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Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/05**

Paper 5 Practical Test

October/November 2006

2 hours

Candidates answer on the Question Paper.
Additional Materials: As listed in Instructions to Supervisors

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.
Chemistry practical notes for this paper are printed on page 12.
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	
Total	

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1 (a) Mammals have fur to insulate them against heat loss. You will do an experiment to find out what difference it would make to an animal's heat loss with both dry and wet body covering.

The test-tube of hot water represents the mammal and the cotton wool represents the fur.

- Wrap cotton wool around two test-tubes to a thickness of approximately 0.5 cm. Hold it in place by two elastic bands, as shown in Fig. 1.1. Place the tubes in a rack or hold them using a clamp.

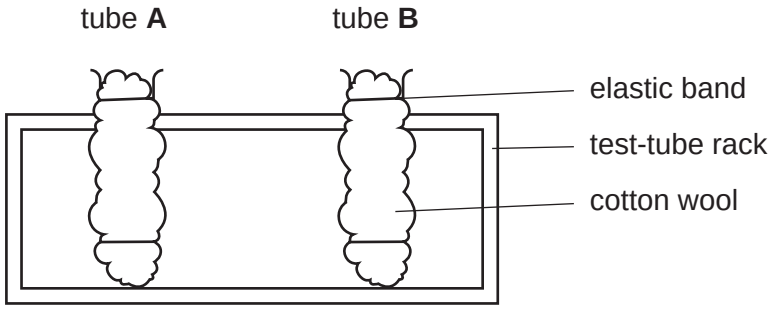

Fig. 1.1

- Wet the cotton wool of tube **B** by holding the covered tube under the tap, or by immersing it in a beaker of water. Gently squeeze the wet cotton wool to remove excess water, then replace the covered tube into the test-tube rack.
- Ask your supervisor for enough boiling water to fill the two tubes, leaving a space of about 5 cm at the top. Start with tube **A** first.
- Place a thermometer into each tube and wait for a few seconds. Take a reading from both thermometers at the same time and record the readings in Fig. 1.2.
- Continue to take readings every minute for 5 minutes.

time / minutes	temperature of tube **A** / °C	temperature of tube **B** / °C
0		
1		
2		
3		
4		
5		

Fig. 1.2 [4]

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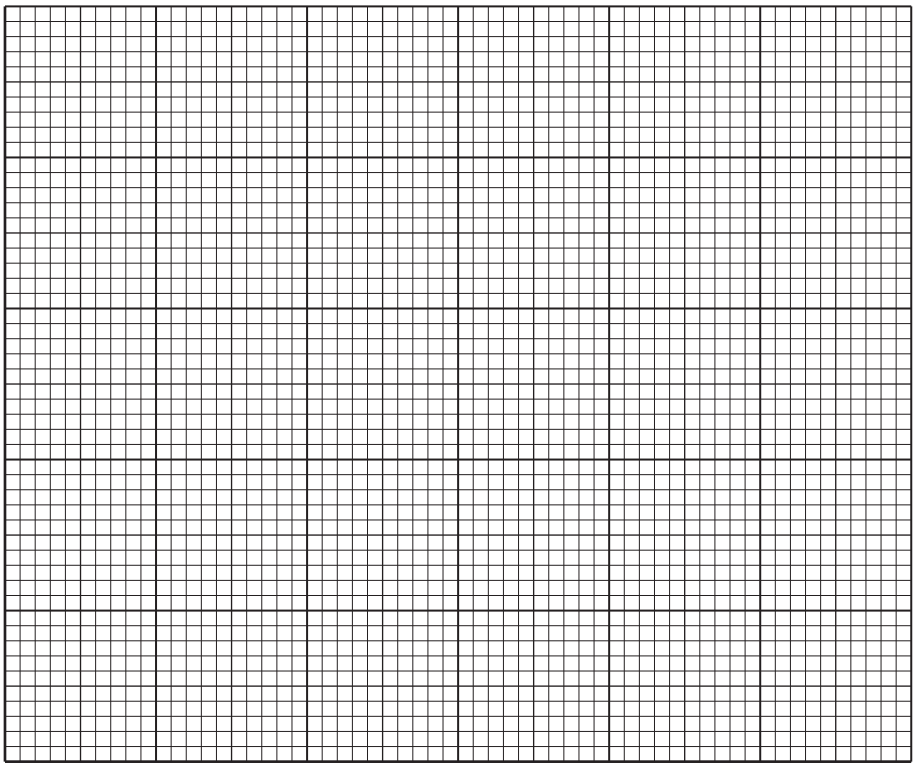
(b) (i) Plot temperature (vertical axis) against time for each tube. Draw smooth curves through the points and label the lines tube **A** and tube **B**. [3]



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

..... [1]

(iii) Explain your answer.

.....

.....

..... [2]

(c) Describe two sources of error in the experiment.

1. .....

.....

2. .....

..... [2]

(d) (i) The experiment uses the test-tubes as models of mammals. Explain how the temperature variation is different in mammals compared with the test-tubes in the experiment.

.....

..... [1]

(ii) 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]

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2 You are going to cut out an L-shaped card and use it to take various measurements.

