Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

COMBINED SCIENCE **0653/06**

CO-ORDINATED SCIENCES **0654/06**

Paper 6 Alternative to Practical

October/November 2006

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 or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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

1 Mammals have fur to insulate them against heat loss. A student did an experiment to find out what difference it made to an animal's heat loss with both dry and wet body covering.

The test-tube of hot water represented the mammal and the cotton wool represented the fur. The apparatus is shown in Fig. 1.1.

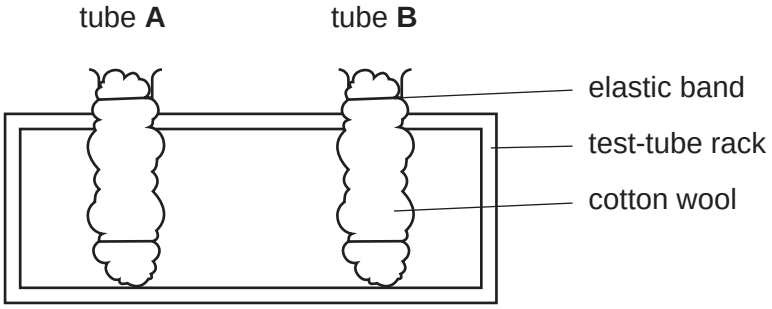


Fig. 1.1

Method

- The student wrapped cotton wool around two identical test-tubes and placed them in a rack.
- He wet the cotton wool of tube **B** with water then replaced it in the rack.
- He poured the same amount of boiling water into both tubes leaving a space at the top.
- He placed thermometers into the test-tubes.
- He then took a reading from both thermometers at the same time and recorded the temperatures in Fig. 1.2.
- He continued to take readings from both thermometers and recorded them every minute for 5 minutes.

time / minutes	temperature of tube **A** / °C	temperature of tube **B** / °C
0	77	77
1	74	55
2	70	49
3		46
4	64	
5	62	42

Fig. 1.2

(a) Read the thermometers in Fig. 1.3 below to complete Fig. 1.2. [2]

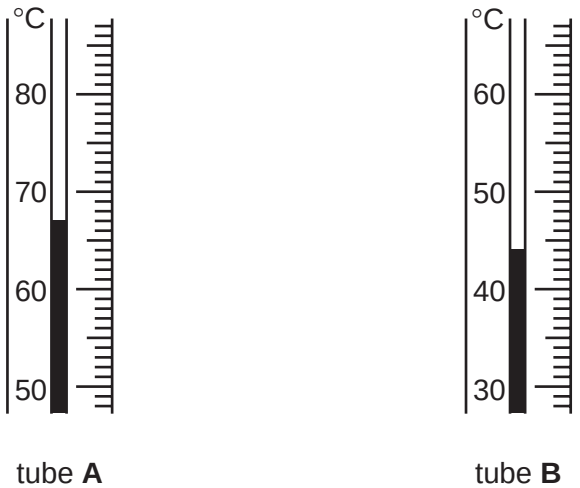
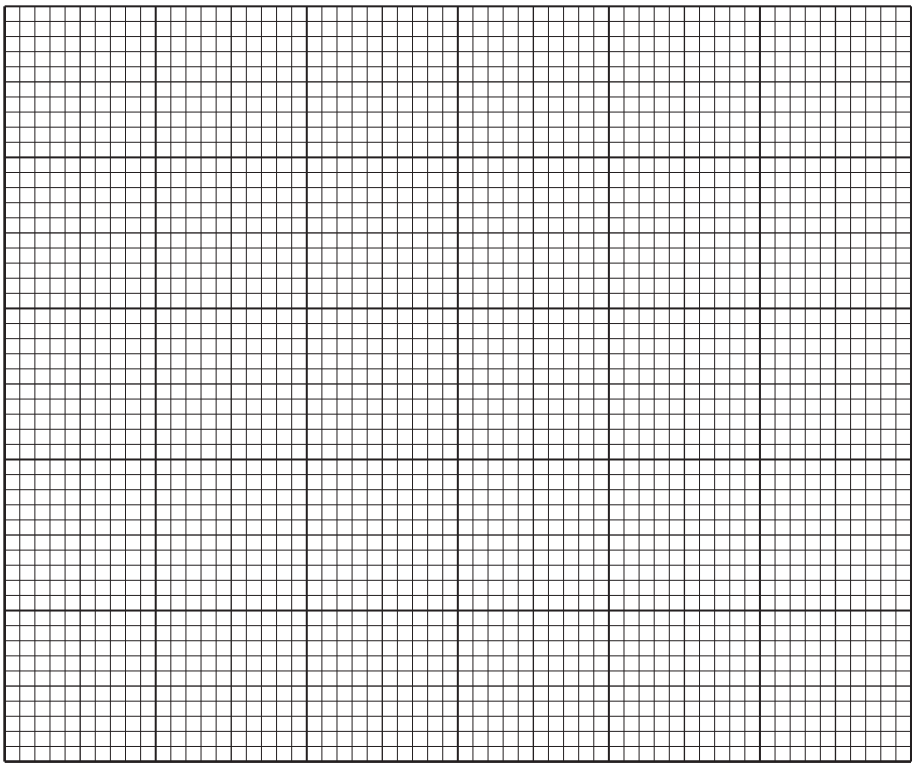


