UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

CHEMISTRY **0620/61**

Paper 6 Alternative to Practical **May/June 2012**

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 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.

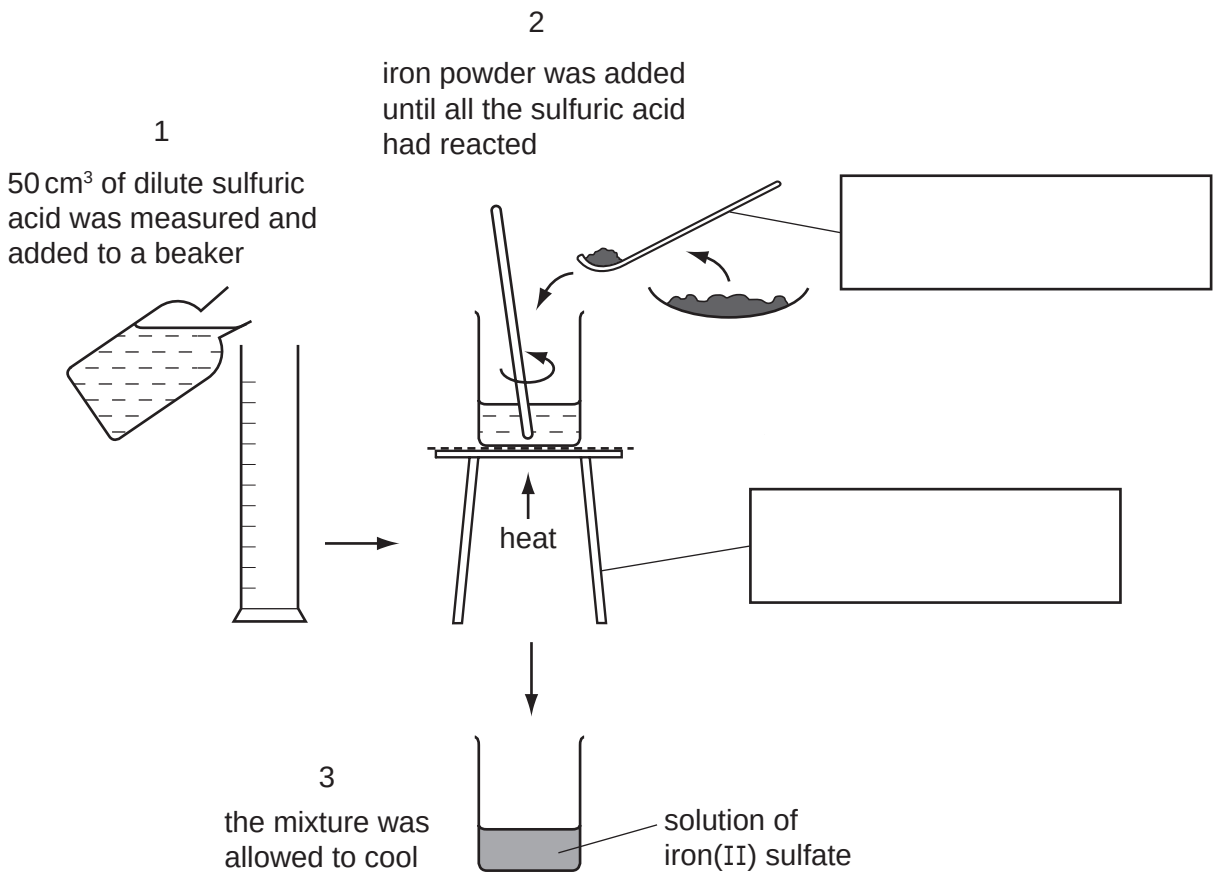
Answer **all** questions.

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 **11** printed pages and **1** blank page.

1 A student reacted excess iron powder with sulfuric acid to prepare a solution of iron(II) sulfate.
The diagram shows the procedure followed in three stages.



(a) Complete the boxes to identify the pieces of apparatus labelled. [2]

(b) How would the student know when all of the sulfuric acid had reacted? Give **two** reasons.

1 .....

