UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

2666903188

CHEMISTRY **0620/61**

Paper 6 Alternative to Practical **October/November 2011**

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.

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1	
2	
3	
4	
5	
6	
Total	

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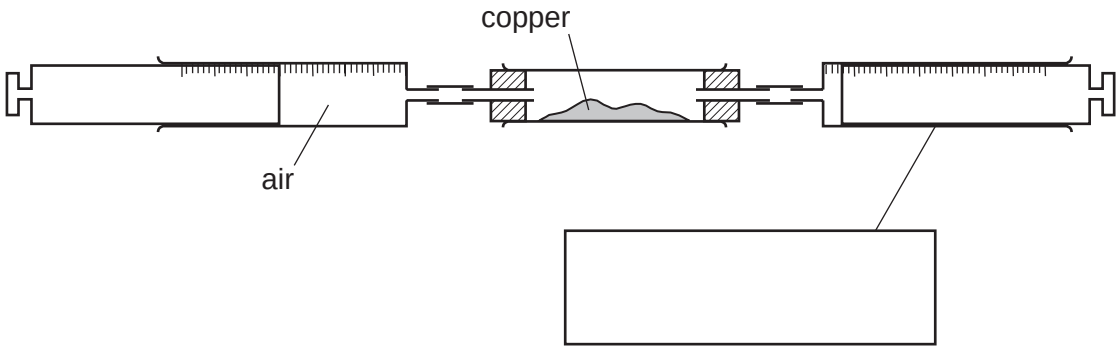
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1 A student investigated the reaction of air with copper. 100 cm^3 of air was passed continuously over heated copper using the apparatus below. When the volume remained constant, the apparatus was left to cool and the volume of gas was measured.



(a) **(i)** Complete the box to show the apparatus labelled. [1]

(ii) Indicate on the diagram, with an arrow, where heat is applied. [1]

(b) What should be used to transfer the copper from a bottle to the apparatus?

..... [1]

(c) The copper changed colour from brown to ..... [1]

(d) Why was the apparatus left to cool before measuring the final volume of gas?

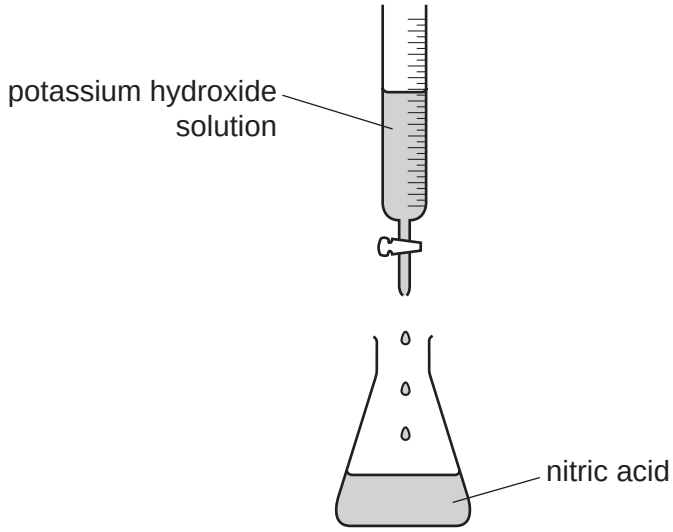
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..... [2]

[Total: 6]

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2 A student prepared a sample of potassium nitrate by neutralising nitric acid using potassium hydroxide solution.
25.0 cm^3 of nitric acid was poured into a conical flask. Potassium hydroxide was added a little at a time from a burette as shown below.



After each addition of potassium hydroxide solution the pH was measured with a pH meter and the values recorded in the table of results.

