UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | |

CANDIDATE NUMBER | | | |

*6554451667*

**COMBINED SCIENCE** **0653/06**
**CO-ORDINATED SCIENCES** **0654/06**

Paper 6 Alternative to Practical **October/November 2008**

**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 a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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** | |
| **4** | |
| **5** | |
| **6** | |
| **Total** | |

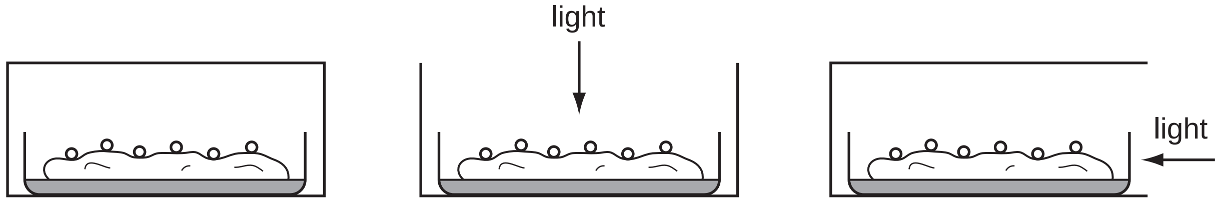
This document consists of **17** printed pages and **3** blank pages.

IB08 11_0653_06/5RP


UNIVERSITY of CAMBRIDGE International Examinations

For ...iner's

**1** A student set up an experiment to investigate the effect of light on the growth of see... The seeds were set up for germination as shown in Fig. 1.1. and left for a few days.




| box **A** | box **B** | box **C** |
|---|---|---|
| completely closed | open at the top | open at one side |

**Fig. 1.1**

The dishes of seedlings from each box are shown in the photographs in Fig. 1.2.

| | |
|---|---|
|  | seedlings from box **A** |
|  | seedlings from box **B** |
|  | seedlings from box **C** |

**Fig. 1.2**

**(a)** **(i)** Construct a table to display the observations. The observations are the **shap**[e and] the **vertical height** of the seedlings from each box. Do not fill in the table yet.

[2]

**(ii)** Study Fig. 1.2. and write a description of the shapes of the seedlings in the table. [3]

**(iii)** Choose **one** of the tallest seedlings from box **A**. Measure its vertical height. Take the measurement from the base of the photograph to the top of the seedling. Label this seedling on Fig. 1.2 with the letter **a**. Write the vertical height of this seedling in the table in **(a)(i)**. [1]

**(iv)** Repeat part **(iii)** for seedlings from boxes **B** and **C**, labelling them **b** and **c**. [2]

**(b)** Explain why the seedlings in box **C** grew differently from the seedlings in box **B**.

..........................................................................................................................................

........................................................................................................................................ [1]

**2** A student is doing an experiment with a spring to which a weight hanger is attached. shown in Fig. 2.1.

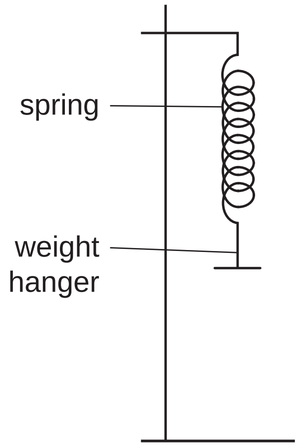



**Fig. 2.1**

A 200 g mass is attached to the weight hanger.
When the mass is pulled down and then released, it oscillates (bounces up and down). This is shown in Fig. 2.2.