2 ..... [2]

(c) Describe the effect of boiling the solution of iron(II) sulfate for several minutes.

.....

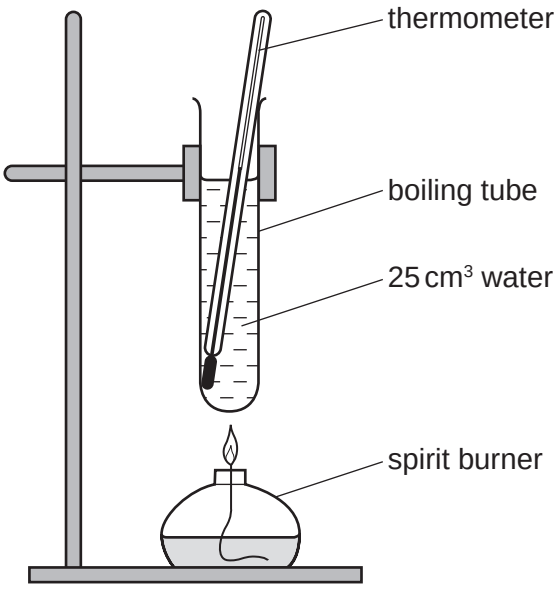
.....

..... [3]

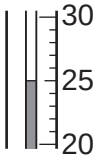
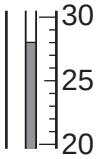
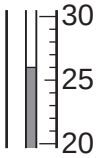
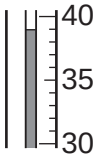
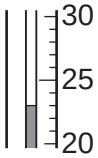
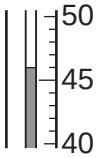
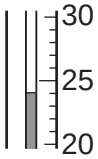
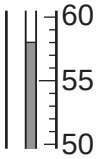
[Total: 7]

2 Heat is given out when alcohols are burned.

A student used the apparatus below to find the amount of heat produced when four different alcohols, methanol, ethanol, propanol and butanol, were burned.



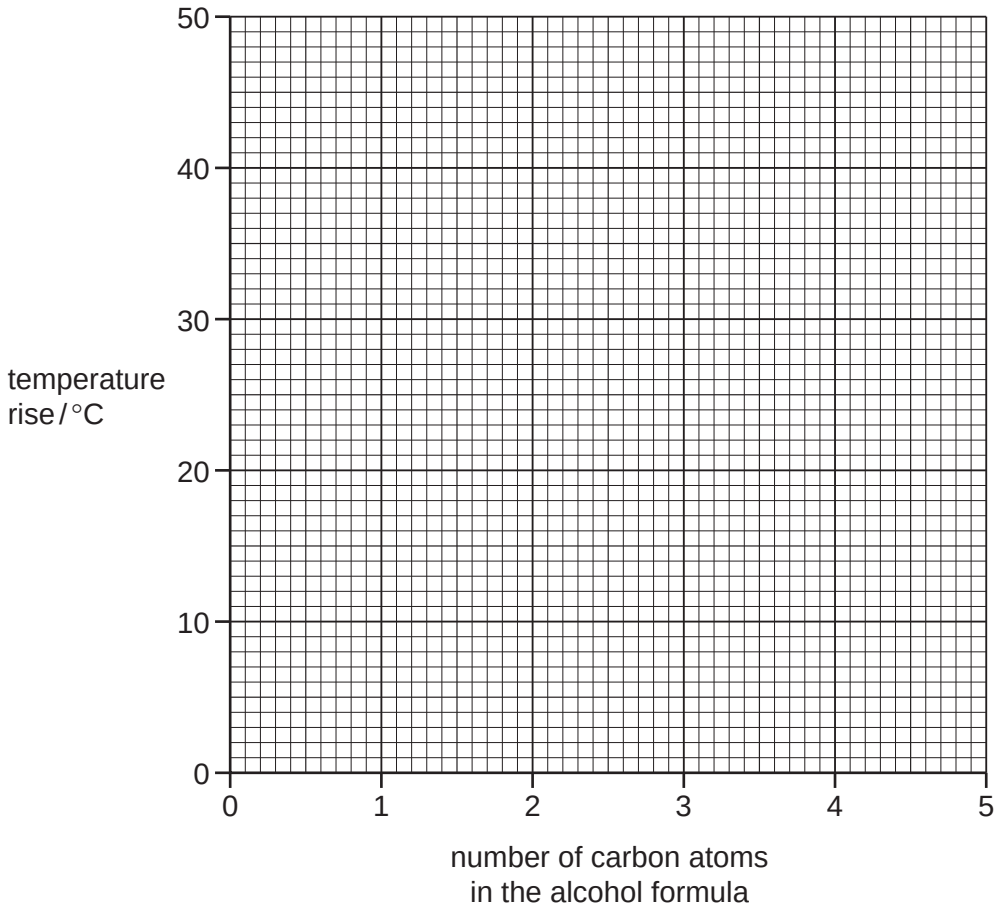
(a) Some methanol was put into the burner. The initial temperature of the water was measured. The burner was lit and allowed to burn for one minute. The flame was extinguished and the final temperature of the water was measured. The experiment was repeated with ethanol, propanol and butanol.
Use the thermometer diagrams to record the temperatures in the table on page 4. Complete the table by recording the temperature rise for each alcohol.

