UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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| CANDIDATE NAME | |
| CENTRE NUMBER | |
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*4271923629*

**CHEMISTRY** **0620/63**

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.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| Total | |

This document consists of **10** printed pages and **2** blank pages.

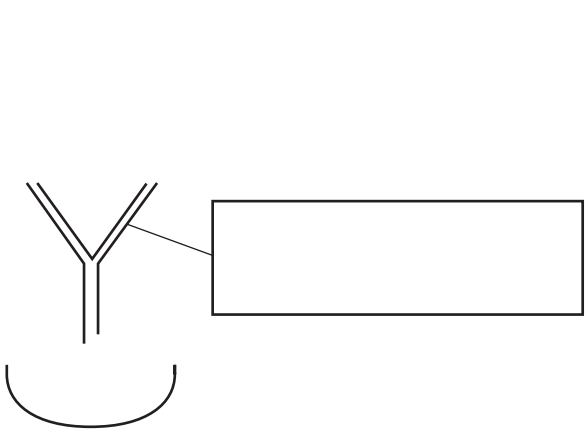

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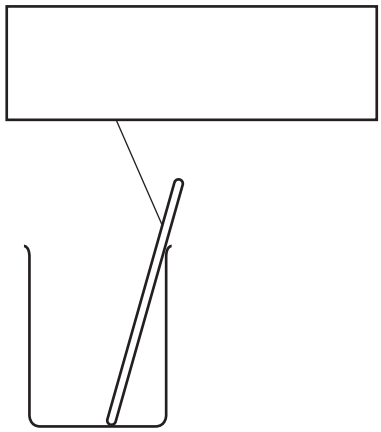
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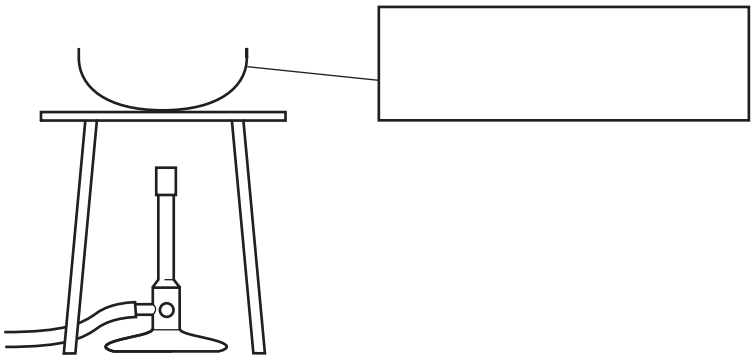
**1** Three sets of apparatus, **A**, **B** and **C**, are shown below.



**A**



**B**



**C**

**(a)** Complete the empty boxes to name the pieces of apparatus. [3]

**(b)** What name is given to the separation method in **A**?

..... [1]

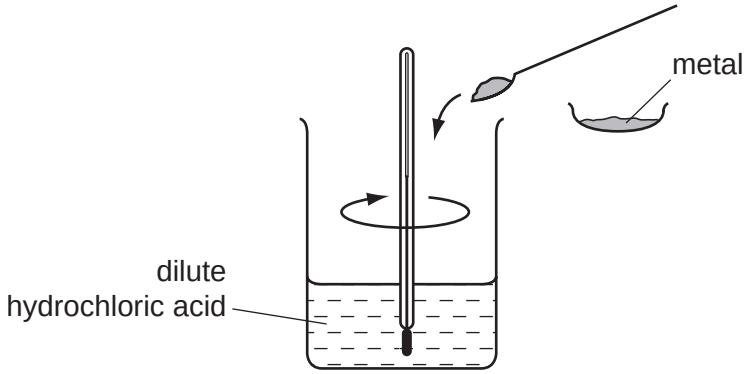
**(c)** Which apparatus would be most suitable to obtain crystals from an aqueous solution of copper sulfate?

..... [1]

[Total: 5]

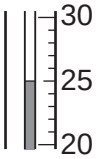
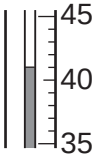
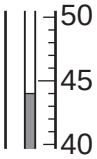
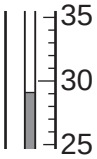
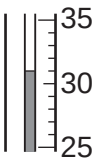
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**2** A student investigated the temperature changes when metals are added to excess dilute hydrochloric acid using the apparatus shown.




The five metals used were copper, magnesium, calcium, iron and zinc.
0.5 g of each metal was added to 25 $cm^3$ of hydrochloric acid and the highest temperature reached was measured.
In each experiment the initial temperature of the acid was 25 °C.

