Topical Past Paper Questions Workbook

IGCSE Chemistry (0620) Paper 6

[Alternative to Practical]

Exam Series: May 2012 – March 2022

Format Type A:
Answers to questions are provided as an appendix

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Introduction

Each topical past paper questions workbook consists of hundreds of questions and their answer schemes, in the form of worksheets. Questions are assigned to each chapter according to their corresponding topic. Topics, in turn, are based on the items of the latest Cambridge IGCSE or AS/A level syllabus content. This book's specifications are as follows:

Title: IGCSE Chemistry (0620) Paper 6 Topical Past Paper Questions Workbook
Subtitle: Exam Practice Worksheets With Answer Scheme
Examination board: Cambridge Assessment International Education (CAIE)
Format Type A: answers to questions are provided as an appendix at the back of the e-book
Subject code: 0620
Years covered: May 2012 – March 2022
Paper: 6 (Alternative to practical)
Number of pages: 769
Number of questions: 330

Contents

Chapter 1

Experimental techniques

1.1 Measurement

1. 0620_m22_qp_62 Q: 4

Fizzy drinks contain carbon dioxide gas dissolved in a liquid. The carbon dioxide gas can be removed from the fizzy drink by heating.

Plan an investigation to find the volume of carbon dioxide gas in 1 dm^3 of a fizzy drink.
Include in your answer how you will calculate the volume of carbon dioxide gas dissolved in 1 dm^3 of a fizzy drink.

You are provided with a small sample (less than 1 dm^3) of the fizzy drink and common laboratory apparatus.
(1 dm^3 = 1000 cm^3)

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2. 0620_s15_qp_63 Q: 6

Methane hydrate is ice which contains trapped methane gas. Methane is released when the ice melts and is a useful fuel.
Plan an investigation to find the volume of methane gas trapped in 1 kg of this ice.
You are provided with a lump of the ice weighing between 100 g and 200 g and common laboratory apparatus.
You may include a diagram in your answer.

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..... [6]

[Total: 6]

3. 0620_s20_qp_63 Q: 2

A student investigated the temperature change when aqueous sodium hydroxide neutralises dilute hydrochloric acid. The equation for the reaction is shown.

$$NaOH + HCl \rightarrow NaCl + H_2O$$

Eight experiments were done.

Experiment 1
- A polystyrene cup was placed into a 250 cm^3 beaker for support.
- Using a measuring cylinder, 5 cm^3 of aqueous sodium hydroxide was poured into the polystyrene cup.
- Using a measuring cylinder, 45 cm^3 of dilute hydrochloric acid was poured into the polystyrene cup.
- The mixture was stirred and the maximum temperature reached was measured using a thermometer.
- The polystyrene cup was rinsed with distilled water.

Experiment 2
- Experiment 1 was repeated using 10 cm^3 of aqueous sodium hydroxide and 40 cm^3 of dilute hydrochloric acid.

Experiment 3
- Experiment 1 was repeated using 15 cm^3 of aqueous sodium hydroxide and 35 cm^3 of dilute hydrochloric acid.

Experiment 4
- Experiment 1 was repeated using 20 cm^3 of aqueous sodium hydroxide and 30 cm^3 of dilute hydrochloric acid.

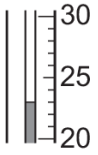
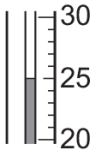
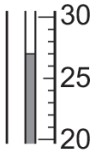
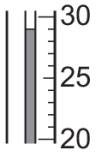
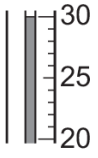
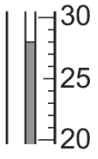
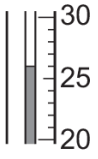
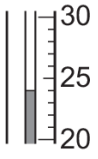
Experiment 5
- Experiment 1 was repeated using 30 cm^3 of aqueous sodium hydroxide and 20 cm^3 of dilute hydrochloric acid.

Experiment 6
- Experiment 1 was repeated using 35 cm^3 of aqueous sodium hydroxide and 15 cm^3 of dilute hydrochloric acid.

Experiment 7
- Experiment 1 was repeated using 40 cm^3 of aqueous sodium hydroxide and 10 cm^3 of dilute hydrochloric acid.

