Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

PHYSICAL SCIENCE **0652/05**

Paper 5 Practical Test

October/November 2003

1 hour 30 minutes

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 in the spaces provided on the Question Paper.
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.

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.
Chemistry practical notes for this paper are printed on page 8.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use	
1	
2	
Total	

This document consists of **7** printed pages and **1** blank page.

1 Substance **X** is a mixture of a simple salt and a metal oxide. You are going to carry o to identify the salt and the metal oxide.

(a) Place a small amount of **X** in a test-tube and add about 5 cm^3 dilute nitric acid. Warm carefully. Record your observation.

observation .....[1]

(b) Prepare a solution for testing as follows.

Warm the remainder of **X** with about 15 cm^3 water in a large test-tube or beaker. Filter and use portions of the filtrate for testing as indicated below. Keep the filter paper containing the solid residue in the filter funnel, for part **(c)**.

(i) To about 2 cm^3 of the filtrate, add about 5 cm^3 of dilute hydrochloric acid. Record your observation and any conclusion.

observation .....

conclusion .....[2]

(ii) To another 2 cm^3 of the filtrate, add a few drops of nitric acid followed by a few drops of silver nitrate solution. Record your observation and any conclusion.

observation .....

conclusion .....[2]

(iii) To another 2 cm^3 of the filtrate, add about 1 cm^3 of aqueous sodium hydroxide and warm the mixture. The solution should be hot but do **not** boil. Test any gas given off with moist red litmus paper. Record your observation and identify the gas.

observation .....

name of gas given off .....[2]

(c) Warm about 10 cm^3 of dilute nitric acid in a test-tube until it is very hot, and pour onto the solid residue in the filter paper from **(b)**. Collect the filtrate in a test-tube. You are required to carry out two tests of your own on this filtrate which enables you to identify the metal in the metal oxide. You are advised to use about 2 cm^3 of the filtrate for each test. Describe fully each test you carry out. Include any relevant observations.

test 1 .....

.....

.....[3]

test 2 .....

.....

.....[3]

(d) Complete the following:

The salt in **X** is ..... .

2 You are going to show how the solubility of potassium nitrate varies with temperature.

(a) The large test-tube contains 7.0 g of potassium nitrate and 5.0 cm^3 of water.

- Clamp the tube in the stand.
- Lower the tube into a beaker of water so that the level of the water in the beaker comes above the level of the water in the tube as shown in Fig. 2.1.
- Heat the beaker of water, stirring the contents of the tube until all the potassium nitrate has dissolved.
- Remove the tube from the beaker of water.
- Allow the tube to cool, stirring gently all the time.
- Small shiny crystals will appear. Note the temperature at which these crystals appear and record it in the table, Fig. 2.2.

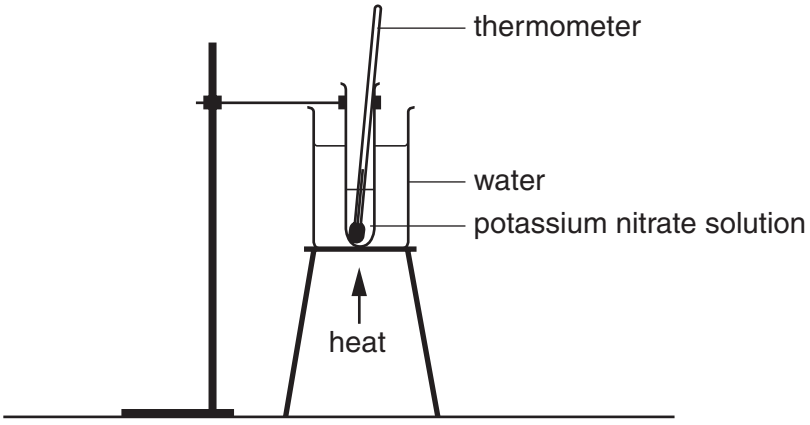


Fig. 2.1

(b) Use a burette or calibrated dropper to add 1.0 cm^3 of water to the tube, making a total of 6.0 cm^3. Replace the tube in the beaker of water.
Warm the water again, stirring until all the solid has dissolved. Remove from the beaker and note the temperature at which crystals appear. Record this temperature in the table, Fig. 2.2.

(c) Repeat the procedure, adding 1.0 cm^3 of water each time to obtain two more readings. Record the temperatures in the table, Fig. 2.2.

Two more sets of readings are provided for you.