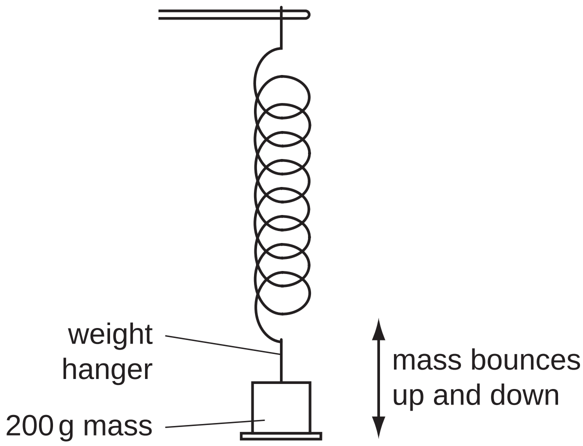



**Fig. 2.2**

- Using a stopclock, the student finds the time in seconds taken for 20 oscillations.
- He records the results in Fig. 2.3.
- He increases the mass to 300 g and finds the new time.
- The student repeats the experiment using 400 g and 500 g masses.

| mass on weight hanger / g | time for 20 oscillations / s | time **T**, for one oscillation / s | $\mathbf{T}^2$ / $s^2$ |
|---|---|---|---|
| 200 | 13.0 | 0.65 | 0.42 |
| 300 | | | |
| 400 | | | |
| 500 | 19.0 | 0.95 | 0.90 |

**Fig. 2.3**

**(a)** Fig. 2.4 shows the missing times for 20 oscillations of the 300 g and 400 g masses.

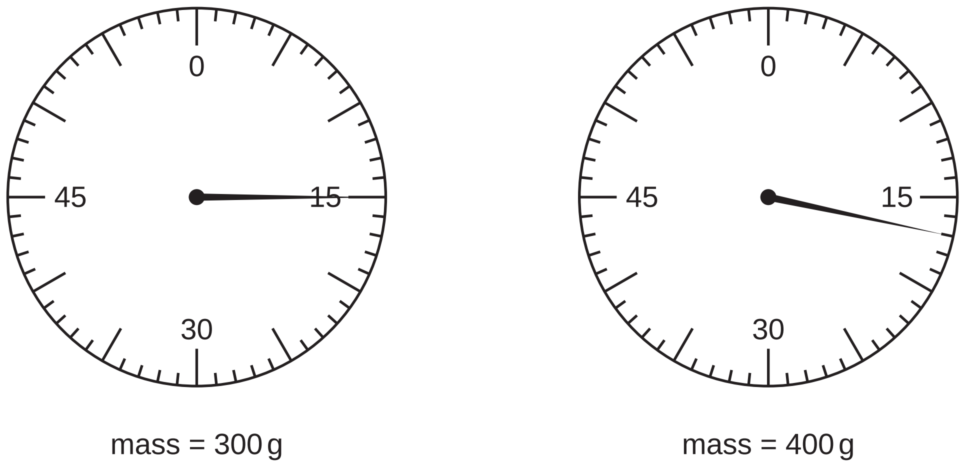



**Fig. 2.4**

**(i)** Read the times and record them in column 2 of Fig. 2.3. [2]

**(ii)** Complete column 3 of Fig. 2.3 by calculating **T**, the time for one oscillation. [1]

**(iii)** Find the values of $\mathbf{T}^2$ for the 300 g and 400 g masses and complete column 4. [1]

**(b)** On the graph grid, Fig. 2.5, plot $\mathbf{T}^2$ (vertical axis) against the mass. Draw the best straight line. It will **not** pass through the point (0, 0). [2]