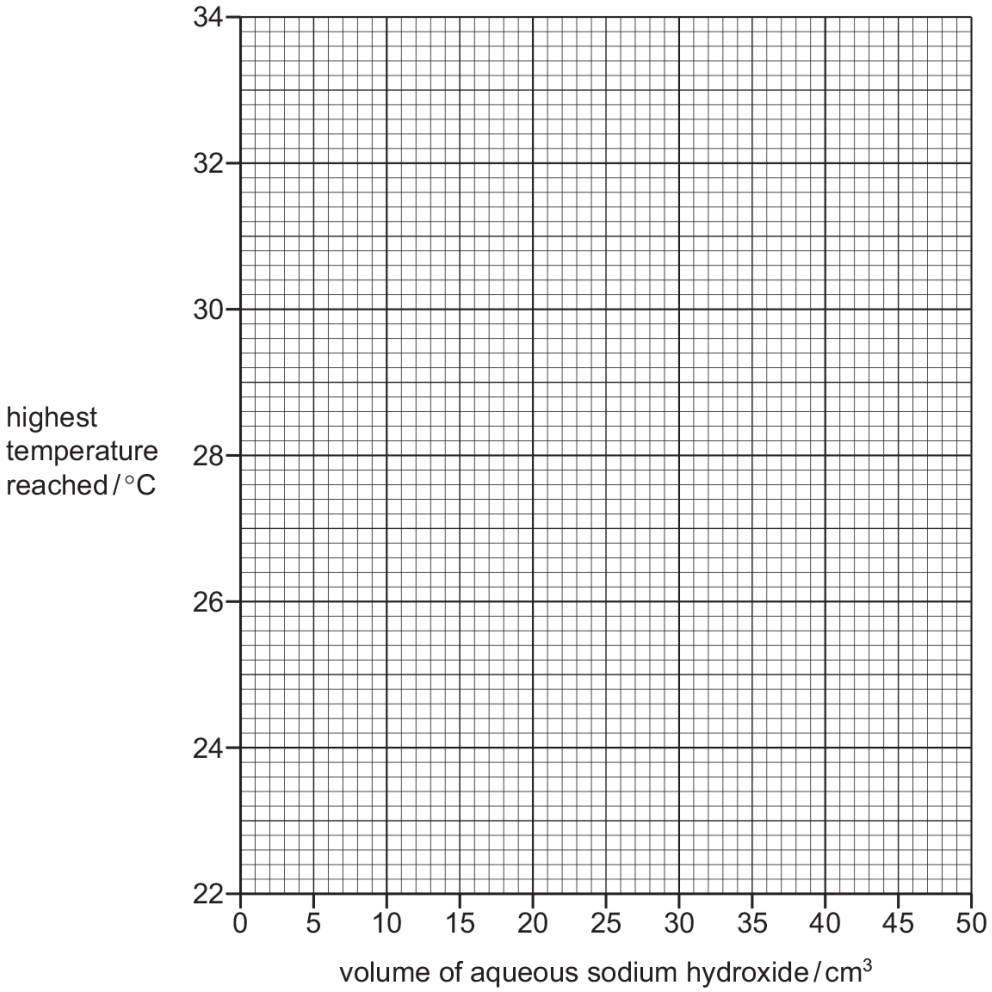
Experiment 8
- Experiment 1 was repeated using 45 cm^3 of aqueous sodium hydroxide and 5 cm^3 of dilute hydrochloric acid.

(a) Use the information in the description of the experiments and the thermometer diagrams to complete the table.

experiment	volume of aqueous sodium hydroxide / cm^3	volume of dilute hydrochloric acid / cm^3	thermometer diagram	highest temperature reached / °C
1	5			
2	10			
3	15			
4	20			
5	30			
6	35			
7	40			
8	45			

[4]

(b) Plot the results from Experiments 1 to 8 on the grid. Draw **two** straight lines through the points. Extend your straight lines so that they cross.



[4]

(c) The point on the graph where the two straight lines cross is where all of the aqueous sodium hydroxide reacts with all of the dilute hydrochloric acid to form a neutral solution.

(i) **Use your graph** to deduce the volume of aqueous sodium hydroxide and the volume of dilute hydrochloric acid that react together to produce a neutral solution.
Show your working **on the grid**.

volume of aqueous sodium hydroxide = ... cm^3

volume of dilute hydrochloric acid = ... cm^3
[3]

(ii) **Use your graph** to determine the highest temperature reached if the volumes in **(c)(i)** were mixed together.

highest temperature reached = ... [2]

(iii) Which solution, aqueous sodium hydroxide or dilute hydrochloric acid, was the most concentrated?
Use your answer to **(c)(i)** to explain why.

most concentrated solution .....

explanation .....

.....
[1]

(d) **On the graph**, sketch the lines you would expect to obtain if a copper can was used instead of a polystyrene cup. [2]

(e) Give **one** advantage and **one** disadvantage of using a burette, instead of a measuring cylinder, to add the dilute hydrochloric acid directly into the polystyrene cup.

advantage .....

.....

disadvantage .....

.....
[2]

(f) How could the reliability of the results of this investigation be checked?

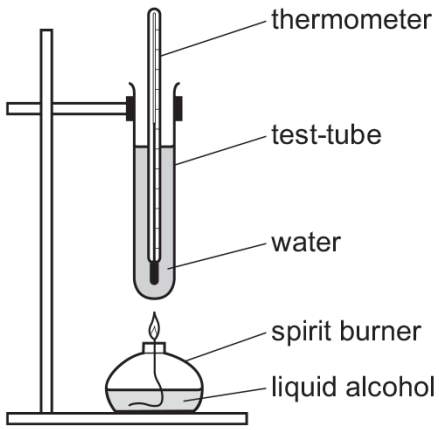
.....

..... [1]

[Total: 19]

4. 0620_s21_qp_63 Q: 4

The energy given out when different liquid alcohols are burned can be compared using the apparatus shown.



Describe how the apparatus shown can be used to compare the amount of energy given out by three different liquid alcohols, ethanol, propanol and butanol. Your answer should include how the results can be used to determine which fuel gives out the most energy.