Fig. 1.3

(b) (i) Plot temperature (vertical axis) against time for tube **A**. Draw a smooth curve and label it tube **A**. On the same axes plot the results for tube **B**. Draw a smooth curve and label it tube **B.**



[4]

(ii) Which test-tube, **A** or **B**, cooled faster?

.....

Explain your answer. .....

.....

..... [3]

(c) List three ways in which the student ensured it was a fair test.

1. .....

2. .....

3. ..... [3]

(d) The skin of mammals produces oil that coats the fur. This makes it water-resistant, so that rain will run off the fur, preventing it from becoming wet.

Suggest how washing a mammal's fur with strong detergent may interfere with its ability to retain heat.

.....

.....

..... [2]

2 A student did an experiment with an **L**-shaped piece of card. He wanted to find its centre of mass. You do not need to know the meaning of the term *centre of mass*.

- The card was suspended on a pin pushed through a hole 5 mm from point **A** (distance **x**). A plumb-line was also hung on the pin.

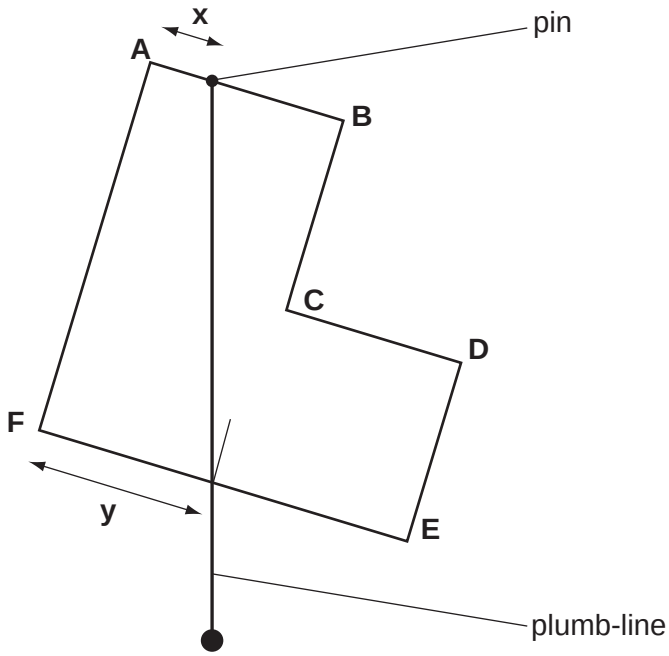


Fig. 2.1

- When he was sure that the card was hanging freely, he marked the point at which the plumb-line crossed line **FE** (distance **y** from **F**).
- He recorded the distances **x** and **y** in Fig. 2.2.
- He moved the position of the pin towards **B** and repeated the experiment until he had obtained 5 sets of readings.

reading number	1	2	3	4	5
x/ mm	5			20	25
y/ mm	67			57	53

Fig. 2.2

(a) Figs. 2.3 and 2.4 show distances **x** and **y** for the two missing readings. Measure the distances **x** and **y** and record them in Fig. 2.2. [4]