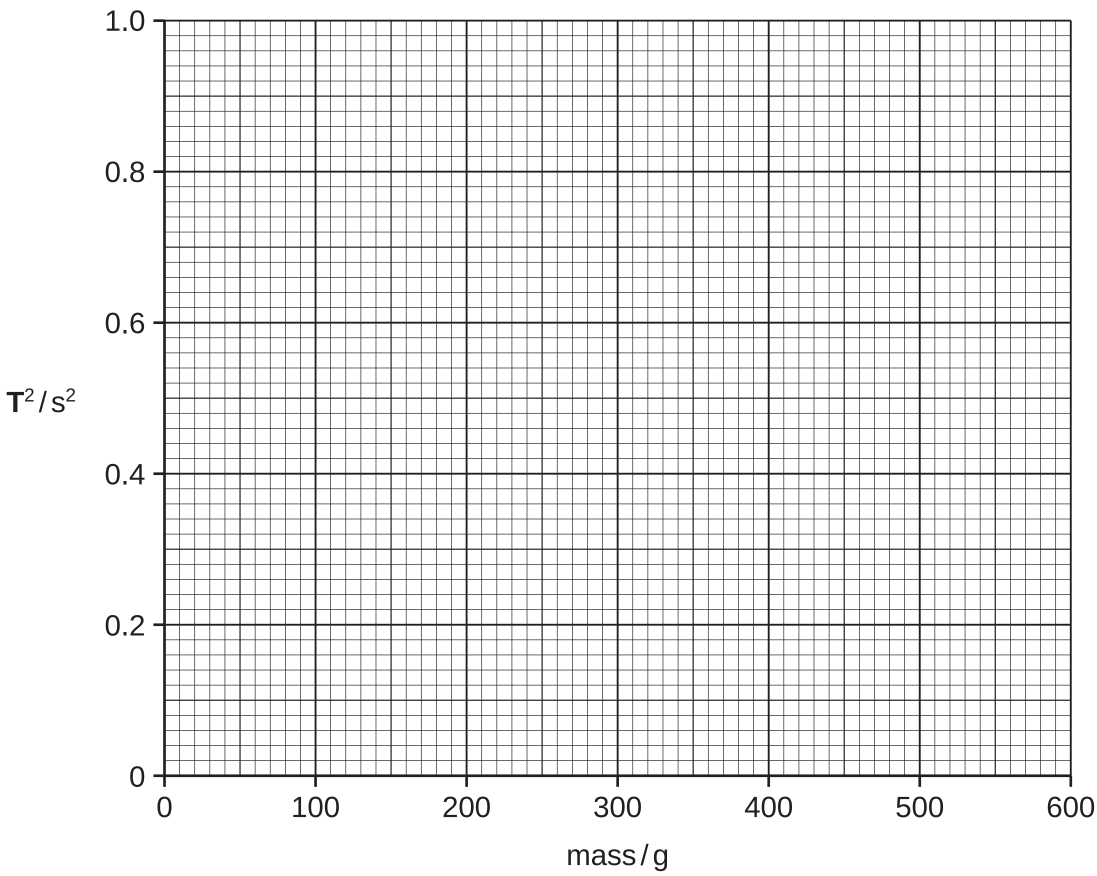



**Fig. 2.5**

For
iner's

**(c)** Find **f** , the gradient of the line, showing on the graph how you did this.

**f** = ................................................ $s^2/g$ [2]

**(d)** A mass of 200 g extended the spring by 75 mm.
Use the gradient, **f**, from **(c)** and the equation below to calculate a value for **g**, the acceleration of free fall. (The extension of 75 mm produced by the 200 g mass has been included in the equation.)

$$\mathbf{g} = \frac{75 \times 0.0002}{\mathbf{f}}$$

[1]

**(e)** Suggest a reason why the straight line of the graph does **not** pass through the point (0,0).

..........................................................................................................................................

.......................................................................................................................................... [1]

3 The science class is making magnesium carbonate by the process of precipitation. The teacher gives them this equation for the reaction.

$$MgCl_2\,(aq) + K_2CO_3(aq) \rightarrow MgCO_3(s) + 2KCl(aq)$$

**(a)** State the meaning of the symbols

**(i)** (aq) .................................................................................................................. [1]

**(ii)** (s) .................................................................................................................. [1]

The teacher gives a student 50 cm$^3$ of magnesium chloride solution and a beaker of potassium carbonate solution. The teacher says that the potassium carbonate solution is more concentrated than the magnesium chloride solution.

**(b)** What volume of potassium carbonate solution will the student need to react with all the 50 cm$^3$ of the magnesium chloride solution? Tick the correct answer.

☐ less than 50 cm$^3$

☐ exactly 50 cm$^3$

☐ more than 50 cm$^3$ [1]

The student begins to add potassium carbonate solution, a few drops at a time, to the magnesium chloride solution. She stirs the mixture. This is shown in Fig. 3.1.

