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9389523754

CHEMISTRY **0620/61**

Paper 6 Alternative to Practical **October/November 2020**

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Blank pages are indicated.

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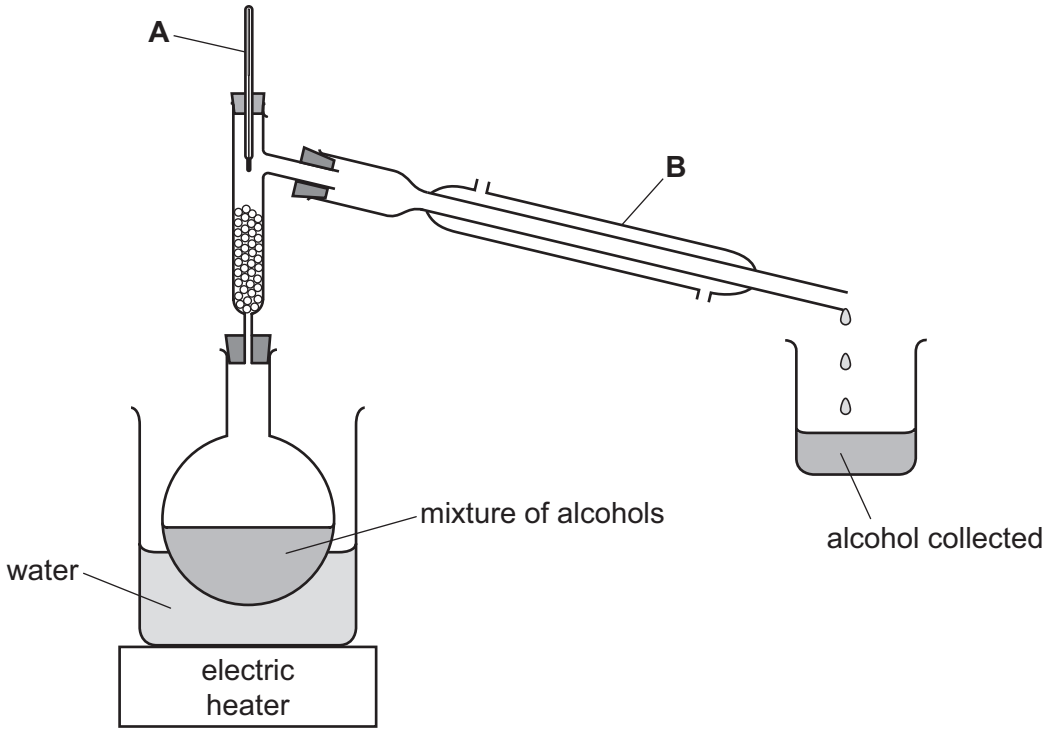
1 The table gives the boiling points of four alcohols.

alcohol	boiling point / °C
butanol	117
ethanol	79
pentanol	138
propanol	97

The apparatus shown can be used to obtain propanol from a mixture containing butanol, ethanol, pentanol and propanol.



(a) Name the items of apparatus labelled **A** and **B**.

A .....

B .....
[2]

(b) Name this method of separation.

..... [2]

(c) Explain why it is safer to heat the mixture of alcohols in the way shown rather than with a Bunsen burner.

..... [1]

[Turn over

(d) Describe how propanol can be obtained from the mixture. Use data from the table.

.....

.....

..... [2]

(e) Explain why the apparatus in the diagram **cannot** be used to obtain butanol from the mixture.

.....

..... [1]

[Total: 8]

2 A student investigated the mass of lead(II) iodide precipitate formed when aqueous potassium iodide reacts with aqueous lead(II) nitrate.

The equation for the reaction is shown.

$$2KI(aq) + Pb(NO_3)_2(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$$

The student did seven experiments.

Experiment 1

- Using a 50 cm^3 measuring cylinder, 25 cm^3 of aqueous potassium iodide was poured into a beaker.
- Using a clean 50 cm^3 measuring cylinder, 10 cm^3 of aqueous lead(II) nitrate was added to the aqueous potassium iodide in the beaker. The solutions were mixed together.
- The mass of the precipitate of lead(II) iodide formed was found.

Experiment 2

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 1.

Experiment 3

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 2.

Experiment 4

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 3.

Experiment 5

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 4.