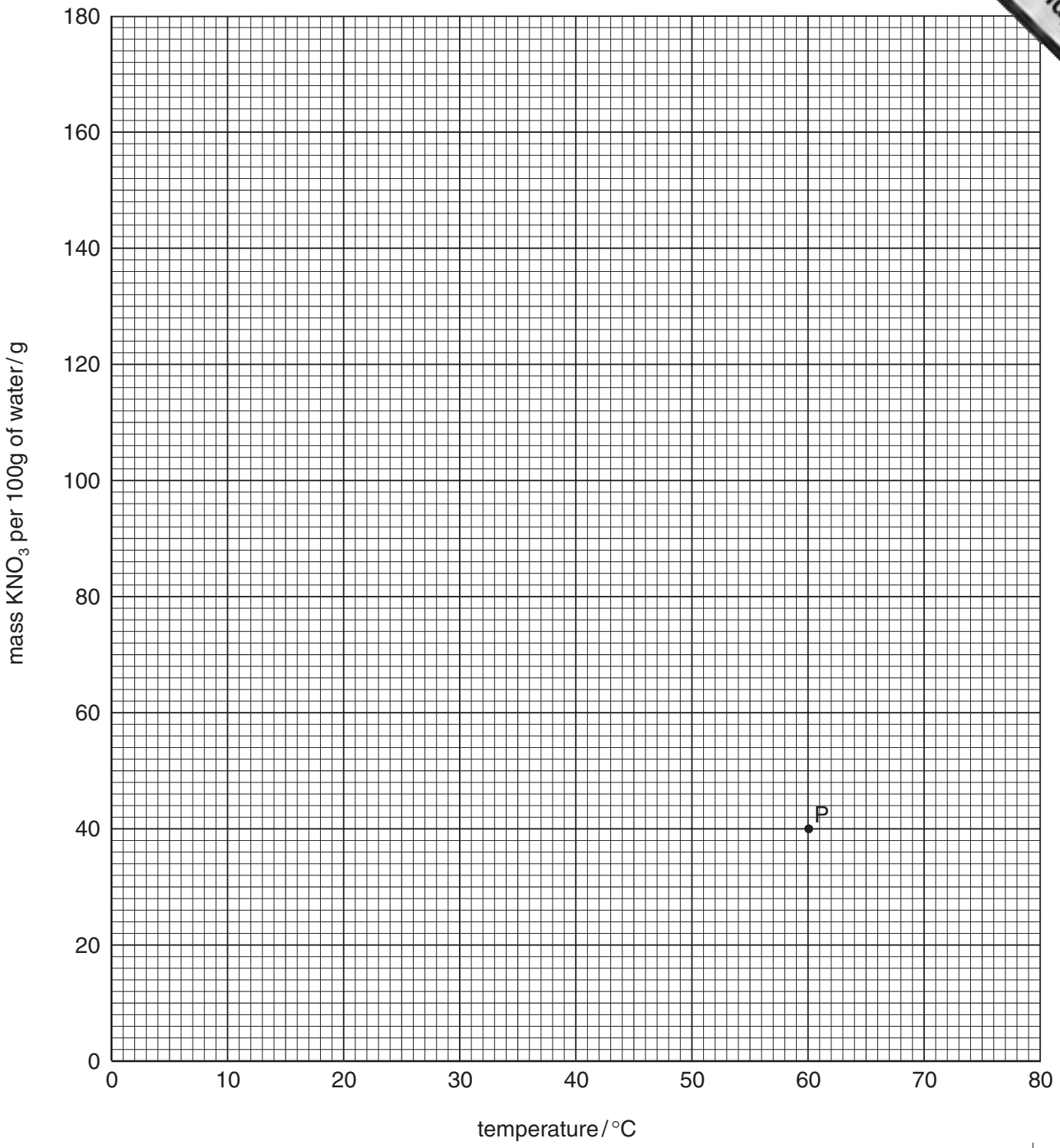
mass of potassium nitrate / g	total vol water / cm^3	mass of potassium nitrate per 100 g of water / g	temperature at which crystals form / °C
7.0	4.0	175	78
7.0	5.0		
7.0	6.0		
7.0	7.0		
7.0	8.0		
7.0	12.0	58.3	38

[5]

Fig. 2.2

(d) Complete the table by calculating the mass of potassium nitrate in 100 g water in each line. Assume that 1 cm^3 of water has a mass of 1 g. [1]

(e) Plot a graph of mass of potassium nitrate per 100 g water (vertical axis) temperature at which crystals form.



(f) Use your graph to answer the following:

(i) If a solution of potassium nitrate containing 100 g of the salt per 100 g water at 70 °C is cooled, at what temperature will crystals start to appear?

.....[1]

(ii) Estimate the solubility of potassium nitrate in water at 0 °C.

(g) Why was the temperature taken when the crystals appeared on **cooling** rath when they disappeared when **heating**?

.....

.....

.....[1]

(h) Note the point **P** on the graph and then complete the following sentence.

The point **P** represents a solution of ..... g potassium nitrate in ..... g water at a temperature of ..... °C. [3]

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CHEMISTRY PRACTICAL NOTES

Tests 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 with dilute nitric acid, then add aqueous barium chloride *or* aqueous barium nitrate	white ppt.

Tests 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

Tests for gases

gas	*test and test result*
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