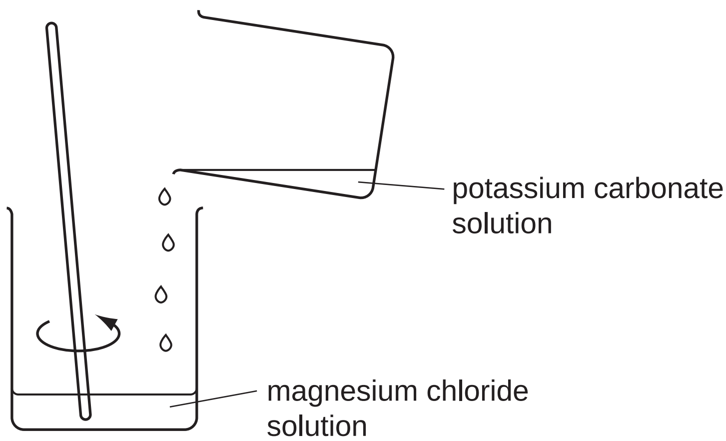



**Fig. 3.1**

The student decides that she has added enough potassium carbonate to react with the magnesium chloride. She wants to filter the mixture to remove the magnesium carbonate. This is shown in Fig. 3.2.

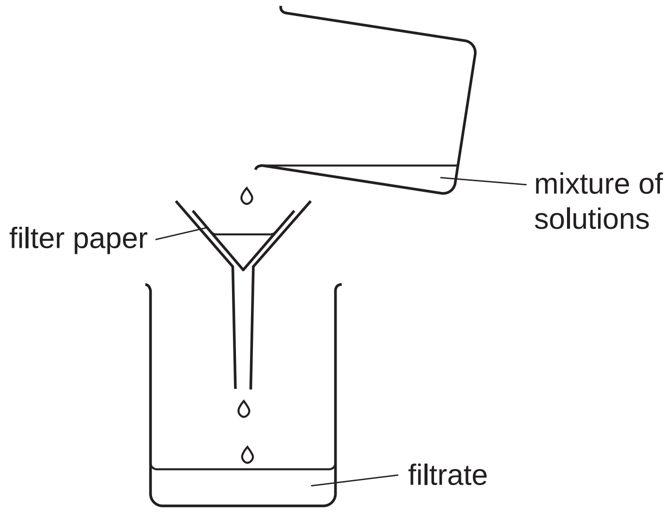



**Fig. 3.2**

**(c)** Here is her filter paper circle. Show by completing the diagram, **or** by describing, how to fold the filter paper to fit it into the filter funnel.

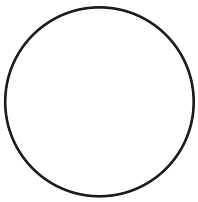


**Fig. 3.3**

.................................................................................................................................

................................................................................................................................. [2]

The student collects the magnesium carbonate in the filter paper. The filtrate is collected in the beaker.

**(d)** The student wants a pure sample of magnesium carbonate. She does **not** take the magnesium carbonate out of the filter paper. What does she do next?

................................................................................................................................. [1]

For iner's

**(e)** The student wants to find out if, in Fig. 3.1, enough potassium carbonate was ad the magnesium chloride solution. Explain how she can do this, using the filtrate **(c)** and a few more drops of potassium carbonate solution.

[2]

**(f)** Suggest a way of getting a pure sample of potassium chloride crystals from the filtrate.

[2]

**4** **(a)** This question is about reaction time which involves the nervous system. The r time is the time taken from a stimulus to the response produced. In the experimen stimulus is a falling ruler and the response is its capture by the person's hand.

A student did an experiment to find the reaction time of several different people, **A, B, C** and **D**. He did this by holding a ruler just above the thumb of the person and letting it fall. The person then caught the falling ruler between finger and thumb as quickly as possible (see Fig. 4.1). The vertical distance, **d**, travelled by the ruler is noted. The greater the distance the slower the reaction time. Each reading was taken twice.