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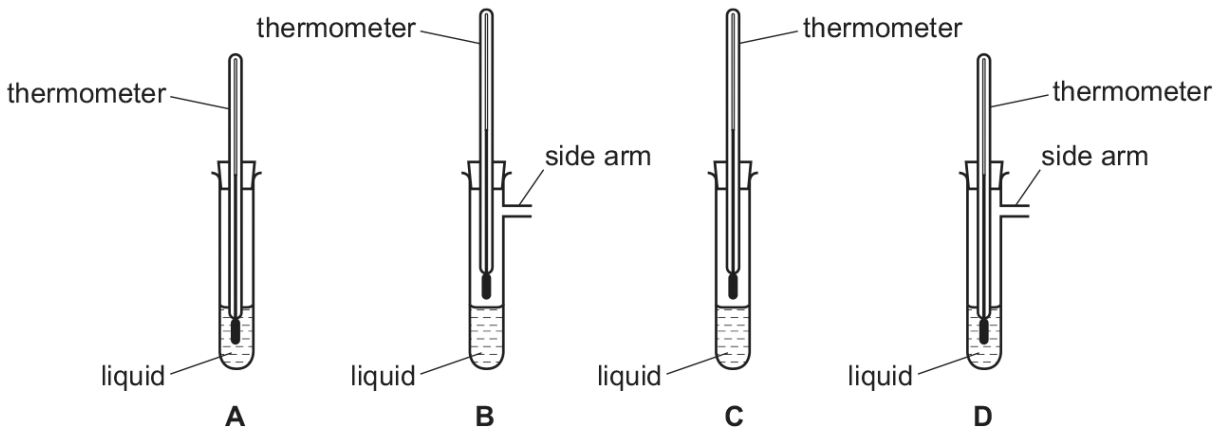
..... [6]

5. 0620_w12_qp_63 Q: 1

The diagrams show four sets of apparatus, **A**, **B**, **C** and **D**.



(a) **(i)** Which set of apparatus would be most suitable to determine the boiling point of a liquid?

..... [1]

(ii) Indicate with an arrow on this diagram where heat should be applied. [1]

(b) What would be the effect if the liquid in **A** was heated strongly? Explain your answer.

effect .....

explanation ..... [2]

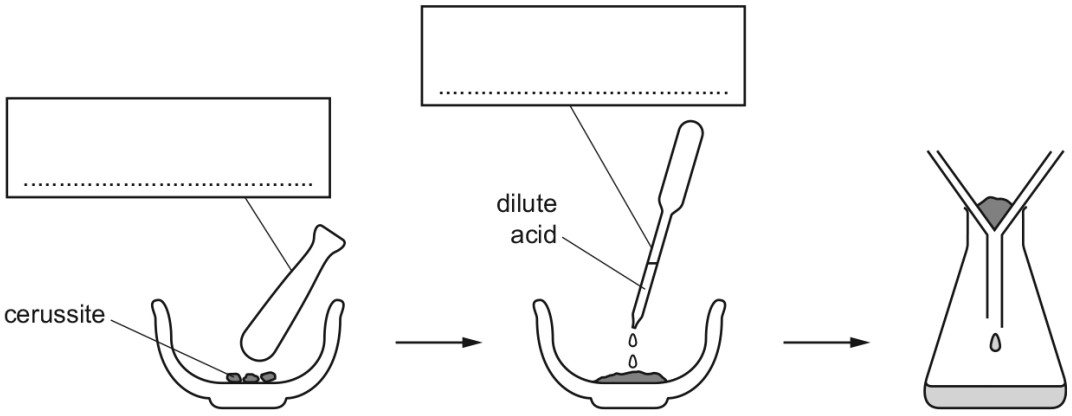
(c) The apparatus below can be used to prepare and collect a gas which is insoluble in water. Complete the diagram to show how this gas could be collected over water. Label the diagram.

[2]

[Total: 6]

6. 0620_w17_qp_63 Q: 1

Cerussite is a lead ore which contains lead(II) carbonate. A student obtained a solution of lead(II) nitrate from cerussite using the apparatus shown.



(a) Complete the boxes to name the apparatus. [2]

(b) Why was the cerussite crushed in **step 1**?

..... [1]

(c) Name the dilute acid used in **step 2**.

..... [1]

(d) What is the general name given to an insoluble solid left on a filter paper after filtration?

..... [1]

(e) Suggest how a sample of lead could be obtained from the solution of lead(II) nitrate.

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..... [2]