alcohol	formula	initial		final		temperature rise / °C
		thermometer diagram	temperature / °C	thermometer diagram	temperature / °C	
methanol	CH_3OH					
ethanol	C_2H_5OH					
propanol	C_3H_7OH					
butanol	C_4H_9OH					

[4]

For Examiner's Use

(b) Plot the results obtained on the grid and draw a straight line graph.



[4]

(c) **From your graph**, work out the temperature rise expected if the experiment was repeated using pentanol, $C_5H_{11}OH$.
Show clearly **on the grid** how you obtained your answer.

..... [3]

(d) Suggest the effect of using a copper can to contain the water instead of a boiling tube. Explain your answer.

.....

..... [2]

[Total: 13]

For Examiner's Use

3 Coffee beans contain caffeine and other compounds. Caffeine is soluble in water and in trichloromethane, an organic solvent.
A student obtained crystals of caffeine by the following method.

Stage 1 Some coffee beans were crushed into small pieces.

Stage 2 Hot water was added to the crushed beans to dissolve the soluble substances.

Stage 3 The crushed beans were separated from the liquid solution.

Stage 4 The liquid was allowed to cool and shaken with trichloromethane to extract the caffeine from the water.

Stage 5 The caffeine was crystallised from the trichloromethane solution.

Stage 6 The caffeine crystals were checked for purity.

(a) What apparatus should be used to crush the beans in Stage 1?

..... [2]

(b) How could the dissolving process in Stage 2 be speeded up?

..... [1]

(c) Draw a diagram of the apparatus used in Stage 3.

[2]

(d) How should Stage 5 be carried out?

.....

..... [2]

(e) What method could be used to check the purity of the crystals in Stage 6?

..... [1]

[Total: 8]

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4 A student investigated the reaction between aqueous lead nitrate and aqueous potassium chloride.

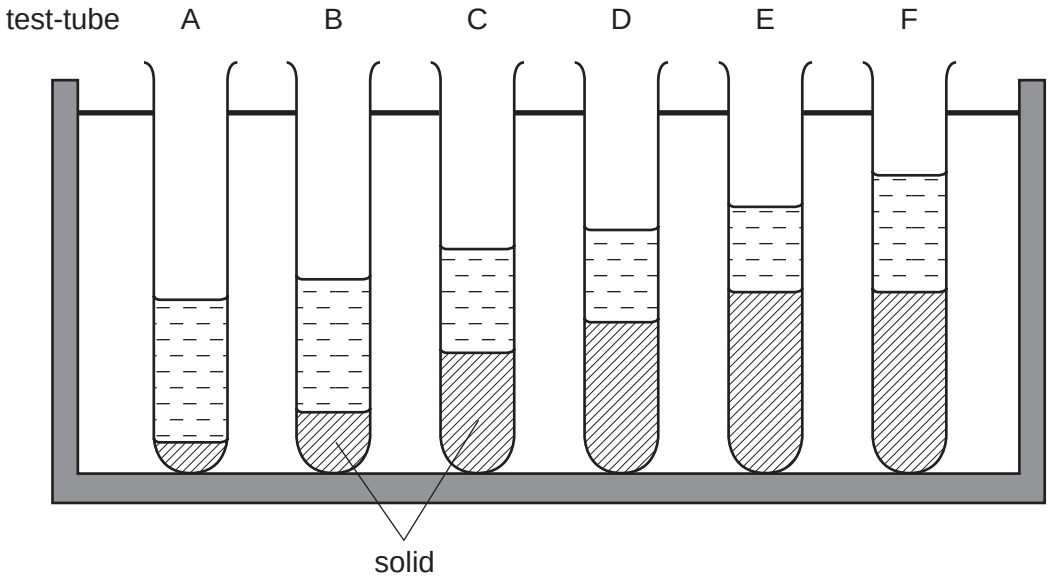
(a) One experiment was carried out.