**(a)** Use the thermometer diagrams to record the highest temperatures in the table.
Complete the table by calculating the temperature rises.

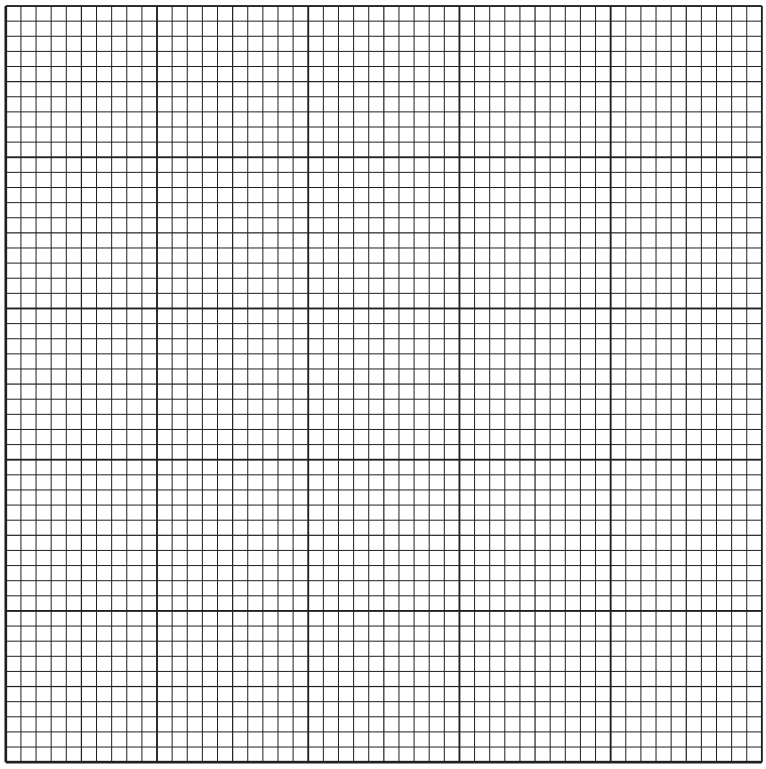
| metals | thermometer diagrams | highest temperature / °C | temperature rise / °C |
|---|---|---|---|
| copper |   | | |
| magnesium |   | | |
| calcium |   | | |
| iron |   | | |
| zinc |   | | |

[4]

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**(b)** Draw a labelled bar chart to show the results of the experiments.

temperature rise / °C



[4]

**(c)** **(i)** Which metal reacted with the hydrochloric acid to produce the largest temperature rise?

..... [1]

**(ii)** State and explain the result obtained for copper.

.....

..... [2]

**(d)** Use the results to place the metals in order of increasing reactivity.

least reactive metal ⟶ most reactive metal

| | | | | |
|---|---|---|---|---|
| | | | | |

[2]

**(e)** Predict the effect on the temperature changes if the experiments were repeated using 50 $cm^3$ of the dilute hydrochloric acid. Explain your answer.

.....