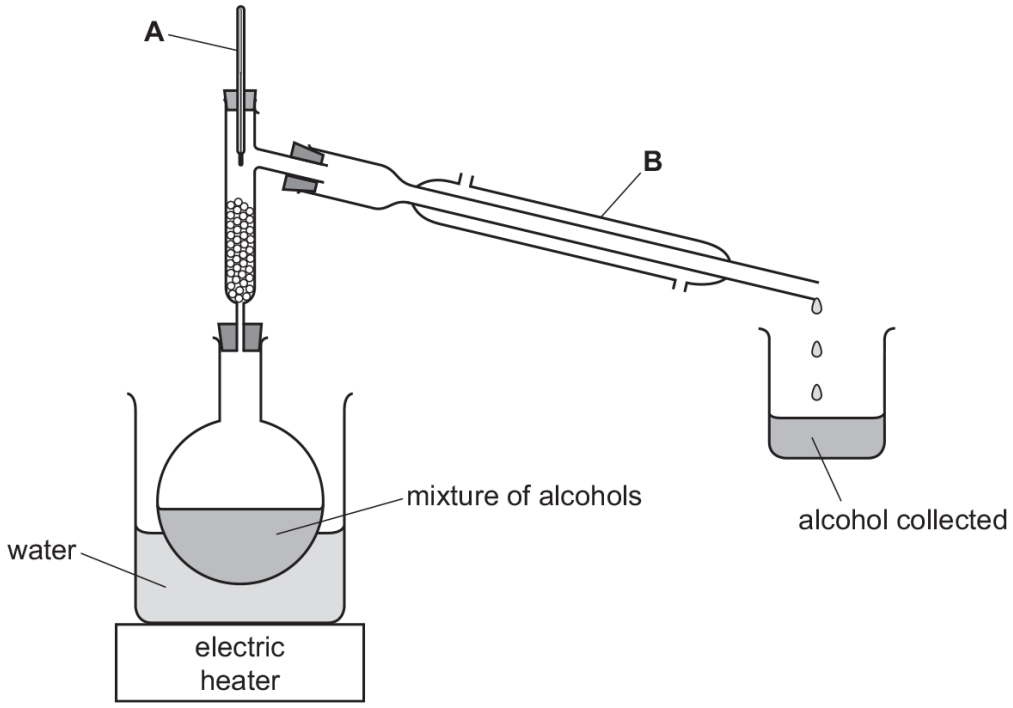
[Total: 7]

7. 0620_w20_qp_61 Q: 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]

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

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..... [2]

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

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..... [1]

[Total: 8]

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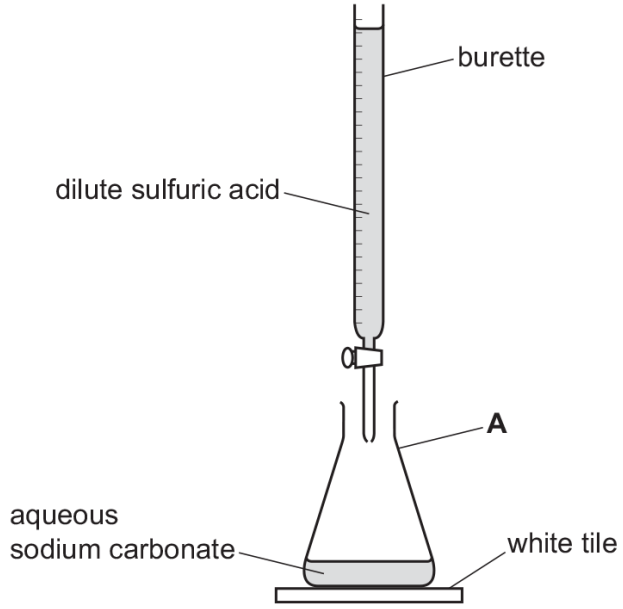
8. 0620_w21_qp_61 Q: 1

A student investigated the volume of dilute sulfuric acid that would react with 25.0 cm^3 of aqueous sodium carbonate.

- A burette was rinsed with water and then with dilute sulfuric acid.
- The burette was filled with dilute sulfuric acid. Some of the dilute sulfuric acid was run out of the burette so that the level of the dilute sulfuric acid was on the burette scale.
- 25.0 cm^3 of aqueous sodium carbonate was poured into the apparatus labelled **A** in the diagram.
- Five drops of methyl orange indicator were added to the aqueous sodium carbonate in **A**.
- The apparatus labelled **A** was placed on a white tile.
- The dilute sulfuric acid was added slowly to the 25.0 cm^3 of aqueous sodium carbonate until the colour of the methyl orange changed from yellow to orange.

The apparatus was arranged as shown in the diagram.



(a) Name the apparatus labelled **A**.

..... [1]

(b) State **one** safety precaution that should be taken when using dilute sulfuric acid.

..... [1]

(c) Give a reason why the white tile is used.

..... [1]

(d) Describe what should be done to the apparatus labelled **A** as the dilute sulfuric acid is added to the aqueous sodium carbonate.

..... [1]

(e) State why the burette was rinsed with water and then with dilute sulfuric acid at the start of the experiment.

water .....

.....

dilute sulfuric acid .....

.....

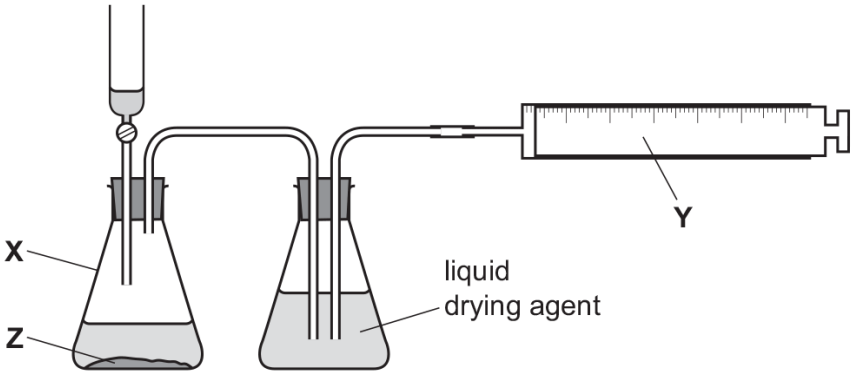
[2]

[Total: 6]

9. 0620_w21_qp_63 Q: 1

Hot concentrated hydrochloric acid reacts with solid manganese(IV) oxide to make chlorine gas. Chlorine gas can be dried by bubbling it through a liquid drying agent.