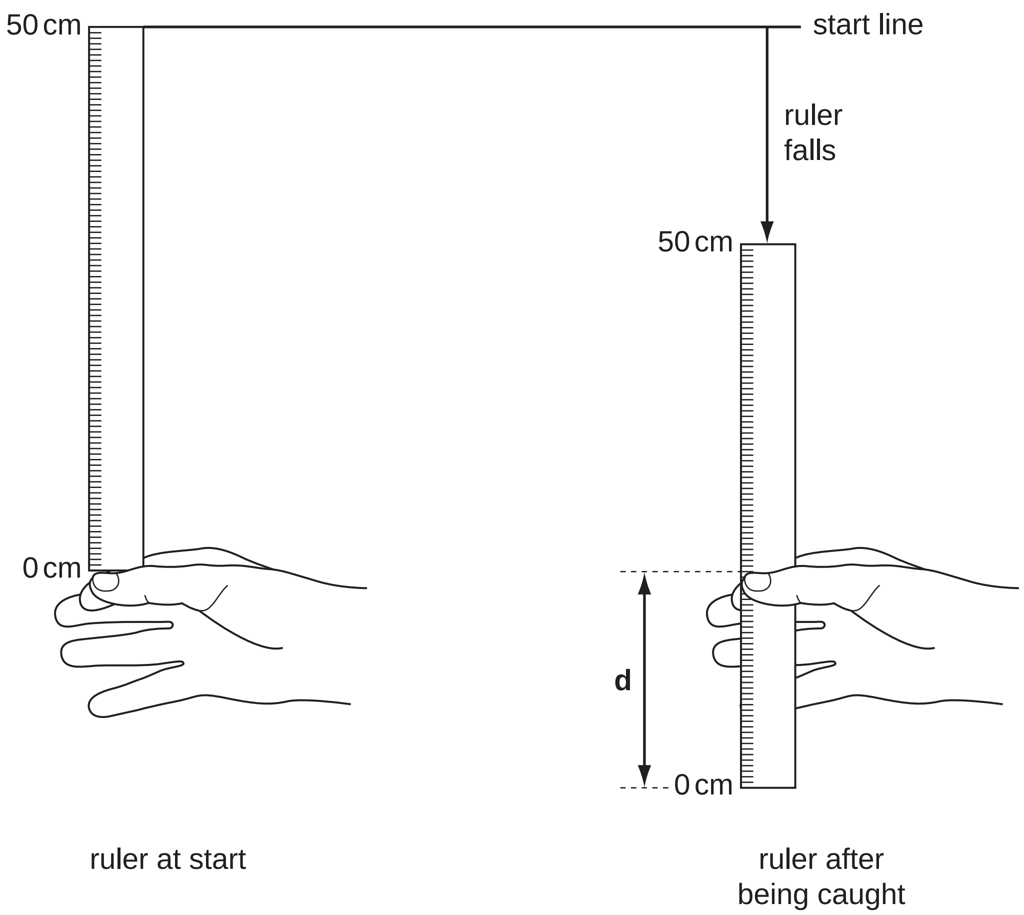


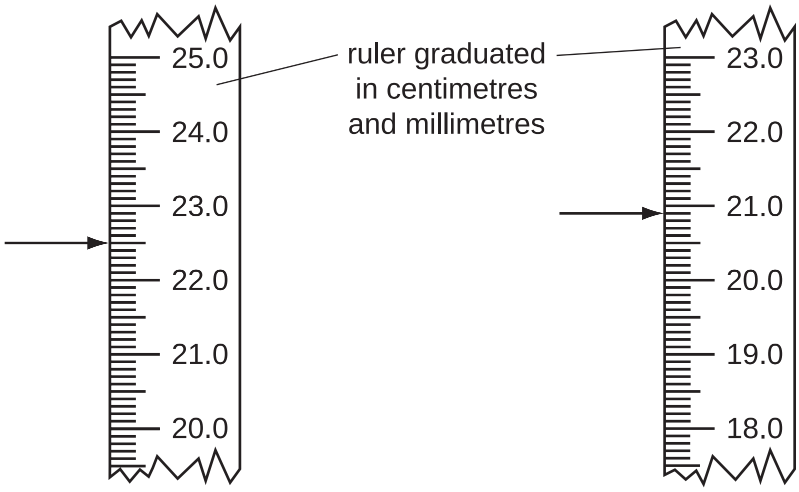

**Fig. 4.1**

The readings were recorded in Fig. 4.2.

