Name

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CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CO-ORDINATED SCIENCES

0654/05

Paper 5 Practical Test

October/November 2003

2 hours

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

READ THESE INSTRUCTIONS FIRST

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 12.

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	
3	
Total	

1 This question is about heat loss in animals. During cold weather some animals together (huddle) to keep warm.

Your experiment is to find how effective such huddling is.

www.papaCambridge.com You will use test-tubes of hot water to represent the animals. One tube, tube A, will be put in the middle of six others. Another tube, tube B, will be put by itself.

- Put eight test-tubes into a test-tube rack. You may need two racks.
- Label one test-tube 'A' and another one test-tube 'B'.
- Arrange a stand and clamp to hold tube **B** in the middle of an empty beaker (see Fig. 1.1(a)).
- Now return tube **B** to the rack. Ask your supervisor to put hot water into one of your beakers. (The water will be at a temperature above 90 °C, be careful). This is your supply of hot water and is to be used to put water in the test-tubes.

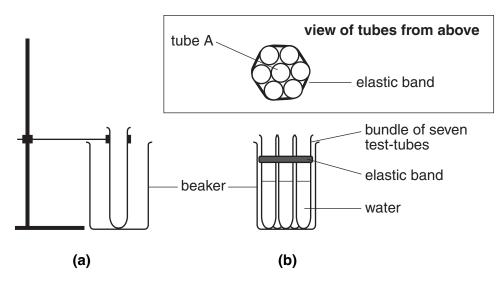


Fig. 1.1

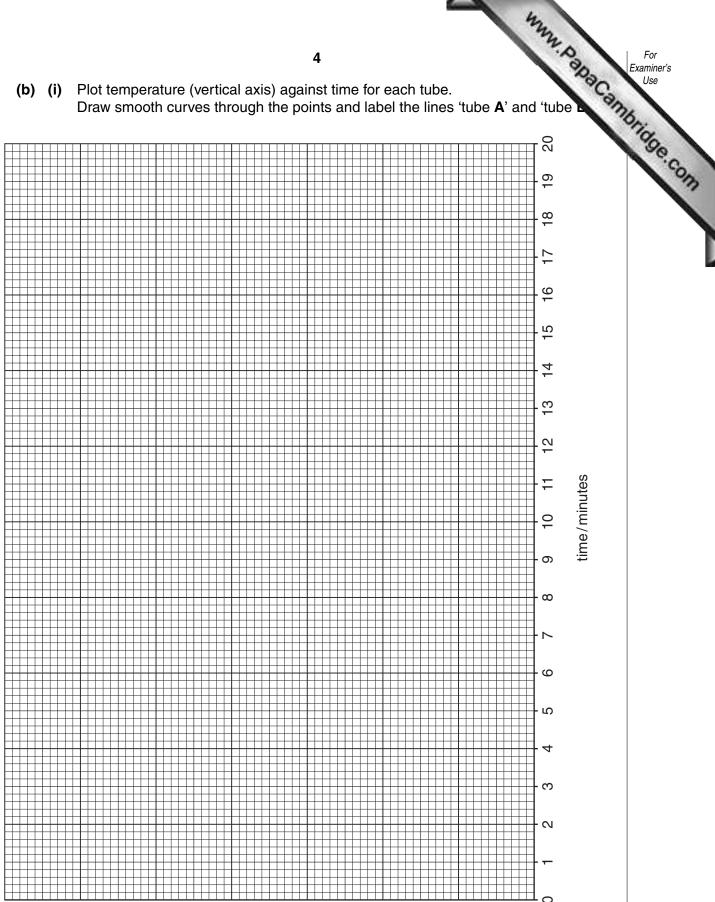
- Half-fill each test-tube with the hot water provided.
- Replace tube **B** in the clamp so that it is by itself in the beaker.
- Put seven of your test-tubes into a different empty beaker. Group them so that tube A is in the middle surrounded by the six remaining tubes. Hold them together with an elastic band. This is shown in Fig. 1.1(b).
- Put a thermometer into test-tubes A and B.

Take the temperature of both test-tubes, (time 0 minutes), and then receivement temperatures every minute for ten minutes in the table, Fig. 1.2. time/minutes temperature of tube A/°C temperature of tube B/°C			Fig. 1.2.
	time/minutes	temperature of tube A /°C	temperature of tube B /°C
			\ \ \

[3]

Fig. 1.2

(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



temperature/°C

[3]

	(ii) Which test-tube, A or B , cooled down more slowly?	Use
(c)	Is huddling effective? Use your results and your knowledge of heat transfer to explain your answer.	Ohiotice.com
	[3]	
(d)	Assuming that all seven test-tubes in the bundle with tube A had the same starting temperature, suggest the temperature for one of the outer tubes after ten minutes. Explain your answer.	
	suggested temperature after ten minutes°C explanation	
	[2]	
(e)	Continue the lines for tube A and tube B on your graph to show how you would expect the readings to change over the next ten minutes. [1]	
(f)	Suggest two ways in which you could improve the accuracy of the experiment.	
	[0]	I