The diagram shows the apparatus used to make and collect a sample of dry chlorine gas. There is one error in the diagram.



(a) Name the items of apparatus labelled **X** and **Y**.

X .....

Y .....
[2]

(b) Name the substance labelled **Z**.

..... [1]

(c) **On the diagram** draw **one** arrow to show where heat should be applied so that chlorine gas is made. [1]

(d) There is one error in the way the apparatus has been set up.

(i) **On the diagram** draw a circle around the error in the apparatus. [1]

(ii) Describe what would happen if the apparatus is used before the error is corrected.

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..... [1]

[Total: 6]

1.2 Purity

10. 0620_m15_qp_62 Q: 6

Ethanedioic acid dihydrate, $H_2C_2O_4.2H_2O$, is a white crystalline solid. This acid is water-soluble and is found in rhubarb leaves.

Plan an investigation to obtain crystals of ethanedioic acid dihydrate from some rhubarb leaves. You are provided with common laboratory apparatus, water and sand.

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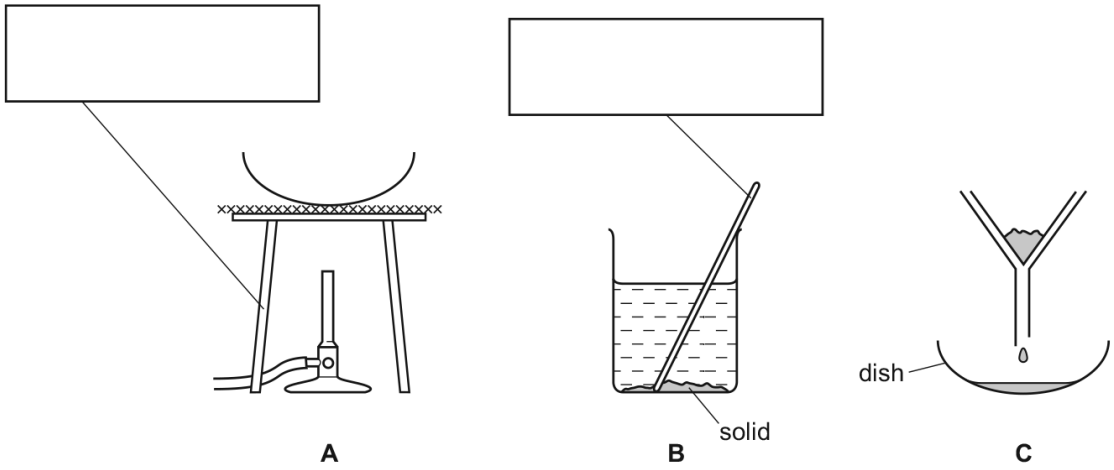
..... [7]

[Total: 7]

11. 0620_m16_qp_62 Q: 1

The diagrams show the apparatus used to obtain crystals of calcium chloride from a mixture of solid calcium chloride and solid calcium carbonate.
Calcium chloride is soluble in water and calcium carbonate is insoluble in water.



(a) Complete the boxes to name the apparatus. [2]

(b) (i) Write down the order in which the apparatus should be used in this experiment.

..... [1]

(ii) Name the separation process in **C**.

..... [1]

(c) (i) What has been added to the mixture in **B**?

..... [1]

(ii) What is the general name given to the liquid in the dish in **C**?

..... [1]

(d) How would you know when to stop heating the dish in **A**?

.....

..... [1]

[Total: 7]

12. 0620_m16_qp_62 Q: 4

The label on a bottle of orange drink stated 'contains no artificial colours'. A scientist thought that the orange colour in the drink was a mixture of two artificial colours:

- Sunset Yellow E110
- Allura Red E129

Plan an investigation to show that the orange colour in the drink did **not** contain these two artificial colours.
You are provided with samples of E110, E129 and the orange colouring from the drink. You are also provided with common laboratory apparatus.
You may draw a diagram to help answer the question.

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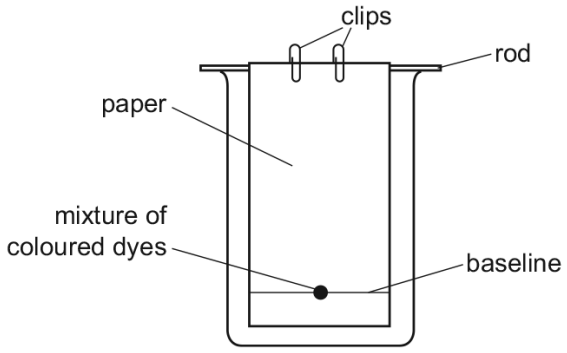
..... [6]

[Total: 6]

13. 0620_m18_qp_62 Q: 1

A student used paper chromatography to separate a mixture of coloured dyes. The diagram shows the apparatus used.