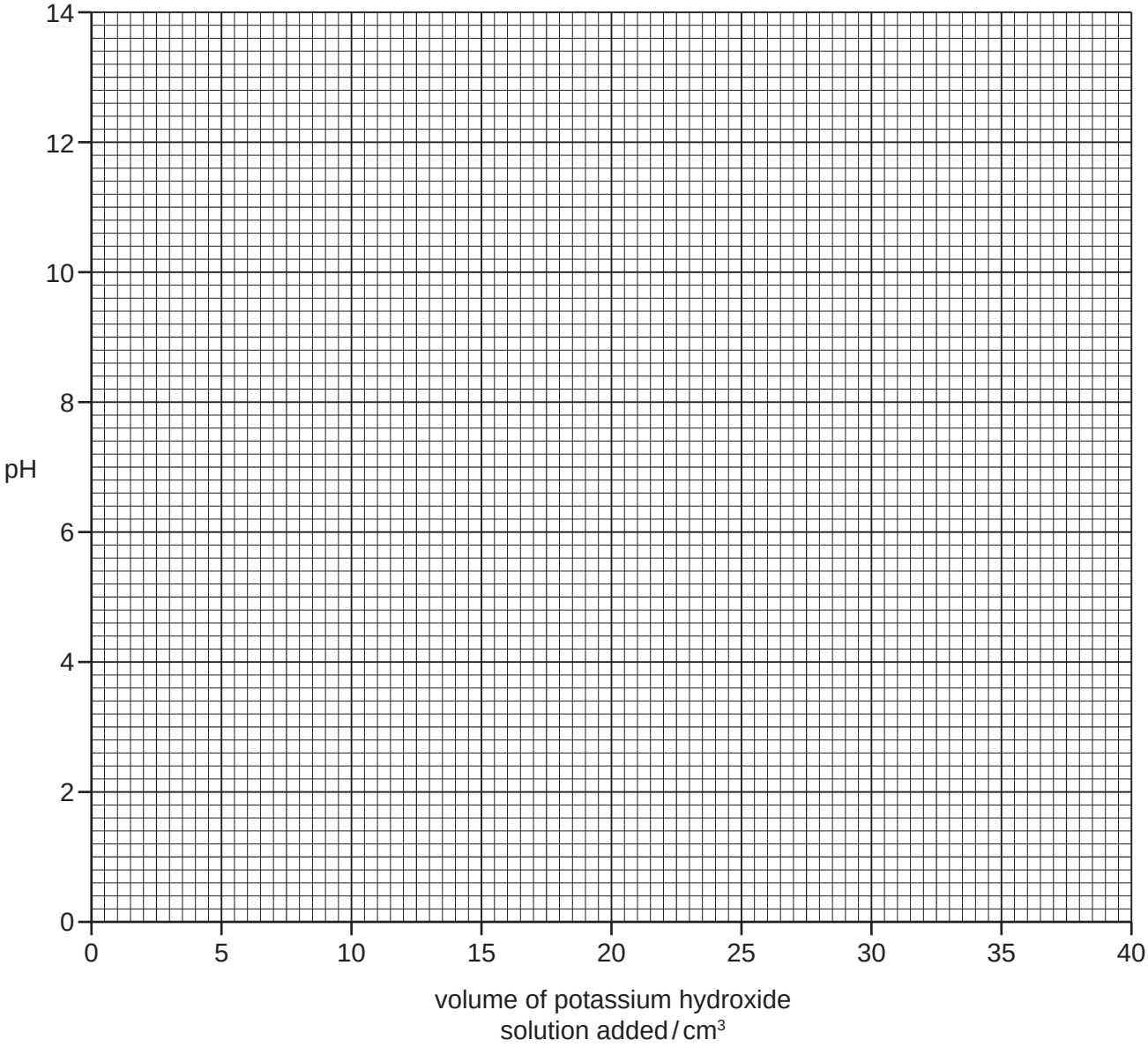
volume of potassium hydroxide solution added / cm^3	pH value
5.0	1.2
10.0	1.4
15.0	2.6
20.0	2.0
24.0	2.7
24.5	3.0
25.5	11.0
26.0	11.3
30.0	12.0
40.0	13.2

You are going to draw a graph to find the volume of potassium hydroxide solution required to neutralise the 25.0 cm^3 of nitric acid.

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



[3]

(b) Which point appears to be inaccurate?

..... [1]

(c) **(i)** **Use your graph** to find the pH of the solution when 35.0 cm^3 of potassium hydroxide was added.

..... [1]

(ii) **Use your graph** to find the pH of 25.0 cm^3 of nitric acid.