reading 2

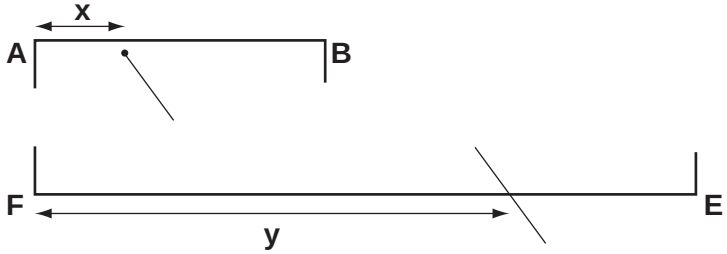


Fig. 2.3

reading 3

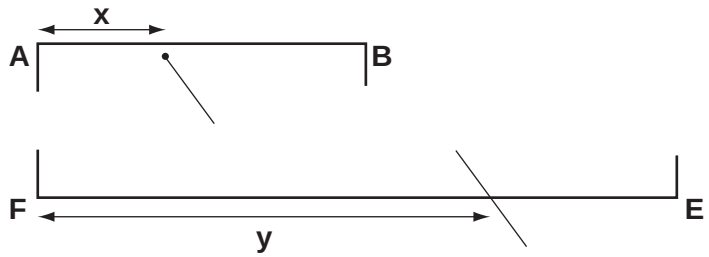


Fig. 2.4

(b) (i) Plot a graph of **y** (vertical axis) against **x** and draw the best fit straight line. Extend the line to cut the vertical axis. [3]

(ii) From the graph determine y_0, the value of **y** when **x** = 0.

y_0 = ...mm [1]

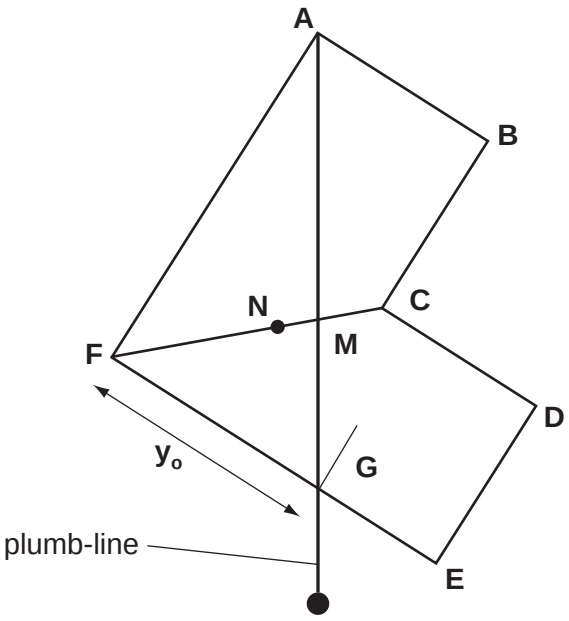


Fig. 2.5

(iii) Use the value of $\mathbf{y_0}$ from **(ii)** to mark, **on Fig. 2.6**, the position of the plumb-line **AG**. (See Fig. 2.5)
Label point **M**, where **AG** crosses **FC**. [1]

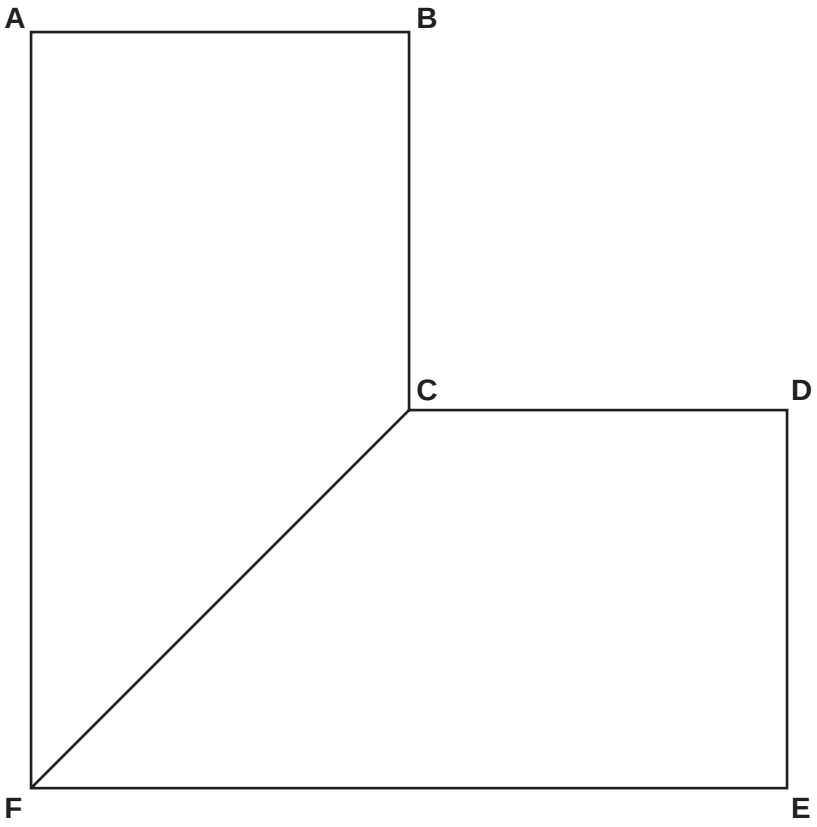


Fig. 2.6

(c) The student thought that the centre of mass of the card was at **M**.