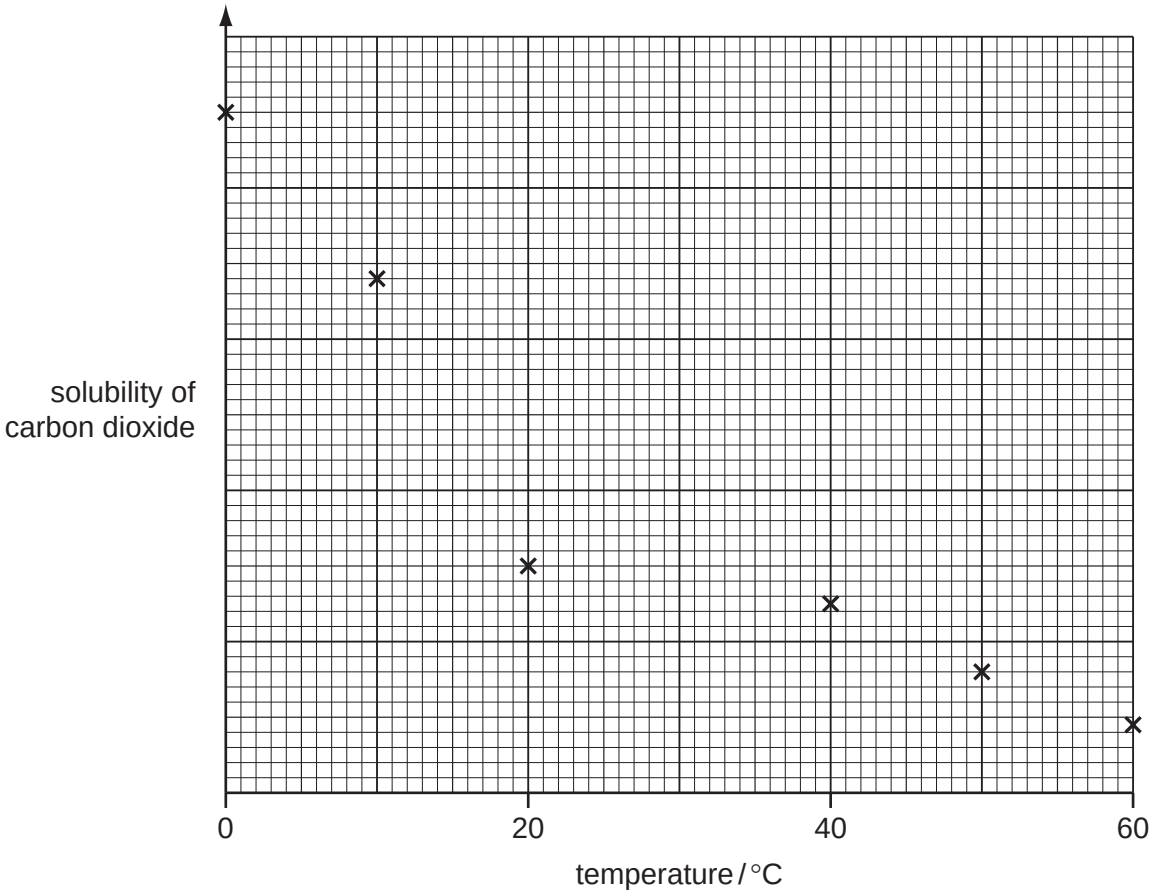
..... [2]

[Total: 15]

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**3** The solubility of carbon dioxide gas in water varies with temperature.
A student used a data book to plot the solubility of carbon dioxide in water at different temperatures on the grid below.




**(a)** Draw a smooth curve through the points. [1]

**(b)** Which point appears to have been incorrectly plotted?

..... [1]

**(c)** What is the effect of increasing the temperature on the solubility of carbon dioxide in water?

..... [1]

**(d)** Nitrogen is less soluble in water than carbon dioxide. On the grid, sketch a graph to represent the solubility of nitrogen. [1]

[Total: 4]

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**Question 4 starts on the next page.**

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**4** A student investigated the reaction between dilute sulfuric acid and three aqueous solutions of sodium hydroxide of different concentrations, labelled **A**, **B** and **C**.

Three experiments were carried out.

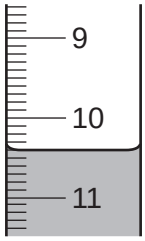
*Experiment 1*

A burette was filled up to the 0.0 $cm^3$ mark with dilute sulfuric acid.

Using a measuring cylinder, 20 $cm^3$ of solution **A** was poured into a conical flask with a few drops of phenolphthalein indicator.

The sulfuric acid was added to the flask, until the colour of the phenolphthalein changed.

**(a)** Use the burette diagram to record the final volume in the table.

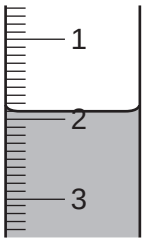



final reading

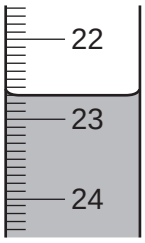
*Experiment 2*

Experiment 1 was repeated using solution **B**.

**(b)** Use the burette diagrams to record the volumes in the table.




initial reading

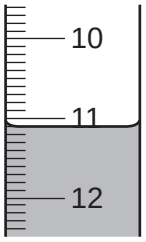



final reading

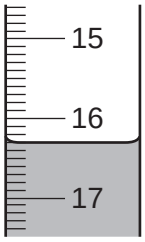
*Experiment 3*

Experiment 2 was repeated using solution **C** instead of solution **B**.