Show clearly **on the grid** how you obtained your answer.

..... [2]

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(d) (i) What is the pH of the solution when all of the nitric acid has just been neutralised?

..... [1]

(ii) What volume of potassium hydroxide was required to neutralise 25.0 cm^3 of nitric acid?

..... [1]

(e) Describe how the student should modify the experiment to obtain pure crystals of potassium nitrate.

.....

.....

.....

.....

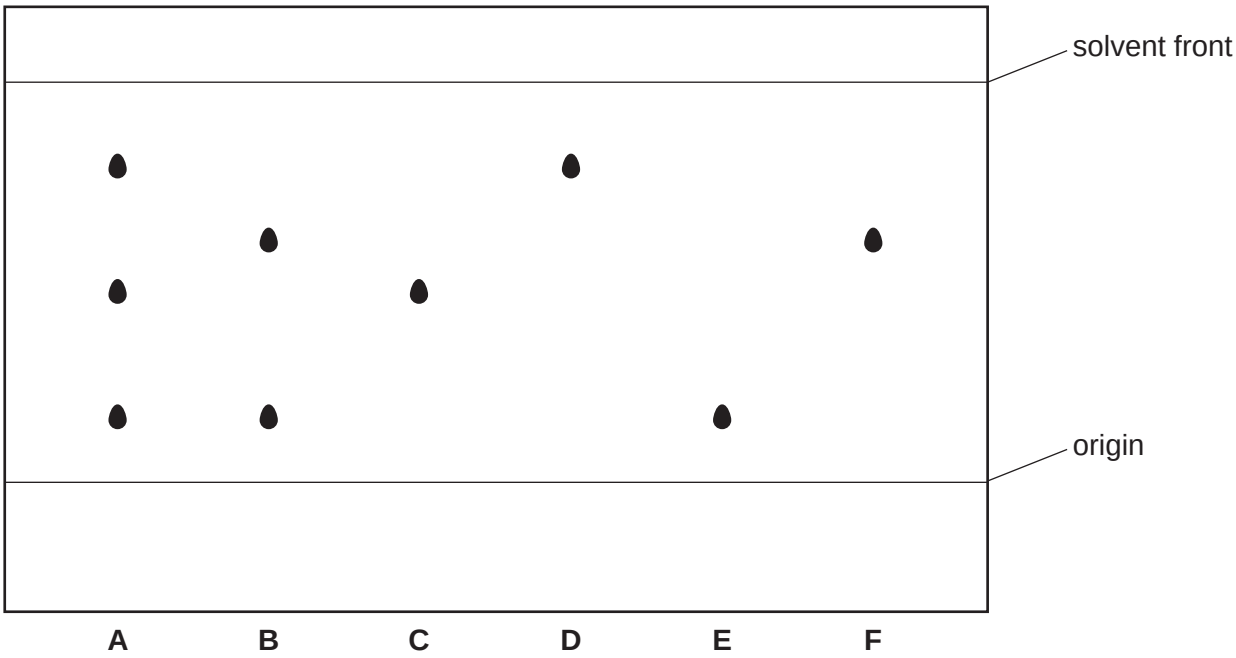
..... [3]

[Total: 12]

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3 The diagram shows the results of an experiment to separate and identify the colours present in two coloured mixtures, **A** and **B**.
Substances **C**, **D**, **E** and **F** are single colours.



(a) Name this method of separation.

..... [1]

(b) Draw a line **on the diagram** to show the level of the solvent at the beginning of the experiment. [1]

(c) Why should a pencil be used instead of a pen to draw the origin line?

.....

..... [1]

(d) State **one** difference and **one** similarity between the coloured mixtures, **A** and **B**.

difference .....

.....

similarity .....

..... [2]

(e) Which substances are present in mixture **A**?