Using a measuring cylinder, 3 cm^3 of aqueous lead nitrate was poured into each of six test-tubes in a test-tube rack. The test-tubes were labelled A, B, C, D, E and F respectively.

A burette was filled with aqueous potassium chloride. A 1.0 cm^3 sample of the aqueous potassium chloride was added to test-tube A.
A 2.0 cm^3 sample of aqueous potassium chloride was added to test-tube B.
A 4.0 cm^3, 5.0 cm^3, 6.0 cm^3 and 7.0 cm^3 sample of aqueous potassium chloride was added to test-tubes C, D, E and F respectively.

Using a glass rod, the contents of the test-tubes were stirred. The contents of the test-tubes were left to stand for 10 minutes.

After 10 minutes, a ruler was used to measure the height of the solid in each test-tube. The diagrams show the six test-tubes in a rack. Use a ruler to measure the height of the solid in each test-tube in the diagram. Record the heights of the solid in the table.

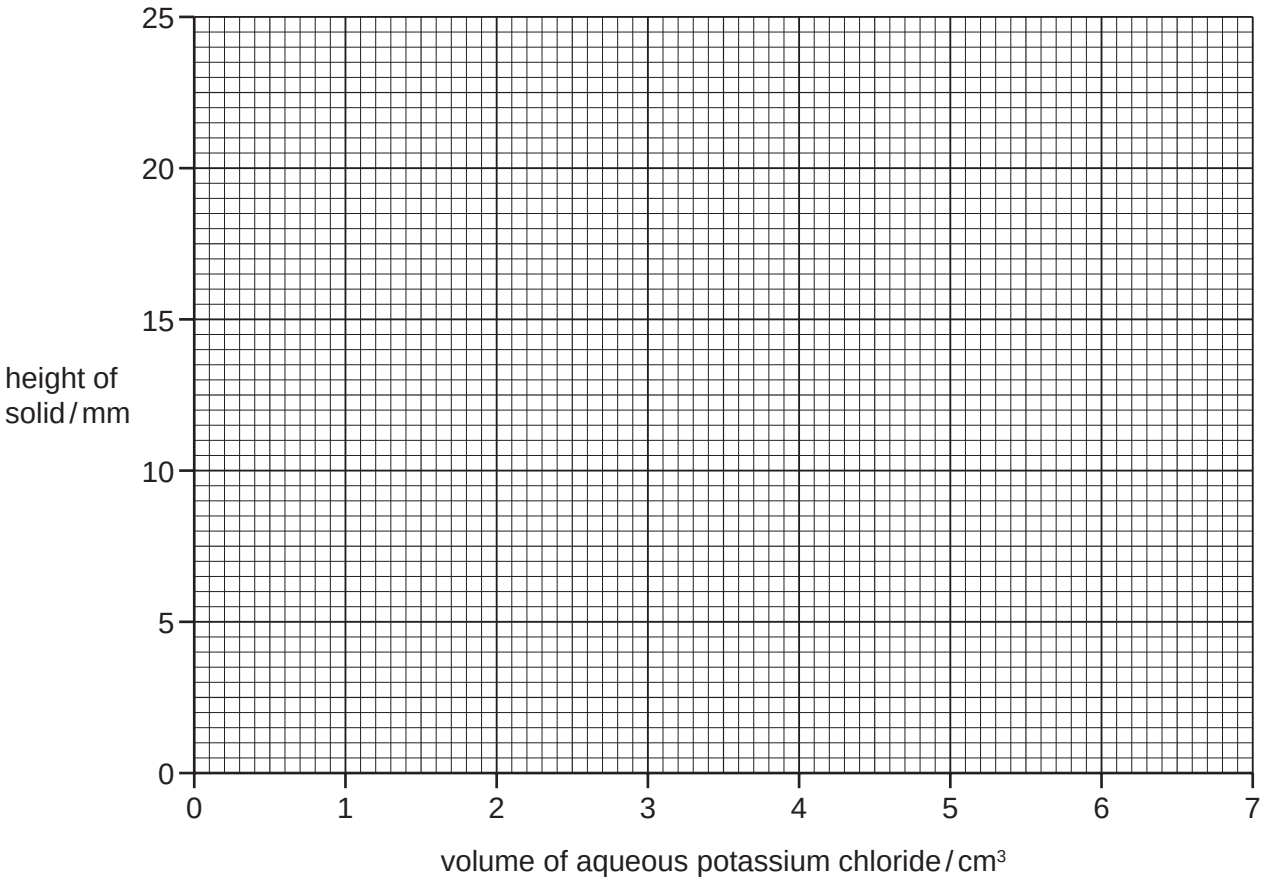


test-tube number	volume of aqueous potassium chloride / cm^3	height of solid / mm
A		
B		
C		
D		
E		
F		

[4]

For Examiner's Use

(b) Plot your results on the grid below. Draw two intersecting straight line graphs.



[4]

(c) **From your graph**, find the height of the solid formed when 3.5 cm^3 of aqueous potassium chloride was added to 3 cm^3 of aqueous lead nitrate.
Show clearly **on the graph** how you obtained your answer.

..... [3]

(d) What type of chemical reaction occurs when aqueous potassium chloride reacts with aqueous lead nitrate?

..... [1]

(e) **(i)** Compare the heights of the solids in test-tubes E and F.

..... [1]

(ii) Suggest an explanation for the heights of the solids in **(e)(i)**.

.....

..... [1]

(f) Predict what would happen if the experiment were continued using three further test-tubes with 8 cm^3, 9 cm^3 and 10 cm^3 of aqueous potassium chloride. Explain your answer.