Experiment 6

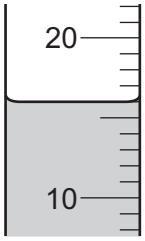
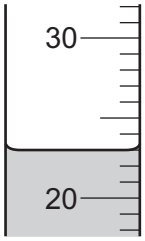
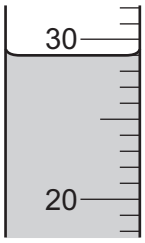
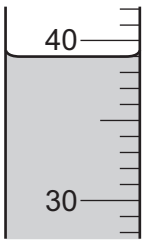
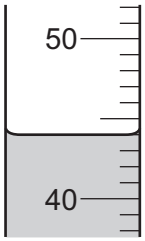
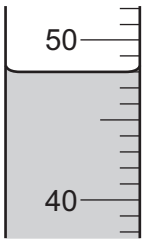
- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 5.

Experiment 7

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 6.

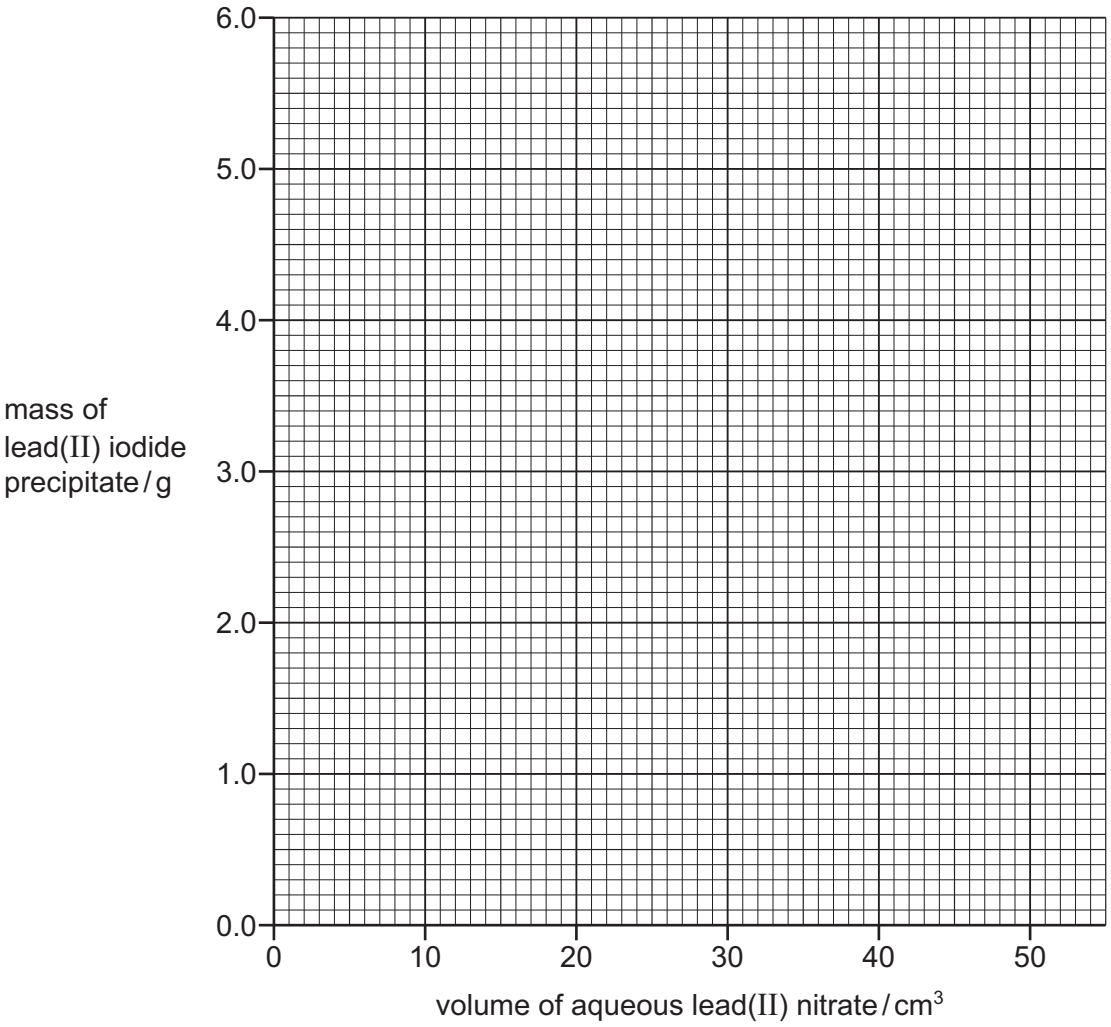
[Turn over

(a) Use the measuring cylinder diagrams to complete the table.

