[Total: 7]

**2** A person's heart rate increases as they do more exercise. After the person stops exercising, the heart rate will return to normal.

**(a)** Describe one technique for measuring a person's heart rate.

.....

..... [1]

**(b)** Plan an investigation, using the technique you have described in **(a)**, to find out the average time it takes for the heart rate to return to normal after exercise.

In your answer, include:

- the apparatus needed, including a labelled diagram if you wish
- a brief description of the method
- how you will treat variables and any safety precautions
- the measurements you will make
- how you will use your results to draw a conclusion.

.....

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..... [6]

[Total: 7]

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**3** A student investigates the volume of carbon dioxide given off when calcium carbonate (marble chips) reacts with hydrochloric acid.

**(a) Method**

- She places marble chips in a conical flask.
- She adds 25 $cm^3$ hydrochloric acid and quickly connects the delivery tube to the conical flask.
- She starts the stopclock and measures the volume of carbon dioxide gas collected in a measuring cylinder every minute for 7 minutes.
- She records the volumes, to the nearest 0.5 $cm^3$ in Table 3.1.

**(i)** Fig. 3.1 shows the conical flask, its contents and the delivery tube.

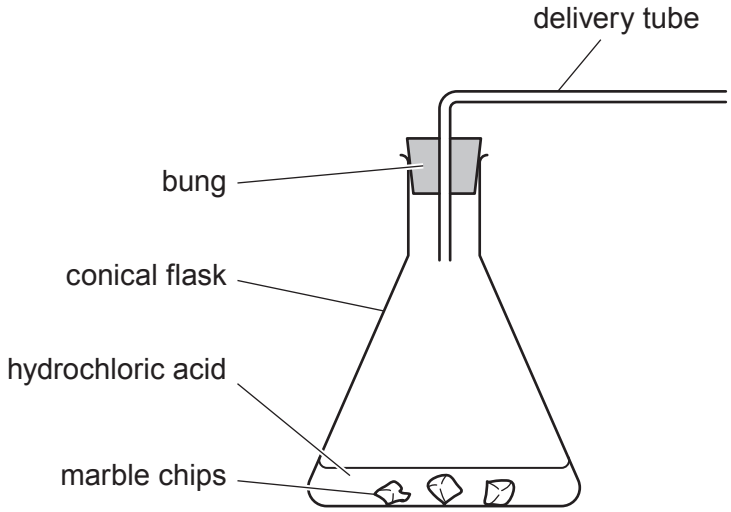



**Fig. 3.1**

Complete the diagram in Fig. 3.1 to show the gas being collected in the measuring cylinder. Include labels in your diagram. [2]

**(ii)** Carbon dioxide gas is slightly soluble in water.

Describe a method of collecting the gas which would give more accurate values for the amount of carbon dioxide given off in the reaction.

.....

..... [1]

