UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CHEMISTRY **0620/53**

Paper 5 Practical Test **May/June 2010**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

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

Answer **all** questions.
Practical notes are provided on page 8.

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	
Total	

This document consists of **8** printed pages.

For Examiner's Use

1 You are going to investigate the solubility of salt **A** in water at various temperatures.

Read all the instructions below carefully before starting the experiments.

Instructions

Experiment 1

You are provided with a clean boiling tube containing 12 g of **A**.
Fill the burette provided with distilled water and add 10.0 cm^3 of water to the boiling tube.
Heat the mixture of salt **A** and water carefully until all of the solid has dissolved.
You will have to boil the solution **gently**.

Remove the boiling tube from the heat and allow the solution to cool.
Stir the solution **gently** with the thermometer.

Note the temperature at which crystals **first appear** and record the temperature in the table.

Keep the boiling tube and its contents for the remaining experiments in this question.

Experiment 2

From the burette, add 2.0 cm^3 more of the water into the boiling tube and contents from Experiment 1.

Repeat the experiment exactly as before to find the temperature at which crystals **first appear**.
It may help if the boiling tube is dipped for **short** periods of time in a beaker of cold water to speed up the cooling.
Record, in the table, the **total** volume of water in the boiling tube and the temperature at which crystals first appear.

Experiment 3

From the burette, add 2.0 cm^3 more of the water into the boiling tube and contents from Experiment 2.
Repeat the experiment exactly as before and record, in the table, the total volume of water used and the temperature at which crystals first appear.

Continue this procedure for *Experiment 4* with one more addition of 2.0 cm^3 of water. Note all the results in the table.

At the end of Experiment 4, the total volume of water in the boiling tube will be 16.0 cm^3.