.....

.....

..... [2]

(g) What difference would be observed if the experiment was repeated using aqueous silver nitrate and aqueous potassium iodide?

.....

..... [1]

(h) Explain **one** improvement the student could make to the experiment to obtain more accurate results.

improvement .....

explanation .....

..... [2]

[Total: 19]

5 Solid **W** was analysed. **W** was a carbonate salt.
The tests on solid **W**, and some of the observations, are in the following table. Complete the observations in the table.
Do not write any conclusions in the table.

tests	observations
<u>tests on solid **W**</u> **(a)** Appearance of solid **W**.	white solid
(b) Solid **W** was heated.	gas evolved formed a white solid at the top of the test-tube
The gas given off was tested with damp red litmus paper.	litmus paper turned blue
(c) Dilute hydrochloric acid was added to solid **W**.	.....
The gas given off was tested.	.... [3]
(d) Dilute sodium hydroxide was added to solid **W** and the mixture heated.	pungent gas given off
The gas given off was tested with damp pH indicator paper.	pH of gas = 10

(e) Identify the gas given off in test **(d)**.

..... [1]

(f) What conclusions can you draw about solid **W**?

..... [2]

[Total: 6]

6

For Examiner's Use

STOP RUST!

Solutions of chemicals known as corrosion inhibitors are added to the water in steel radiators to reduce rust.
You are provided with three different bottles of liquid corrosion inhibitors, **R**, **S** and **T**, and some steel nails.
Plan an experiment to test if these inhibitors prevent the corrosion of steel and which of these inhibitors is the most effective.

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.....

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..... [7]

[Total: 7]