He pushed the pin through the card at point **M**. He turned the card upside down so the pin was underneath it. The card balanced on the pin.

He tried to make the card balance on point **N**. (See Fig. 2.5)

Explain why the card would not balance on point **N**.

.....

..... [1]

3 The teacher gives the student samples of three solids, **A**, **B** and **C**. One solid is an acid, one is a base and the other is a salt.
The student does three sets of experiments. He reacts **A**, **B** and **C** with three chemicals. He tests for any gases that are given off.

(a) The three chemicals are shown in Fig. 3.1. Mark with a tick (✓) where you expect a reaction to take place if they are added to an acid, to a base and to a salt. You should mark **four** boxes. Leave the other boxes blank. [2]

	chemical added		
	sodium carbonate	ammonium chloride	aqueous ammonia
acid			
base			
metal salt			

Fig. 3.1

(b) The student reacts the solids **A**, **B** and **C** with sodium carbonate.
Fig. 3.2 shows the results.

solid **A** with sodium carbonate in water	solid **B** with sodium carbonate in water	solid **C** with sodium carbonate in water
No reaction is seen.	The mixture bubbles and a gas is given off. The gas turns lime-water cloudy.	A white precipitate is seen.

Fig. 3.2

Suggest **one** conclusion that the student can make from these results.

..... [1]

(c) The student adds the solids **A**, **B** and **C** to solid ammonium chloride. He warms the mixture. Fig. 3.3 shows the results.

solid **A** with solid ammonium chloride	solid **B** with solid ammonium chloride	solid **C** with solid ammonium chloride
A gas is given off. The gas has a strong smell.	No apparent reaction.	No apparent reaction.

Fig. 3.3

(i) The student thinks that the strong smelling gas is ammonia. Suggest a test to confirm the presence of ammonia and give the result you expect.

.....

..... [2]

(ii) What does this tell you about solid **A**?

..... [1]

(d) The student adds aqueous ammonia to solutions of **A**, **B** and **C**, until no further reaction is seen. Fig. 3.4 shows the results.

solution of **A** with aqueous ammonia.	solution of **B** with aqueous ammonia	solution of **C** with aqueous ammonia.
No apparent reaction.	A clear solution is left. There is a rise in temperature.	A white precipitate forms. It dissolves when excess ammonia is added.

Fig. 3.4

(i) Name the kind of reaction that takes place between aqueous ammonia and the solution of **B**.

..... [1]

(ii) Suggest the identity of the white precipitate formed when solution **C** reacts with aqueous ammonia.

..... [1]

(e) The student decides which of the solids, **A**, **B** and **C** is a salt. He thinks that the salt is a sulphate.
Describe a test that he can use to confirm the presence of a sulphate in the solution of the salt and give the result that you expect.

test .....

.....

result ..... [2]

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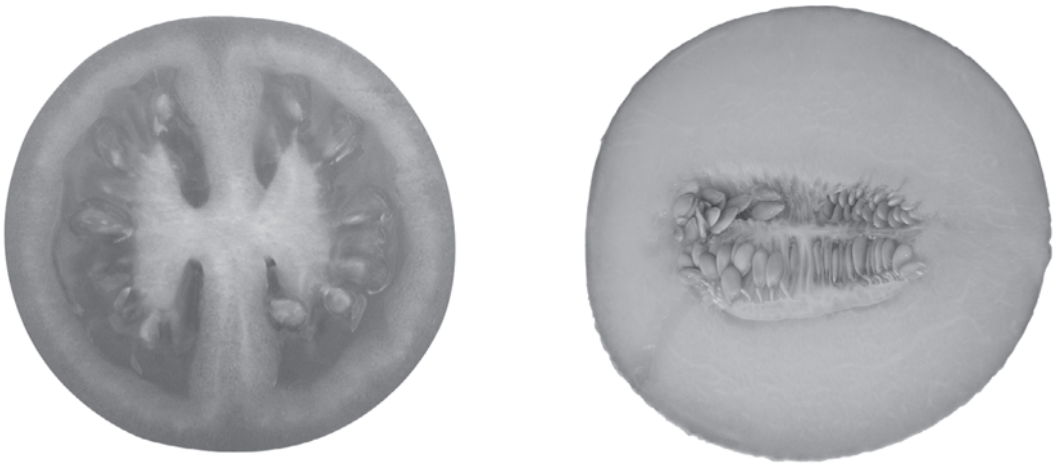
4 The photographs, Fig. 4.1, are of sections through two different fruits, **A** and **B**.