experiment	volume of aqueous potassium iodide / cm^3	measuring cylinder diagram for aqueous lead(II) nitrate	volume of aqueous lead(II) nitrate / cm^3	mass of lead(II) iodide precipitate / g
1	25		10	1.4
2	25			2.3
3	25			3.3
4	25			4.1
5	25			5.1
6	25			5.1
7	25			5.1

[2]

(b) Plot the results from Experiments 1 to 7 on the grid. Draw two straight lines through the points. Extend your straight lines so that they meet.



[5]

(c) **From your graph**, deduce the mass of lead(II) iodide precipitate that would be formed if Experiment 1 was repeated using 20 cm^3 of aqueous lead(II) nitrate.

Show clearly **on the grid** how you worked out your answer.

mass = ... g [2]

(d) Explain why the same mass of precipitate is formed in Experiment 5, Experiment 6 and Experiment 7.

.....

..... [1]

(e) Sketch **on the grid** the graph you would expect if all of the experiments were repeated using aqueous potassium iodide with half the concentration. [2]

(f) **(i)** State why using a 25.0 cm^3 pipette to measure the volume of aqueous potassium iodide would be an improvement.

.....

..... [1]

(ii) State why a 25.0 cm^3 pipette could **not** be used to measure the volume of aqueous lead(II) nitrate in each experiment.

.....

..... [1]

(g) Describe how the solid lead(II) iodide can be separated from the reaction mixture and its mass found.

.....

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.....

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..... [3]

[Total: 17]

3 Solid **Y** and solid **Z** were analysed.
Tests were done on each solid.

tests on solid **Y**	observations
Solid **Y** was dissolved in distilled water to form solution **Y**. Solution **Y** was divided into four portions in four boiling tubes. **test 1** Aqueous ammonia was added dropwise and then in excess to the first portion of solution **Y**.	a white precipitate formed which was insoluble in excess
test 2 Aqueous sodium hydroxide was added dropwise and then in excess to the second portion of solution **Y**.	a white precipitate formed which dissolved in excess to form a colourless solution
test 3 A piece of aluminium foil was added to the solution formed in **test 2**. The mixture was warmed and any gas given off was tested.	the gas turned damp red litmus paper blue
test 4 About 1 cm^3 of dilute nitric acid and a few drops of aqueous silver nitrate were added to the third portion of solution **Y**.	the solution remained colourless, no precipitate formed

(a) Name the gas given off in **test 3**.

..... [1]

(b) Identify solid **Y**.

.....

..... [2]

(c) A strip of universal indicator paper was dipped into the fourth portion of solution **Y**.
The universal indicator paper turned orange.

What additional information does this give about solution **Y**?

..... [1]

tests on solid Z

Solid **Z** was iron(II) sulfate.

Complete the expected observations.

Solid **Z** was dissolved in water to produce solution **Z**. Solution **Z** was split into three equal portions in three boiling tubes.

(d) Aqueous ammonia was added dropwise and then in excess to the first portion of solution **Z**.

observations .....

.....

..... [2]

(e) About 2 cm^3 of dilute hydrochloric acid was added to the second portion of solution **Z**.

observations ..... [1]

(f) The solution from **(e)** was warmed and a piece of filter paper soaked in acidified aqueous potassium manganate(VII) was held at the mouth of the boiling tube.

observations ..... [1]

(g) About 1 cm^3 of dilute nitric acid followed by a few drops of aqueous barium nitrate were added to the third portion of solution **Z**.

observations ..... [1]

[Total: 9]

4 A mixture contains three solid compounds:

- copper(II) sulfate
- cetyl alcohol
- silicon dioxide.

The table gives some information on the solubility of these three solids.

name of compound	solubility in water	solubility in propanone
copper(II) sulfate	soluble	insoluble
cetyl alcohol	insoluble	soluble
silicon dioxide	insoluble	insoluble

Plan a method to obtain a pure sample of each of the three solids, copper(II) sulfate, cetyl alcohol and silicon dioxide, from the mixture.

You have access to normal laboratory apparatus.

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..... [6]

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