**(iii)** Fig. 3.2 shows the reading on the measuring cylinder at 3 minutes and 4 minutes.

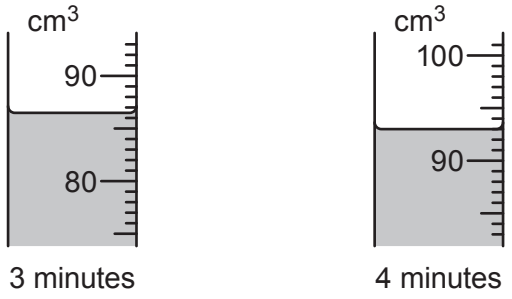



**Fig. 3.2**

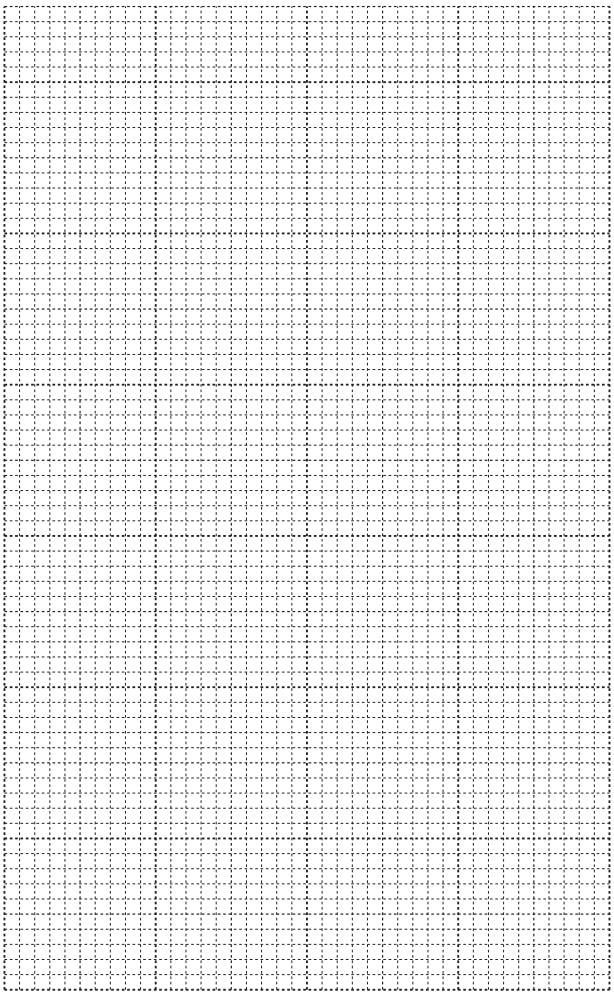
Read the measuring cylinders and record in Table 3.1 the values to the nearest 0.5 $cm^3$.

**Table 3.1**

| time / min | total volume carbon dioxide / $cm^3$ |
|---|---|
| 0 | 0 |
| 1 | 47.0 |
| 2 | 74.5 |
| 3 | |
| 4 | |
| 5 | 94.5 |
| 6 | 96.0 |
| 7 | 96.0 |

[2]

**(b)** **(i)** On the grid provided plot a graph of volume of carbon dioxide (on the vertical axis) against time. [3]



**(ii)** Draw the best-fit curve. [1]

**(c)** Describe and explain what is happening in the reaction in the conical flask at 7 minutes.

description .....

explanation .....
[1]

**(d)** The student repeats the experiment in **(a)** using more concentrated hydrochloric acid but keeping everything else the same.

She notices that the reaction is faster and produces more carbon dioxide gas.

Draw a line on the graph to show the results of this second experiment.

Label your line **D**. [2]

**(e)** The student repeats the experiment in **(a)** using sulfuric acid. The marble chips do not produce very much gas and stop bubbling after only 2 minutes.

The word equation for this reaction is shown.

calcium carbonate + sulfuric acid $\rightarrow$ calcium sulfate + carbon dioxide + water

The teacher says this is because the calcium sulfate that is made is insoluble.

Suggest how this calcium sulfate stops the reaction.

.....

..... [1]

[Total: 13]

**4** A student investigates the relationship between the speed of sound in different materials and the density of the materials.

**(a)** Table 4.1 shows information about the properties of different materials.

**Table 4.1**

| material | density / kg/m$^3$ | speed of sound in material / m/s | solid, liquid or gas? | Is this material metallic? |
|---|---|---|---|---|
| air | 1.204 | 343 | gas | no |
| aluminium | 2691 | 6320 | solid | yes |
| copper | 8960 | 4600 | solid | yes |
| lead | 11 340 | 1210 | solid | yes |
| rubber | 1100 | 60 | solid | no |
| water | | 1484 | liquid | no |

**(i)** Name the material in which sound travels the slowest.

..... [1]

**(ii)** Name the **solid** material with the lowest density.

..... [1]

**(iii)** Use the information in Table 4.1 to place the metallic materials in order from lowest speed of sound to highest speed of sound.

..... metal in which speed of sound is lowest

↓

..... metal in which speed of sound is highest

[1]

**(iv)** Use information in Table 4.1 to describe the relationship between the speed of sound in metallic materials and the density of the metal.

.....

..... [1]

**(b) (i)** The student does an experiment to find the density of pure water.

- He pours some water into a measuring cylinder.
- He measures the mass of the cylinder and water on a balance.
- He empties out the water.
- Then he measures the mass of the measuring cylinder on its own.