..... [1]

[Total: 6]

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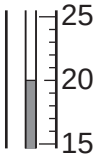
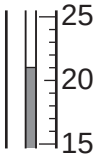
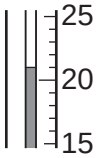
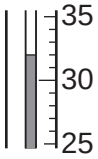
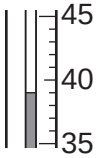
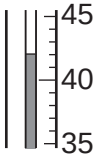
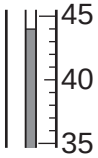
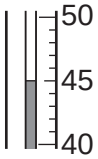
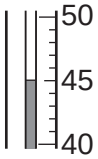
4 A student investigated the reaction between aqueous copper(II) sulfate and two different metals, zinc and iron.
Two experiments were carried out.

Experiment 1
Using a measuring cylinder, 25 cm^3 of aqueous copper(II) sulfate was poured into a polystyrene cup. The temperature of the solution was measured. The timer was started and the temperature was measured every half a minute for one minute.

At 1 minute, 5 g of zinc powder was added to the cup and the mixture stirred with the thermometer. The temperature of the mixture was measured every half minute for an additional three minutes.

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(a) Use the thermometer diagrams in the table to record the temperatures.

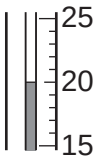
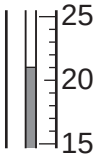
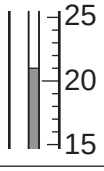
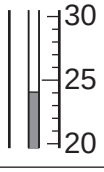
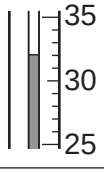
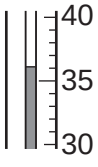
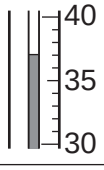
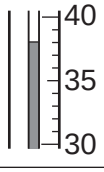
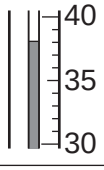
time / min	thermometer diagrams	temperature / °C
0.0		
0.5		
1.0		
1.5		
2.0		
2.5		
3.0		
3.5		
4.0		

[3]

Experiment 2

Experiment 1 was repeated using 5 g of iron powder instead of the zinc powder.

(b) Use the thermometer diagrams in the table to record the temperatures.

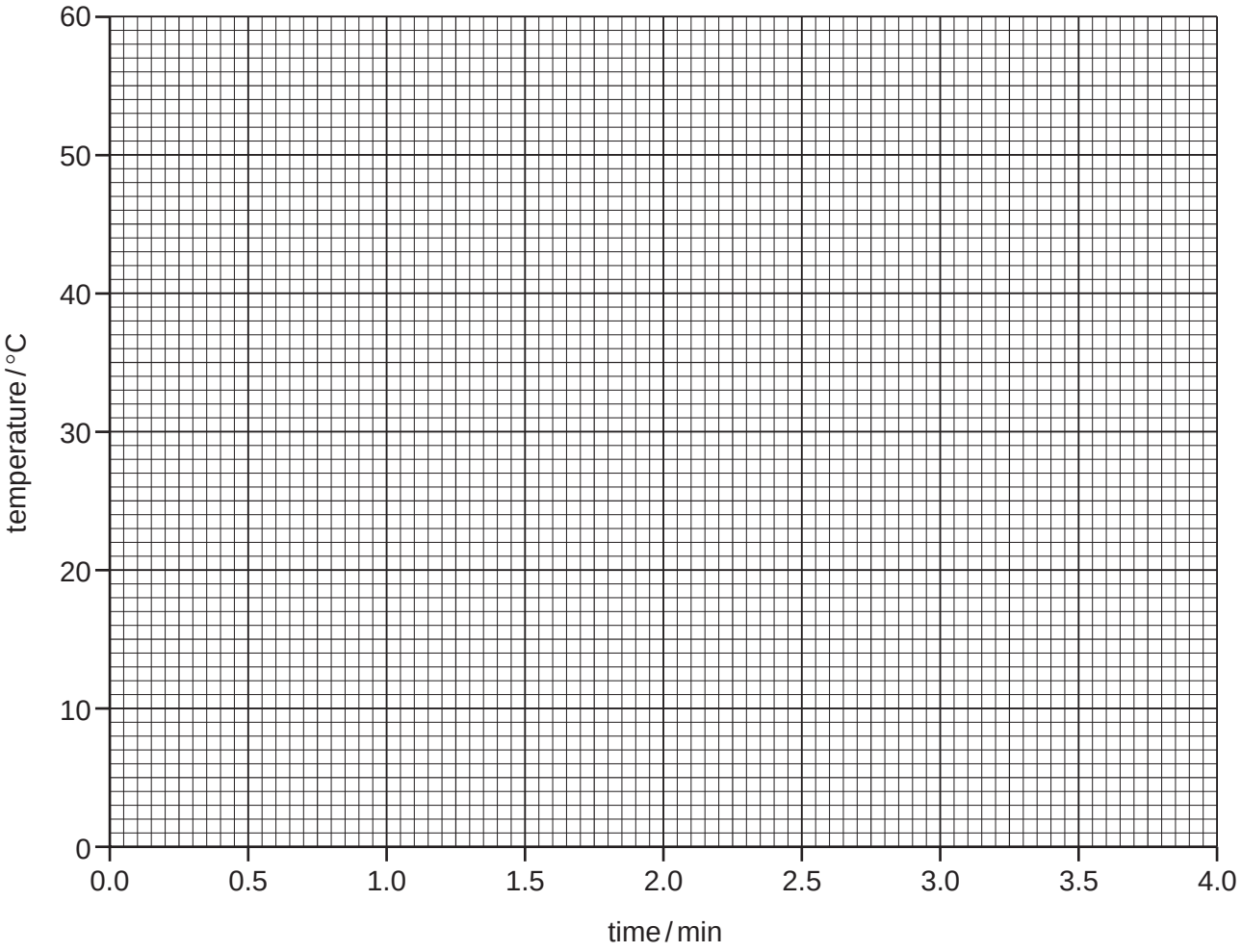
time / min	thermometer diagrams	temperature / °C
0.0		
0.5		
1.0		
1.5		
2.0		
2.5		
3.0		
3.5		
4.0		