(a) Carefully cut out the L-shaped figure using the dimensions shown. If you make a mistake you may ask for another piece of card.

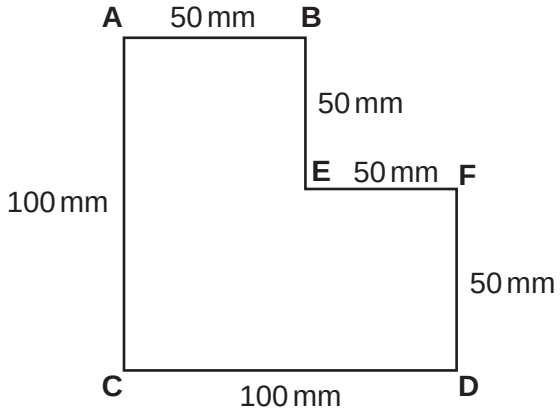

Fig. 2.1

(i) Measure the distance **CE** on your own cut L-shaped figure and record it below.

distance **CE** = ... mm [1]

(ii)
- Make a mark 5 mm from point **A** so that distance **x**, shown on Fig. 2.2 is 5 mm.
- Insert the drawing pin at this mark as near as possible to the edge **AB** of the card.
- Attach the plumb-line to the pin and insert the pin in the cork or suitable support provided. Make sure that the card swings freely.
- Mark the position of point **G**, where the plumb-line crosses the edge **CD**. Measure the distance **CG**. This distance is labelled **y** in the diagram. Record the distance, **y**, in Fig. 2.3

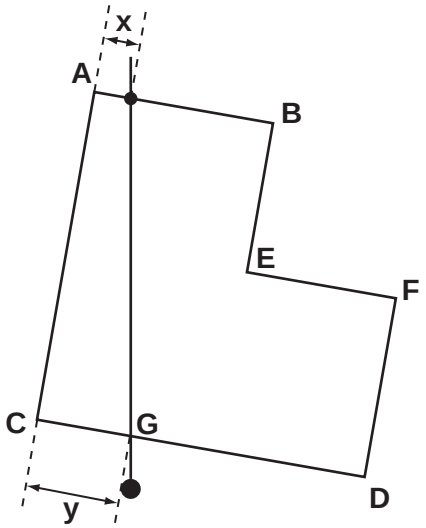

Fig. 2.2

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x / mm	**y** / mm

Fig. 2.3

(iii) Repeat the procedure for **four** further values of **x**, moving the pin about 5 mm nearer to **B** each time. Measure and record **y** for each new value of **x**. [3]

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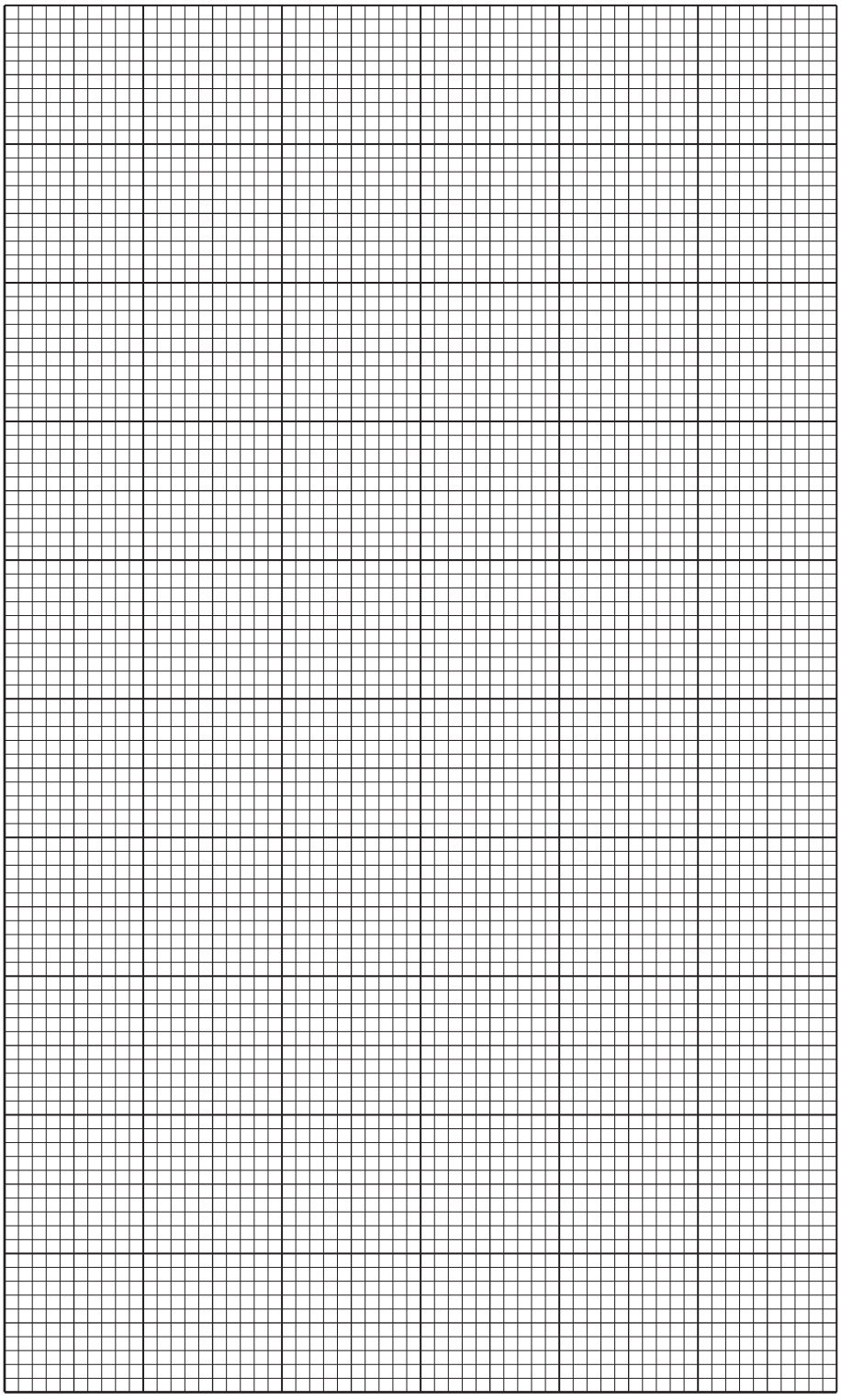
(b) (i) Plot a graph of **y** (vertical axis) against **x** and draw the best fit straight line through your points.