(a) (i) Draw a line on the diagram to show the level of the solvent. [1]

(ii) Suggest a suitable solvent that could be used.

..... [1]

(b) What could be used to put the mixture of coloured dyes onto the paper?

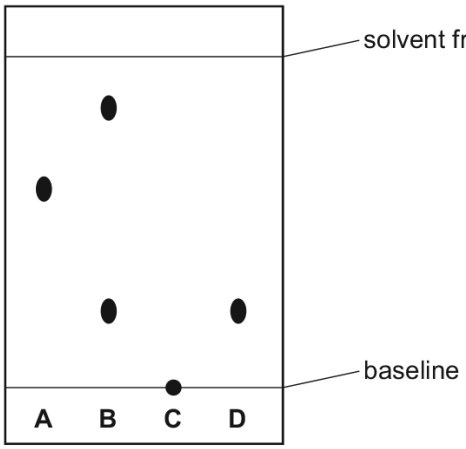
..... [1]

(c) The clips hold the paper in position.

Why is this important for the chromatography experiment?

..... [1]

The diagram shows the chromatogram obtained from four dyes, **A**, **B**, **C** and **D**.



(d) Give **one** conclusion that can be drawn about dye **B**.

..... [1]

(e) Suggest why dye **C** remained on the baseline.

.....

..... [1]

(f) R_f values are used to identify compounds.

$$R_f = \frac{\text{distance travelled by the compound}}{\text{distance travelled by the solvent}}$$

Calculate the R_f value of dye **A**.

R_f = ... [2]

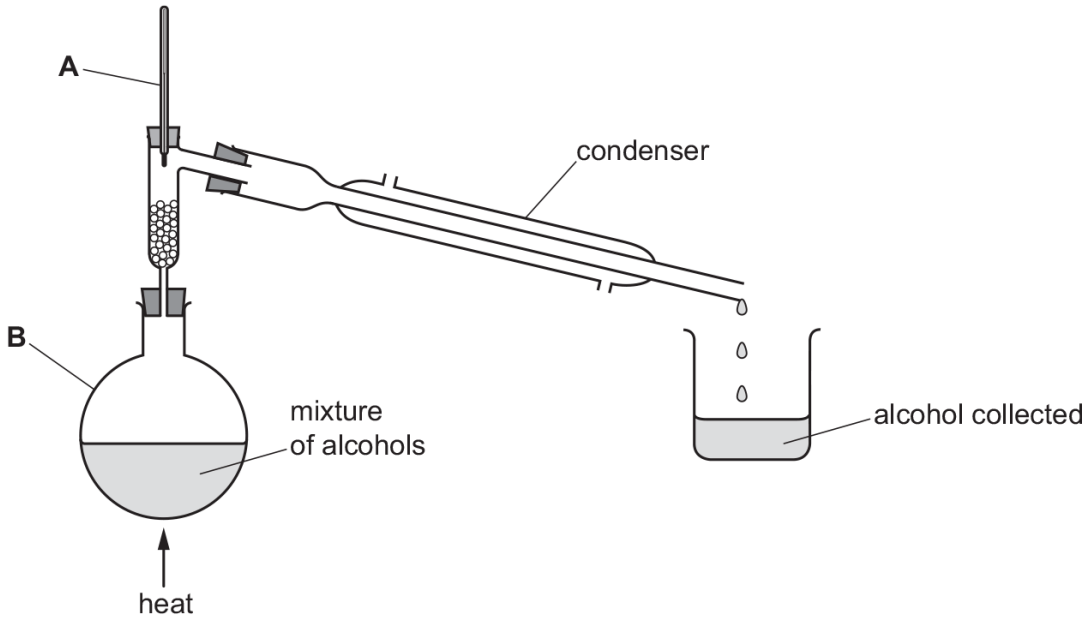
[Total: 8]

14. 0620_m20_qp_62 Q: 1

The table gives the boiling points of four alcohols.

alcohol	boiling point / °C
methanol	65
ethanol	79
propan-1-ol	97
butan-1-ol	117

The apparatus shown can be used to separate a mixture of the four alcohols shown in the table.



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

A .....

B .....

[2]

(b) Add to the diagram **one** arrow to show where water enters the condenser. [1]

(c) **(i)** Why is it **not** safe to heat the mixture of alcohols with a Bunsen burner?

..... [1]

(ii) Suggest how the mixture of alcohols can be heated safely?

..... [1]

(d) Describe how the condenser allows the alcohol to be collected as a liquid.

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..... [1]

(e) Which alcohol would be collected first?
Explain your answer.

alcohol collected first .....

explanation .....

.....
[2]

[Total: 8]

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15. 0620_m20_qp_62 Q: 4

A black dye can be obtained from some plant roots.

Plan an investigation to determine how many different coloured substances are contained in a black dye obtained from plant roots.

You must include how the results you obtain will tell you how many different coloured substances are contained in the black dye.

You have access to plant roots and all normal laboratory apparatus.