**(c)** Use the burette diagrams to record the volumes in the table and complete the table.




initial reading




final reading

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| | burette readings / $cm^3$ | | |
|---|---|---|---|
| | experiment 1 | experiment 2 | experiment 3 |
| final reading | | | |
| initial reading | | | |
| difference | | | |

[4]

**(d)** What permanent colour change was observed after the sulfuric acid was added to the flask?

from ..... to ..... [2]

**(e)** What type of chemical reaction occurs when sulfuric acid reacts with sodium hydroxide?

..... [1]

**(f)** **(i)** Complete the sentences below.

Aqueous sodium hydroxide labelled ..... needed the smallest volume of sulfuric acid to change the colour of the phenolphthalein.

Aqueous sodium hydroxide labelled ..... needed the largest volume of sulfuric acid to change the colour of the phenolphthalein. [1]

**(ii)** The order of concentration of the solutions of sodium hydroxide is

least concentrated ⟶ most concentrated

[2]

**(g)** Compare the volumes of sulfuric acid used in Experiments 1 and 2.

..... [1]

**(h)** If Experiment 3 was repeated using 40 $cm^3$ of solution **C**, what volume of sulfuric acid would be used?

..... [2]

**(i)** What would be a more accurate method of measuring the volume of the aqueous sodium hydroxide?

..... [1]

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**(j)** What would be the effect on the results if the solutions of sodium hydroxide were warmed before adding the sulfuric acid? Give a reason for your answer.

effect on results .....

reason ..... [2]

**(k)** Suggest a **different** method of finding the order of concentrations of the solutions of sodium hydroxide.

.....

.....

.....

.....

..... [3]

[Total: 19]

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**5** Two different salts, **D** and **E**, were analysed.
**D** was an aqueous solution of iron(III) chloride and **E** was a solid.
The tests on the salts and some of the observations are in the following table.
Complete the observations in the table.

| tests | observations |
|---|---|
| **(a) (i)** Appearance of solution **D**. | ..... [1] |
| **(ii)** Appearance of solid **E**. | white crystals |
| <u>tests on solution **D**</u> | |
| **(b)** The solution was divided into four equal portions in test-tubes, and the following tests carried out. | |
| **(i)** Dilute hydrochloric acid was added to the first portion of the solution and then aqueous barium chloride. | ..... [1] |
| **(ii)** Dilute nitric acid was added to the second portion and then aqueous silver nitrate. | ..... [2] |
| **(iii)** An excess of aqueous sodium hydroxide was added to the third portion of the solution. | ..... [2] |
| **(iv)** An excess of aqueous ammonia was added to the fourth portion. | ..... [1] |
| <u>tests on solid **E**</u> | |
| **(c) (i)** Solid **E** was heated in a test-tube. The gas given off was tested. | limewater turned milky |
| **(ii)** Dilute nitric acid was added to solid **E** in a test-tube. | rapid effervescence, limewater turned milky |

**(d)** Identify the gas given off in tests **(c)(i)** and **(c)(ii)**.

..... [1]

**(e)** What conclusions can you draw about solid **E**?

.....

..... [2]

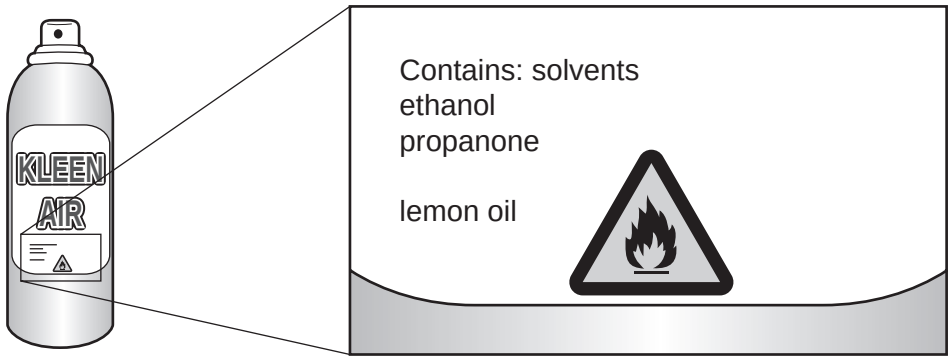
[Total: 10]

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**[Turn over**

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**6** The label on an aerosol can of Kleen Air air freshener is shown.




**(a)** What is meant by the term *solvent*?

..... [1]

**(b)** What does the hazard sign indicate?

..... [1]

**(c)** What method could be used to obtain ethanol (boiling point 78 °C) from a mixture of ethanol and propanone (boiling point 56 °C)?

..... [1]

**(d)** Describe an experiment to investigate the number of coloured substances present in a sample of the lemon oil obtained from Kleen Air.

.....

.....

.....

.....

.....

..... [4]

[Total: 7]

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