A **B**

Fig. 4.1

(a) Make a drawing of the section through fruit **A** in the space provided below.

[2]

(b) (i) The seeds from both of these fruits are dispersed in a similar way. Describe how they are dispersed.

.....

.....

..... [2]

(ii) Describe **one** feature, visible in the photographs, that adapts the fruits to dispersal in this way and explain why it is successful.

.....

.....

..... [2]

5 When air is heated, it expands. An experiment was done to investigate this expansion.
Air was drawn into a 100 cm^3 glass syringe and then the nozzle was sealed. The syringe was placed in a tall beaker of cold water.

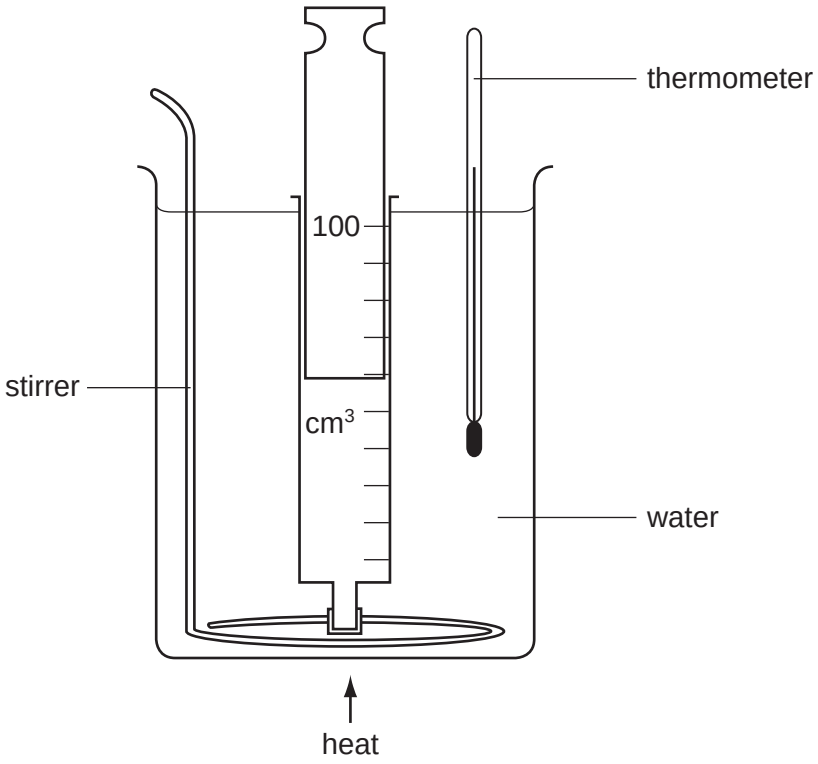


Fig. 5.1

The water was slowly warmed and gently stirred.
At intervals, a thermometer was used to find the temperature of the water. The temperature reading and the volume of air in the syringe were recorded in Fig. 5.2.

reading number	1	2	3	4	5
temperature/ °C	2	25	50		
volume/ cm^3	53	59	64		

Fig. 5.2

(a) The scales of the thermometer and the syringe for the two missing readings are shown in Fig. 5.3. Read the temperatures and the volumes and record the values in Fig. 5.2.

[4]