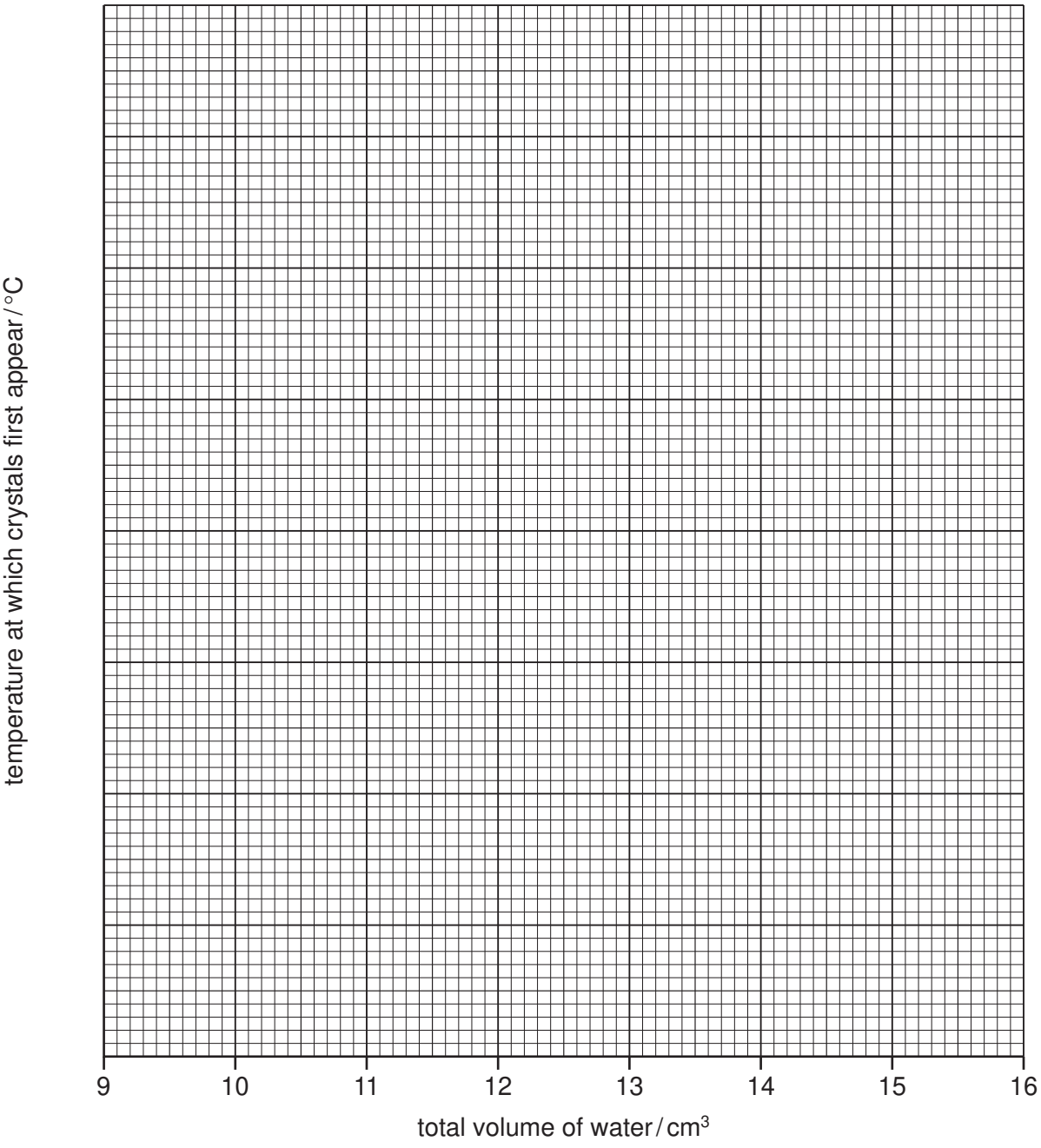
Table of results

experiment	total volume of water / cm^3	temperature at which crystals first appear / °C
1	10.0	
2		
3		
4		

[5]

For Examiner's Use

(a) Plot your results on the grid below and draw a straight line graph.



[6]

(b) How did you know when salt **A** was completely dissolved in the water?

..... [1]

(c) **From your graph**, find the temperature at which crystals of **A** would first appear if the total volume of water in the solution were 9.0 cm^3.
Show clearly **on the graph** how you worked out your answer.

..... °C [2]

(d) Salt **B** is more soluble in water than salt **A**. Sketch on the grid the graph you would expect for **B**. Label this graph. [2]

(e) Suggest, with a reason, how the results would be different if 6 g of salt **A** were used instead of 12 g.

.....

..... [2]

(f) Explain **one** improvement you could make to the experimental procedure to obtain more accurate results in this investigation.

improvement .....

explanation ..... [2]

[Total: 20]

2 You are provided with solid **W** and two solutions, **X** and **Y**.
Carry out the following tests on the solid and the solutions, recording all of your observations in the table.
Conclusions must **not** be written in the table.

tests	observations
tests on solid **W**	
(a) Dissolve half of the sample of solid **W** in about 3 cm^3 of distilled water.	
Add a few drops of dilute nitric acid and then aqueous silver nitrate.	..... [2]
tests on solution **X**	
(b) (i) Describe solution **X**.	..... [1]
Test a little of solution **X** with Universal Indicator paper. Record the pH.	pH ..... [1]
(ii) To about 2 cm^3 of solution **X**, add aqueous sodium hydroxide.	..... [2]
(iii) To about 2 cm^3 of solution **X**, add aqueous ammonia drop by drop and shake the test-tube.	..... [1]
Now add excess aqueous ammonia solution to the test-tube.	..... [2]
(iv) Add the rest of solid **W** to about 3 cm^3 of solution **X**. Stir and leave to stand for 5 minutes.	..... [3]
tests on solution **Y**	
(c) (i) Test a little of solution **Y** with Universal Indicator paper. Record the pH.	pH ..... [1]
(ii) To about 3 cm^3 of solution **Y**, add a few drops of dilute hydrochloric acid and then aqueous barium chloride.	..... [2]

(d) What conclusion can you make about solid **W**?

..... [1]

(e) What conclusions can you make about solution **X**?

.....

..... [2]

(f) Identify solution **Y**.

..... [2]

[Total: 20]

NOTES FOR USE IN QUALITATIVE ANALYSIS

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.
iodide (I^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then aqueous barium nitrate	white ppt.

Test for aqueous cations

cation	*effect of aqueous sodium hydroxide*	*effect of aqueous ammonia*
aluminium (Al^{3+})	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
ammonium (NH_4^+)	ammonia produced on warming	–
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt., or very slight white ppt.
copper (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 red 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