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..... [6]

16. 0620_s12_qp_61 Q: 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]

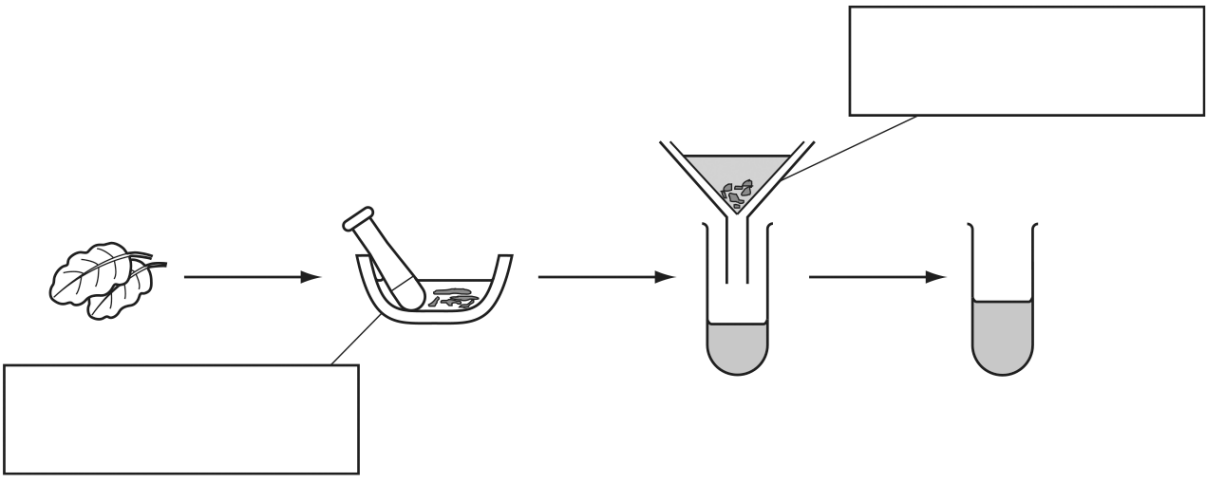
(e) What method could be used to check the purity of the crystals in Stage 6?

..... [1]

[Total: 8]

17. 0620_s13_qp_62 Q: 1

A student extracted the colours present in some leaves using the apparatus below.



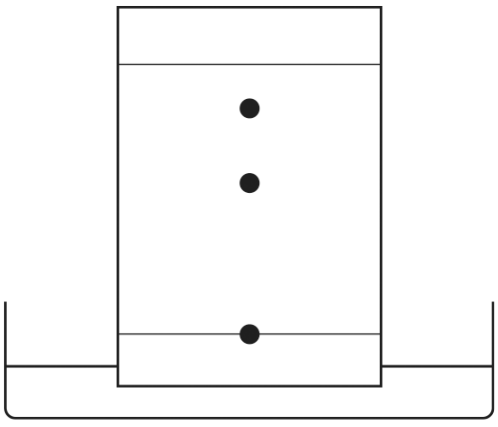
(a) Complete the boxes to identify the pieces of apparatus used. [2]

(b) Use labelled arrows to indicate

(i) the solvent,

(ii) the solution of colours. [2]

(c) Chromatography was used to separate the colours. The chromatogram obtained is shown.



(i) On the diagram, label the solvent front. [1]

(ii) How many colours were present?

..... [1]

[Total: 6]

18. 0620_s13_qp_63 Q: 6

The table gives information about the solubility of three different solids, **W**, **X** and **Y**, in two different solvents.

substance	solubility in cold water	solubility in hot water	solubility in cyclohexane
W	insoluble	insoluble	very soluble
X	insoluble	very soluble	insoluble
Y	very soluble	very soluble	insoluble

You are provided with a mixture of the three substances, **W**, **X** and **Y**. Plan a method which could be used to separate pure dry samples of **W**, **X** and **Y** from the mixture.

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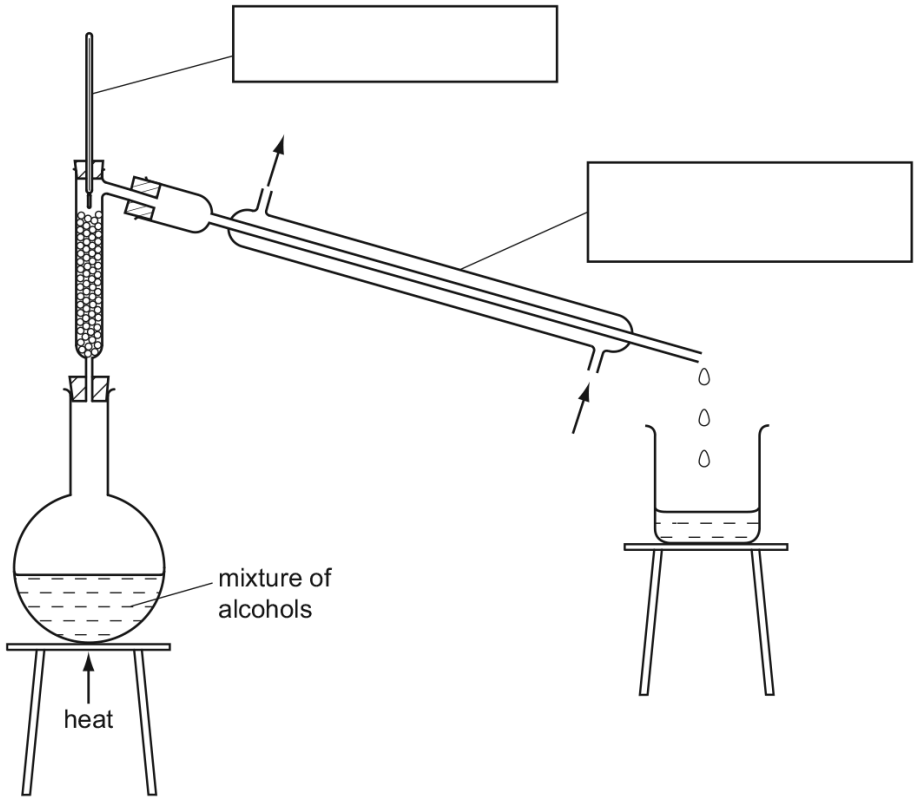
..... [6]