[4]

(ii) From the graph determine $\mathbf{y_o}$, the value of **y** when **x** = 0.

$\mathbf{y_o}$ = ...mm [2]

(c) (i) Place the L-shaped card on the space below. Using a pencil, draw around the card. Label the drawing with the letters **A** to **F** as shown in Fig. 2.2.

[2]

(ii) Using the value of $\mathbf{y_o}$ from **(b)(ii)**, show point **G** on your drawing.
Join point **G** to point **A**. Measure and record the length of the line **AG**.

length of line **AG** = ...mm [2]

(iii) Draw the line **CE**. Mark the point **M**, where lines **CE** and **AG** cross. [1]

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3 You are provided with three solids, **A**, **B** and **C**. One is an acid, one a base and the other a salt. You are required to decide which is the acid, the base and the salt by carrying out the tests **(a)**, **(b)** and **(c)**.

Some of the spaces are already completed. If you do not see a reaction, write 'no reaction'.

(a) (i) Place about one fifth of solid **A** in a test-tube. Add an equal amount of solid sodium carbonate. Add about 2 cm^3 of water and mix. Note any reaction and record your observation in Fig. 3.1.

(ii) Repeat the test replacing solid **A** with solid **B**. Record any observation in Fig. 3.1.

Test: addition of sodium carbonate and water		
solid **A**	solid **B**	solid **C**
		white precipitate

Fig. 3.1 [2]

(b) (i) Place another portion of solid **A** in a test-tube. Add an equal amount of ammonium chloride. Now add about 5 cm^3 water and warm the mixture. If a gas is evolved you must identify it. Record your observation in Fig. 3.2 including the test for the identification of any gas given off.

(ii) Repeat test **(b)(i)** using solid **B** in place of solid **A**.

(iii) Carry out the test again replacing solid **B** with solid **C**.

Test: addition of ammonium chloride and water. Warm and identify any gas given off.		
solid **A**	solid **B**	solid **C**

Fig. 3.2 [4]

(c) (i) Use another portion of solid **B** and add about 5 cm^3 of water. Shake the contents of the test-tube to dissolve the solid. You may filter the mixture if necessary.

Add aqueous ammonia solution a little at a time until it is in excess.

(ii) Repeat test **(c)(i)** using solid **C** in place of solid **B**. Record any observation in Fig. 3.3.

Test: addition of aqueous ammonia a little at a time until in excess.		
solid **A**	solid **B**	solid **C**
no apparent reaction		

Fig. 3.3 [3]

(d) Using the results of tests **(a)**, **(b)** and **(c)**, decide which is the **acid**, which is the **base** and which is the **salt** and give your reasons. Do not try to name the solids.

solid **A** is ..... because .....

.....

solid **B** is ..... because .....

.....

solid **C** is ..... because .....

..... [3]

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(e) Using a fresh sample of the solid you have identified as the salt, carry out the tests for a chloride and a sulphate. Use the notes on page 12 to help you. State the observation for each test.

observation for chloride test

.....

observation for sulphate test

.....

Name the anion in the salt.

..... [3]

CHEMISTRY PRACTICAL NOTES

Test for anions

anion	*test*	*test result*
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulphate (SO_4^{2-}) [in solution]	acidify then add aqueous barium chloride *or* aqueous barium nitrate	white ppt.

Test for aqueous cations

cation	*effect of aqueous sodium hydroxide*	*effect of aqueous ammonia*
ammonium (NH_4^+)	ammonia produced on warming	-
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

Test for gases

gas	*test and test results*
ammonia (NH_3)	turns damp litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	“pops” with a lighted splint
oxygen (O_2)	relights a glowing splint

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