| person | values for **d** / cm | | | reaction time / sec |
|---|---|---|---|---|
| | first reading | second reading | average | |
| **A** | 25.2 | 26.6 | 25.9 | 0.23 |
| **B** | 35.1 | 35.7 | 35.4 | |
| **C** | 21.7 | | | |
| **D** | | 21.7 | | |

**Fig. 4.2**

**(i)** Read the rulers, shown in Fig. 4.3 to complete the readings, **d**, for persons **C** and **D** in Fig. 4.2. The pointers indicate the position of the top edge of the person's thumb. [2]




**C** **D**

**Fig. 4.3**

**(ii)** Calculate the average values of **d** for persons **C** and **D** and write them in Fig. 4.2.

..........................................................................................................................

.......................................................................................................................... [2]

**(iii)** Use the average values of **d** to the **nearest centimetre**, and the information in Fig. 4.4 to complete the column for reaction time in Fig. 4.2.

| **d** / cm | reaction time / s |
|---|---|
| 20 | 0.20 |
| 21 | 0.21 |
| 22 | 0.21 |
| 23 | 0.22 |
| 24 | 0.22 |
| 25 | 0.23 |
| 26 | 0.23 |
| 27 | 0.24 |
| 28 | 0.24 |
| 29 | 0.24 |
| 30 | 0.25 |
| 31 | 0.25 |
| 32 | 0.26 |
| 33 | 0.26 |
| 34 | 0.26 |
| 35 | 0.27 |
| 36 | 0.27 |

**Fig. 4.4**

[3]

**(b)** Briefly describe how the impulse (message) travels from the brain to the hand.

..........................................................................................................................................

.................................................................................................................................... [1]

**(c)** From the results suggest which person, **A, B, C** or **D** would be the least safe driver of a car and explain why.

person

..........................................................................................................................................

explanation

..........................................................................................................................................

..........................................................................................................................................

.................................................................................................................................... [3]

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Please turn over for Question 5.

5 The science class is doing an experiment to compare the expansion of liquids.
They are comparing the expansion of water, ethanol and methanol. The apparatus is shown in Fig. 5.1.