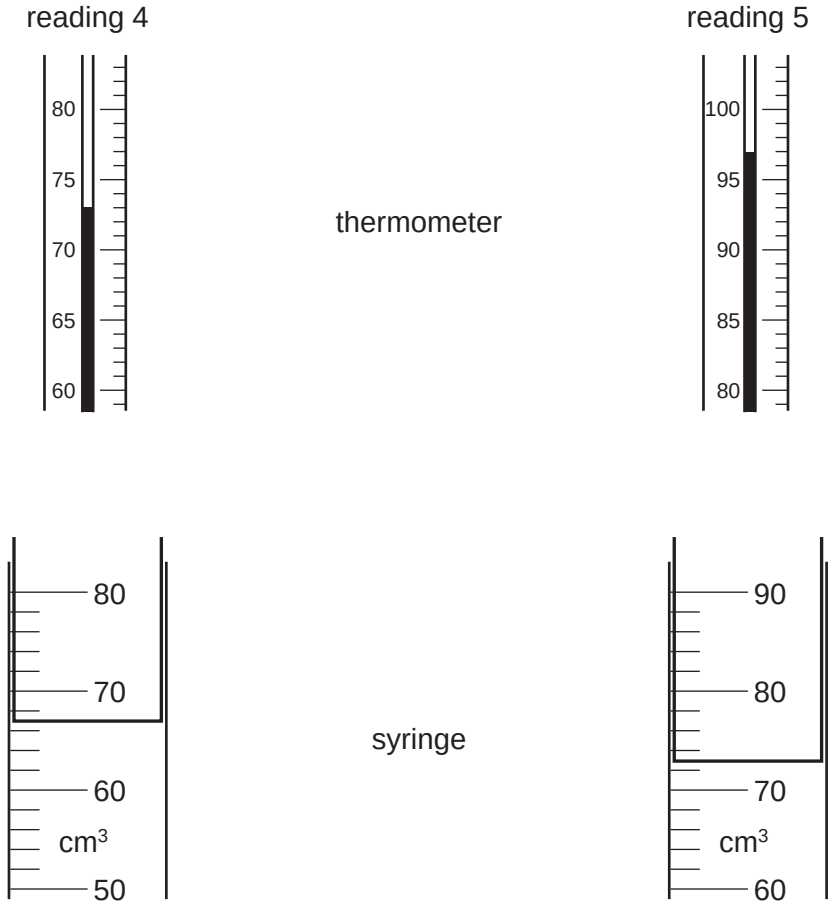
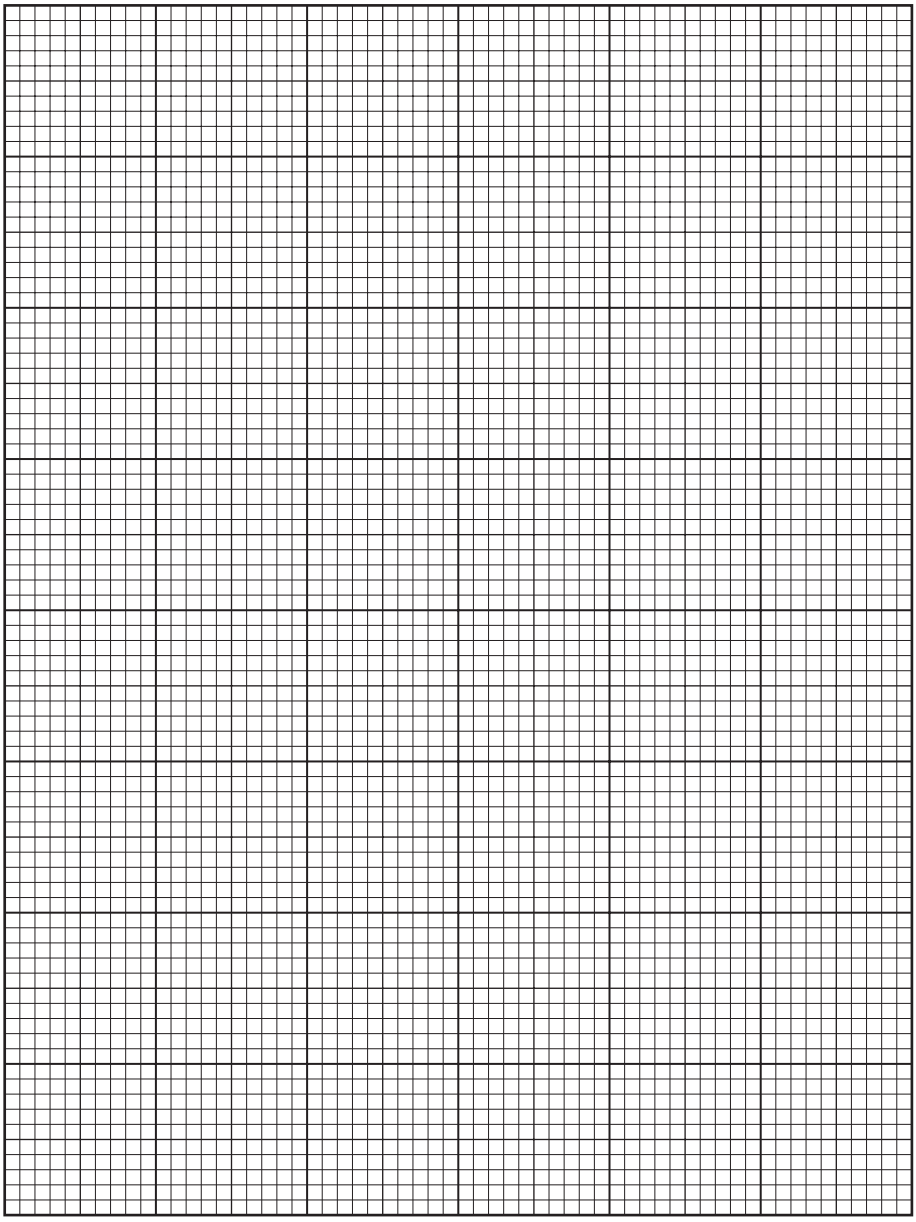