Sub to id	stan dentif	ce X is a mixture of a simple salt and a metal oxide. You are going to carry or 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.		
	obs	ervation[1]	
(b)	(b) Prepare a solution for testing as follows.		
	and	rm the remainder of X with about 15 cm ³ water in a large test-tube or beaker. Filter use portions of the filtrate for testing as indicated below. Keep the filter paper taining the solid residue in the filter funnel, for part (c) .	
	(i)	To about $2\mathrm{cm}^3$ of the filtrate, add about $5\mathrm{cm}^3$ 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)	the requ met	rm about 10 cm ³ of dilute nitric acid in a test-tube until it is very hot, and pour onto solid residue in the filter paper from (b) . Collect the filtrate in a test-tube. You are uired to carry out two tests of your own on this filtrate which enables you to identify the al in the metal oxide. You are advised to use about 2 cm ³ of the filtrate for each test. scribe fully each test you carry out. Include any relevant observations.	
	test	1	
		[3]	
	test	2	
		[3]	
(d)	Cor	nplete the following:	
	The	salt in X is	

- 3 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 cm³ of water.
 - Clamp the tube in the stand.
- www.papaCambridge.com 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. 3.1.
 - 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. 3.2.

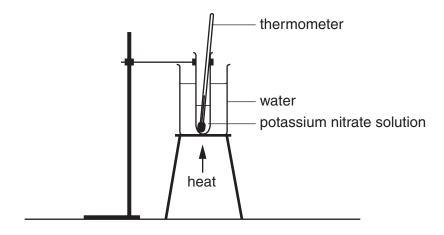


Fig. 3.1

- www.papaCambridge.com (b) Use a burette or calibrated dropper to add 1.0 cm³ of water to the tube, making a 6.0 cm³. Replace the tube in the beaker of water. Warm the water again, stirring until all the solid has dissolved. Remove from the beak and note the temperature at which crystals appear. Record this temperature in the table, Fig. 3.2.
- (c) Repeat the procedure, adding 1.0 cm³ of water each time to obtain two more readings. Record the temperatures in the table, Fig. 3.2.

Two more sets of readings are provided for you.

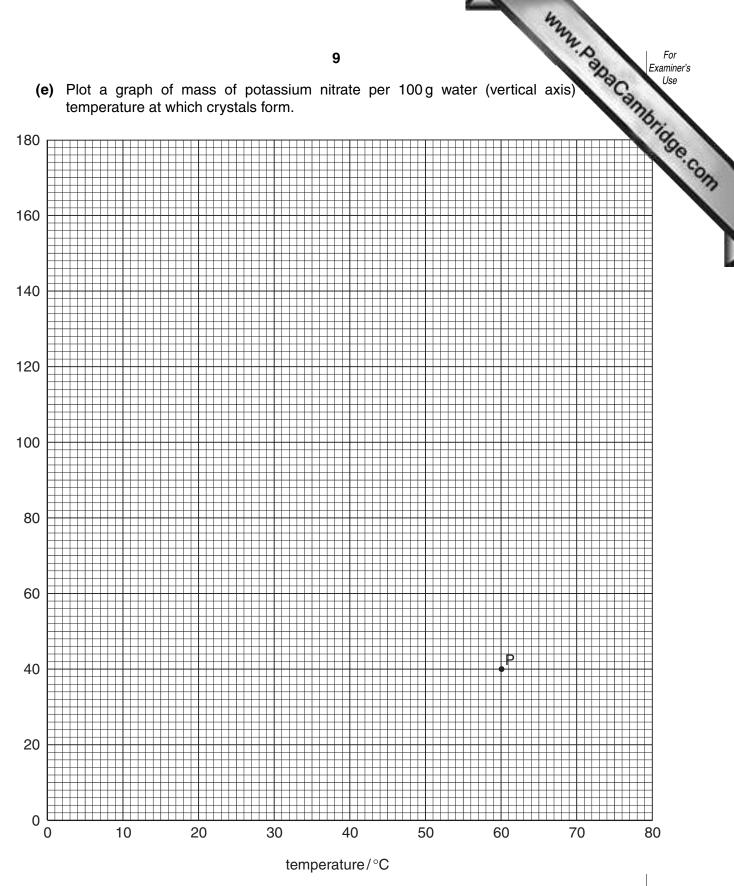
mass of potassium nitrate/g	total vol water/cm ³	mass of potassium nitrate per 100 g of water/g	temperature at which crystals form/°C
7.0	4.0	175	78
7.0	5.0		
7.0	6.0		
7.0	7.0		
7.0	8.0		
7.0	12.0	58.3	38

Fig. 3.2

(d) Complete the table by calculating the mass of potassium nitrate in 100 g water in each line. Assume that 1 cm³ of water has a mass of 1 g. [1]

[5]

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



Use your graph to answer the following:

mass KNO₃ per 100g of water/g

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?

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

	my	
	10	For Examiner's
(g)	Why was the temperature taken when the crystals appeared on cooling rath when they disappeared when heating ?	716hian
		Se. COM
	[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

Tests for anions Annon test Annon test		
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