Fig. 4.1 shows his readings on the balance.

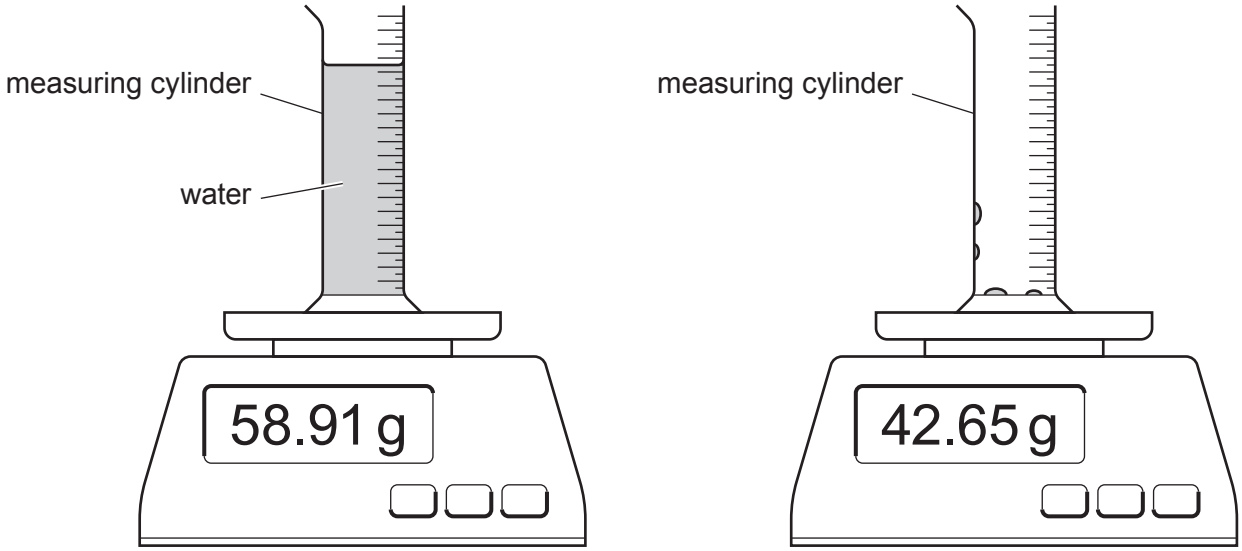



**Fig. 4.1**

Use the readings to calculate the mass of water. Show your working.

mass of water = ..... g [2]

**(ii)** Suggest a change to the experimental procedure carried out in **(b)(i)** that will improve the accuracy of the value of the mass of the measuring cylinder obtained by the student.

.....

..... [1]

**(iii)** Fig. 4.2 shows part of the measuring cylinder containing the water.

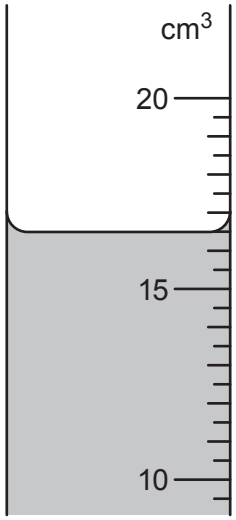



**Fig. 4.2**

Read and record the volume of water in the measuring cylinder to the nearest 0.5 $cm^3$.

volume of water = ..... $cm^3$ [1]

**(iv)** Calculate the density of water. Use your answers to **(b)(i)** and **(b)(iii)** and the equation shown. Record your answer to an appropriate number of significant figures.

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

density of water = ..... $g/cm^3$ [2]

**(v)** Determine the density of water in $kg/cm^3$.

1 kg = 1000 g

density of water = ..... $kg/cm^3$ [1]

**(vi)** Determine the density of water in $kg/m^3$.

$1\,m^3 = 1\,000\,000\,cm^3$

density of water = ..... $kg/m^3$ [1]

**(c)** Another student looks up the value for the density of pure water and it is given as 1000 kg / $m^3$.

State whether your value of the density of water calculated in part **(b)(vi)** agrees with this value within the limits of experimental error. Justify your answer with reference to the two values.

statement .....

justification .....

.....

[1]

[Total: 13]

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