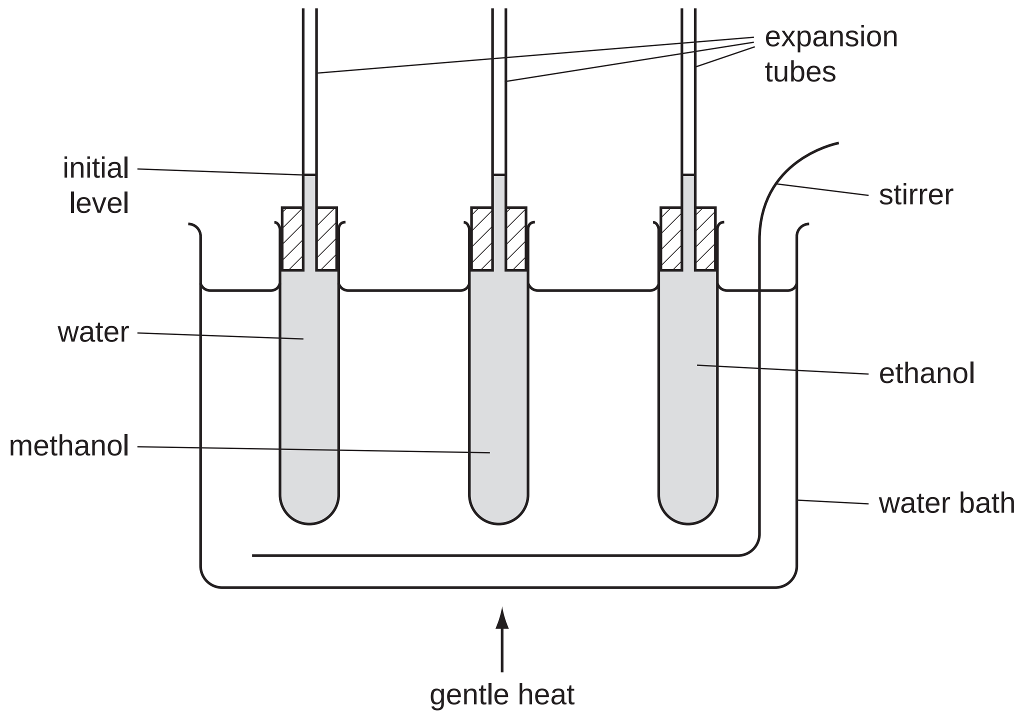


**Fig. 5.1**

- Each test-tube is filled with liquid and the expansion tube is inserted so that there is no air in the tube.
- The initial level of the liquid in the expansion tube is marked.
- The water-bath is gently heated and stirred.
- After a few minutes, the new levels of the liquids in the expansion tubes are noted.

Fig. 5.2 shows the levels of the liquids in the expansion tubes before and after heating.

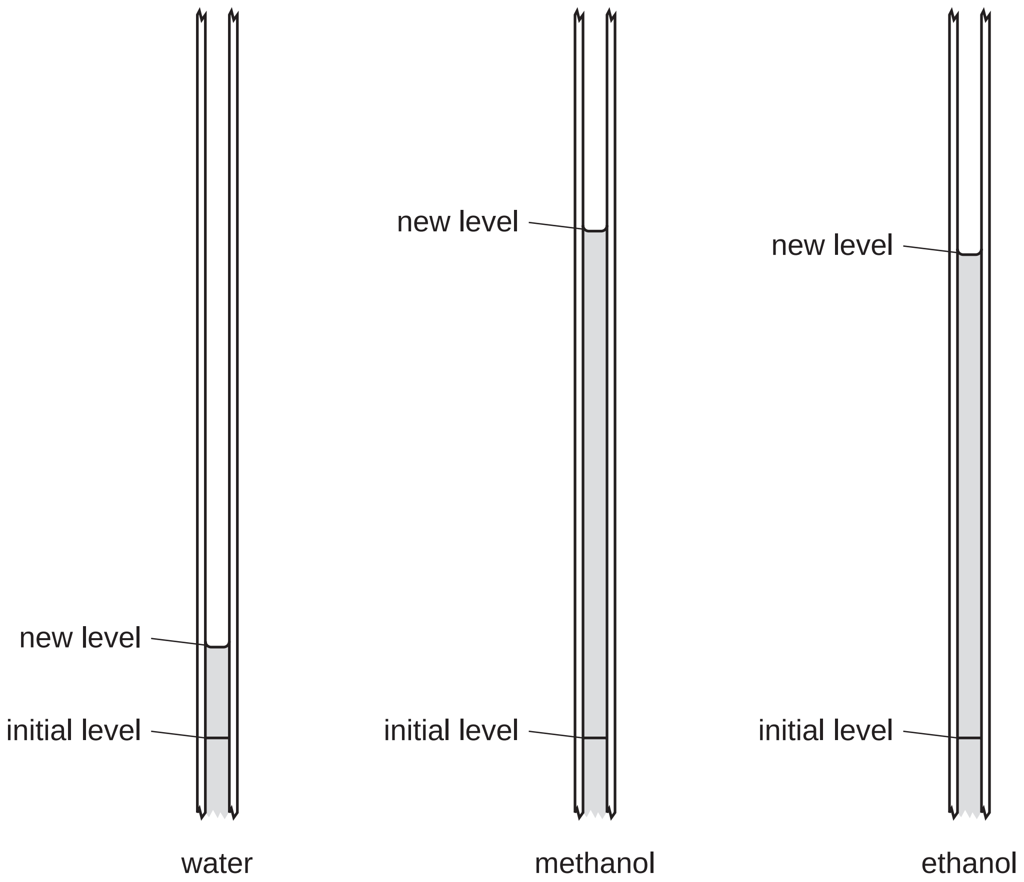


**Fig. 5.2**

**(a) (i)** Use a ruler to measure, to the nearest millimetre, the increase in height of the liquid in each tube. Record your results in Fig. 5.3.

| liquid | water | methanol | ethanol |
|---|---|---|---|
| increase in height / millimetres | | | |

**Fig. 5.3**

[3]

**(ii)** Explain the importance of placing all three tubes in the same water bath.

..........................................................................................................................................