Fig. 5.3

(b) On the grid provided, plot the volume of air (vertical axis) against the temperature. Draw the best fit **straight** line. [3]



(c) Use your knowledge of the behaviour of gas molecules to explain why the air in the syringe expanded when it was heated.

.....

.....

..... [2]

(d) In a different experiment, the sealed syringe containing a hydrocarbon gas was placed in water at room temperature. Then the beaker of water was surrounded by ice at 0 °C. The graph shows how the volume of the gas changed as the temperature drops towards 0 °C.

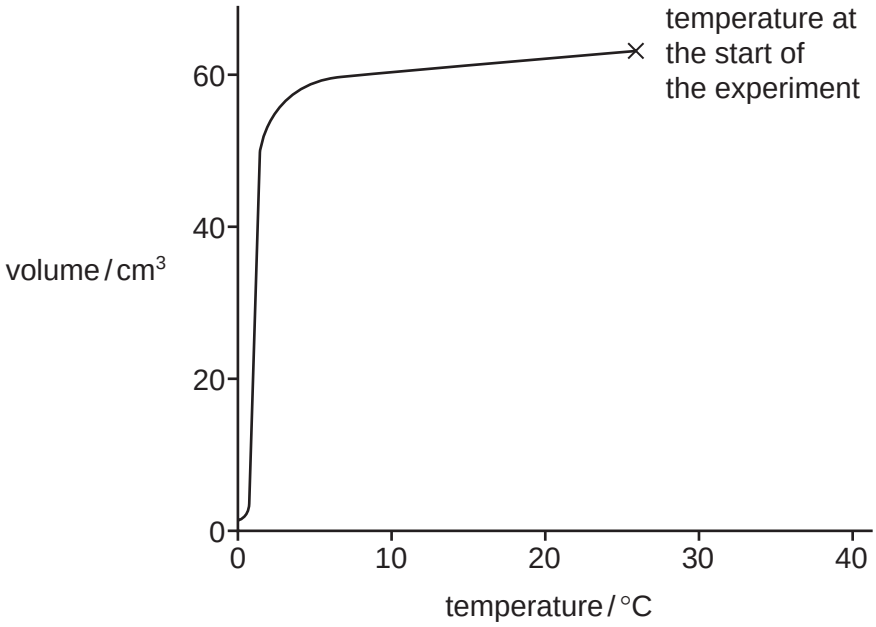


Fig. 5.4

Explain why there was a sudden large decrease in the volume of the gas.

.....

[1]

6 The teacher gave the class four liquids labelled **A**, **B**, **C** and **D**. She asked them to identify the liquids by doing two experiments and using a key, shown in Fig. 6.2.

First experiment. Finding the density of the liquids.

- A 50 cm^3 measuring cylinder was placed on a balance.
- The balance was adjusted so that it read 0.0 g with the measuring cylinder on the pan.
- 50 cm^3 of each liquid was placed in the cylinder.

Fig. 6.1 shows the balance window for each liquid in turn.

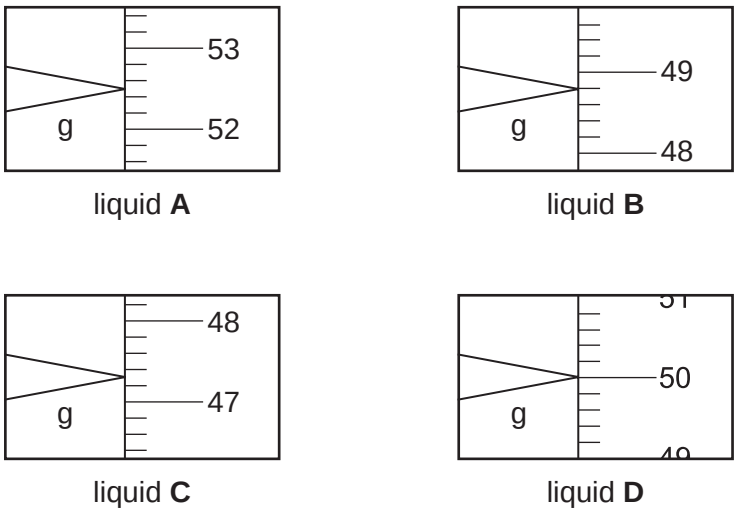


Fig. 6.1

(a) Read the balance windows and record the masses in the spaces provided.