[3]

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(c) Plot the results of both experiments on the grid below. Draw two smooth line graphs. Clearly label your graphs.



[5]

(d) **From your graph**, work out the temperature of the reaction mixture in Experiment 1 after 1 minute 15 seconds. Show clearly **on the graph** how you worked out your answer.

..... [3]

(e) What type of chemical process occurs when zinc and iron react with aqueous copper(II) sulfate?

..... [1]

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[Turn over

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(f) **(i)** Compare the temperature changes in Experiments 1 and 2.

..... [1]

(ii) Suggest an explanation for the difference in temperature changes.

.....

..... [1]

(g) Explain how the temperature changes would differ in the experiments if 12.5 cm^3 of copper(II) sulfate solution were used.

.....

.....

..... [2]

(h) Predict the effect of using lumps of zinc in Experiment 1. Explain your answer.

.....

..... [2]

[Total: 21]

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5 Three different liquids **P**, **Q** and **R** were analysed.
P was an aqueous solution of sulfuric acid.
The tests on the liquids and some of the observations are in the following table.
Complete the observations in the table.

tests	observations
(a) (i) Appearance of the liquids.	**P** ..... [1] **Q** colourless, smell of vinegar **R** colourless, no smell
(ii) The pH of the liquids was tested using Universal Indicator paper.	**P** ..... [1] **Q** pH 5 **R** pH 7
(b) A piece of magnesium ribbon was added to a little of each liquid. The gas given off by liquid **P** was tested.	**P** .... [2] **Q** slow effervescence **R** no reaction
(c) To a little of liquid **P**, hydrochloric acid and aqueous barium chloride were added.	..... [2]
(d) Liquid **R** was heated to boiling in a test-tube. A thermometer was used to record the constant temperature of the vapour produced.	temperature = 100 °C

(e) What conclusions can you draw about liquid **Q**?

..... [2]

(f) Identify liquid **R**.

..... [1]

[Total: 9]

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6 Seawater contains sodium chloride and other salts.
Plan an experiment to find the mass of salts in 1 dm^3 of seawater.
You will be provided with a small bottle of seawater.
You should include details of the method and any apparatus used.
(1 dm^3 = 1000 cm^3)

.....

.....

.....

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.....

.....

..... [6]

[Total: 6]

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