.................................................................................................................................... [1]

**(iii)** Explain the importance of stirring the water in the water-bath during heating.

..........................................................................................................................................

.................................................................................................................................... [1]

**(b)** A student obtained an unexpected result from one of his tubes. The teacher sa there was air in the tube, shown in Fig. 5.4.

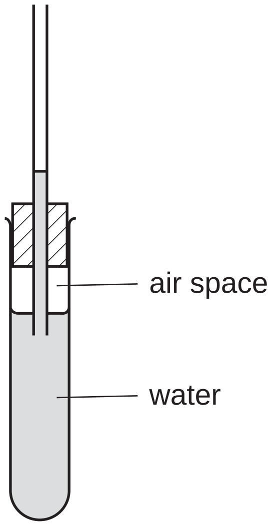


**Fig. 5.4**

Explain why this would give a different result.

..........................................................................................................................................

..........................................................................................................................................

.................................................................................................................................. [2]

**(c)** **(i)** The teacher told the class that the glass of the test-tubes also expands when heated. Did the glass expand **more than**, **the same as** or **less than** the liquids? Explain your answer.

..........................................................................................................................................

..........................................................................................................................................

.................................................................................................................................. [2]

**(ii)** Use the results of the experiment to suggest how the forces of attraction between molecules in water compare with the forces between molecules in ethanol.

..........................................................................................................................................

.................................................................................................................................. [1]

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**Please turn over for Question 6.**

For iner's

6 The class is given a sample of solid **A**. They are also given solution **B** and solution C… carry out the experiments described below.

Complete Figs. 6.1, 6.2 and 6.3 to show the tests, observations and conclusions.

**(a)** <u>experiments on solid **A**</u>

| test | observation | conclusion |
|---|---|---|
| Dissolve solid **A** in water and divide the solution into three parts. | | |
| (i) To the solution of solid **A**, add aqueous barium chloride and dilute hydrochloric acid. | A precipitate is formed that has a<br>..................................<br>colour [1] | Solid **A** contains<br>..................................<br>ions [1] |
| (ii) To the solution of solid **A**, add a piece of magnesium ribbon. | ..................................<br>.................................. [1] | The solution is acid. |
| Test the gas given off with a lighted spill. | ..................................<br>.................................. [1] | The gas is hydrogen. |
| (iii) To the solution of solid **A**, add solid sodium carbonate. | | |
| Test the gas given off with<br>1. a lighted spill | ..................................<br>.................................. [1] | |
| 2. lime water. | ..................................<br>.................................. [1] | The gas is carbon dioxide. |

**Fig. 6.1**

**(b)** experiments on solution **B**

| test | observation | conclusion |
| --- | --- | --- |
| (i) To solution **B**, add aqueous sodium hydroxide. | ..................................... <br> ..................................... [1] | Solution **B** contains iron(III) ions. |
| (ii) To solution **B**, add dilute nitric acid and aqueous <br> ........................ <br> ........................ [1] | ..................................... <br> ..................................... [1] | Solution **B** contains chloride ions. |

**Fig. 6.2**

**(c)** experiments on solution **C**

| test | observation | conclusion |
| --- | --- | --- |
| Acidify solution **C** with hydrochloric acid and add to solution **B** in a large test-tube. Warm the mixture. | | |
| After cooling, add excess aqueous sodium hydroxide. | A precipitate is formed that has a ..................................... [1] colour | The iron(III) ions in solution **B** have been changed into iron(II) ions. |

**Fig. 6.3**

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