mass of 50 cm^3 of liquid **A** .....g

mass of 50 cm^3 of liquid **B** .....g

mass of 50 cm^3 of liquid **C** .....g

mass of 50 cm^3 of liquid **D** .....g [4]

(b) Use the data from **(a)** to help you to write the letters of the four liquids in the correct spaces in boxes **1**, **2** and **3** of the key, Fig. 6.2. Do not attempt to complete boxes **4** and **5** until you answer part **(c)**. [2]

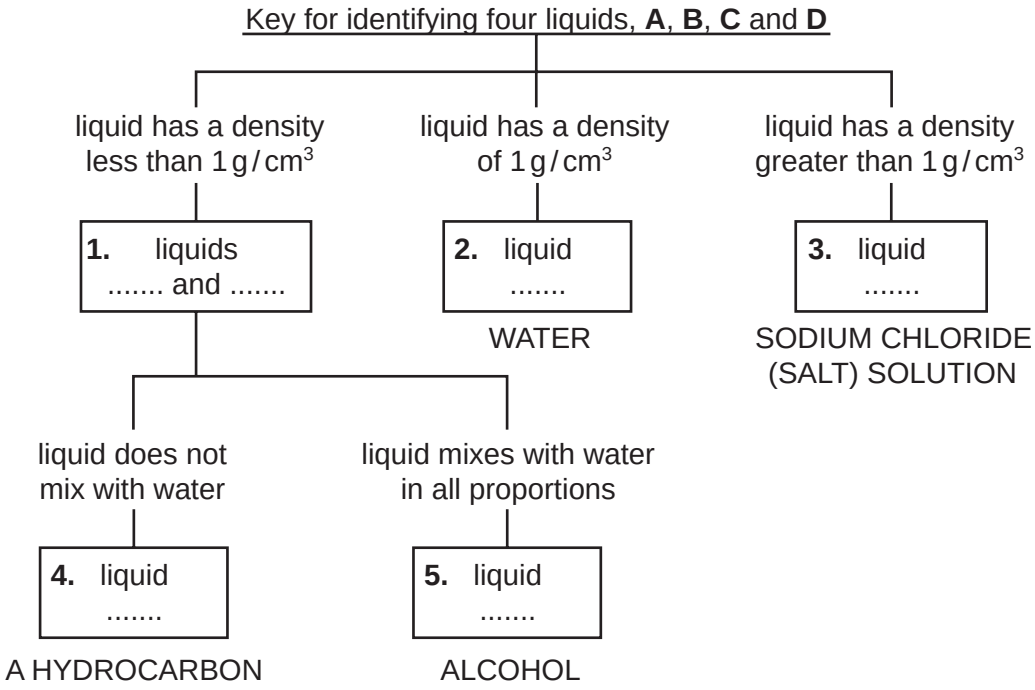


Fig. 6.2

Second experiment. Mixing the liquids with water.

Fig. 6.3. shows the effect of placing 10 cm^3 of each of the liquids with 10 cm^3 of water in a test-tube.

(c) Use information from Fig. 6.3 to help you to complete boxes **4** and **5** in the key, Fig. 6.2. [1]

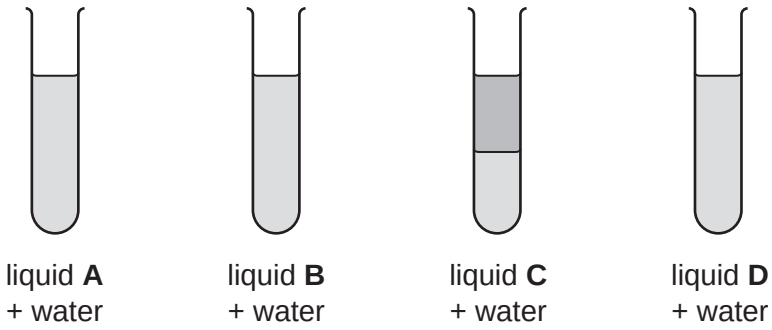


Fig. 6.3

(d) Suggest a different test you can carry out to distinguish between the alcohol and the hydrocarbon.

.....

..... [1]

(e) Describe a chemical test you can carry out to confirm the identity of the salt solution.

.....

..... [2]

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