[Total: 6]

19. 0620_s14_qp_61 Q: 1

A student separated a mixture of two alcohols, ethanol (boiling point 78 °C) and butanol (boiling point 118 °C).
The apparatus used is shown below.



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

(b) Label the arrows. [1]

(c) State the name of this separation process.

..... [2]

(d) (i) Which liquid is first to collect in the beaker?

..... [1]

(ii) How would the student know when all of this liquid had collected?

.....

..... [1]

(e) Identify and explain a possible hazard in this experiment.

.....

..... [2]

[Total: 9]

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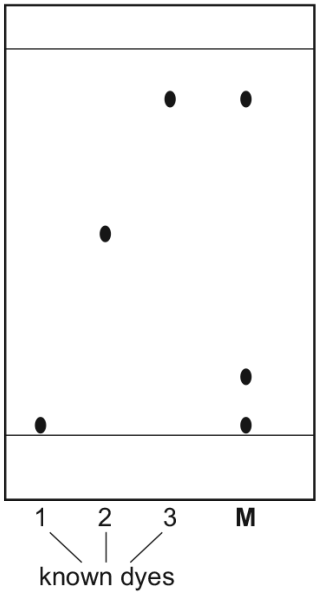
20. 0620_s15_qp_61 Q: 3

A mixture of coloured dyes, **M**, was separated by chromatography. The dyes were insoluble in water.
The chromatogram below shows the result of separating the mixture and the chromatography of three known dyes 1, 2 and 3.



(a) On the diagram, label the base line (origin). [1]

(b) Name a solvent that could be used in this separation.

..... [1]

(c) How many dyes were there in the mixture, **M**?

..... [1]

(d) What are your conclusions about the identity of the dyes in the mixture, **M**?

.....

.....

..... [3]

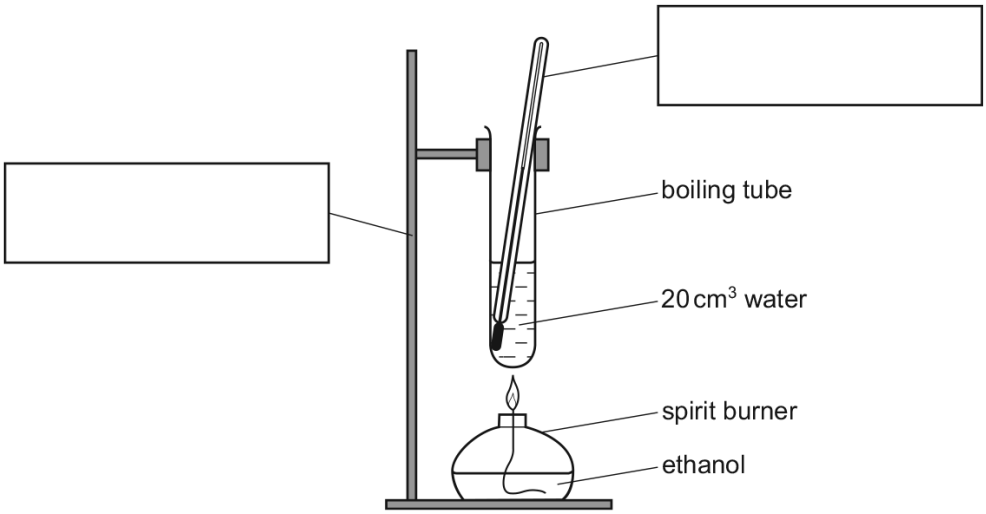
(e) How could the reliability of the results be checked?

..... [1]

[Total: 7]

21. 0620_s15_qp_62 Q: 1

A student did an experiment to measure the energy produced by burning ethanol.
The apparatus used is shown.



The ethanol was burned for one minute. The temperature of the water was then measured and recorded.

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

(b) Give three other measurements the student should have taken.

1 .....

2 .....

3 .....

[3]

(c) The experiment was repeated using 40 cm^3 of water. What effect would this have on the results?

..... [1]

(d) Another student did this experiment using a copper can instead of a boiling tube.
Give one advantage of this change to the apparatus.

..... [1]

[Total: 7]

22. 0620_s18_qp_63 Q: 4

Some trees have purple leaves. The purple colour is a mixture of coloured pigments.

Plan an experiment to extract and separate the coloured pigments present in the purple leaves.

You are provided with some purple leaves, sand, ethanol and common laboratory apparatus.
You may draw a diagram to help you answer the question.

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..... [6]

[Total: 6]

23. 0620_s19_qp_61 Q: 2

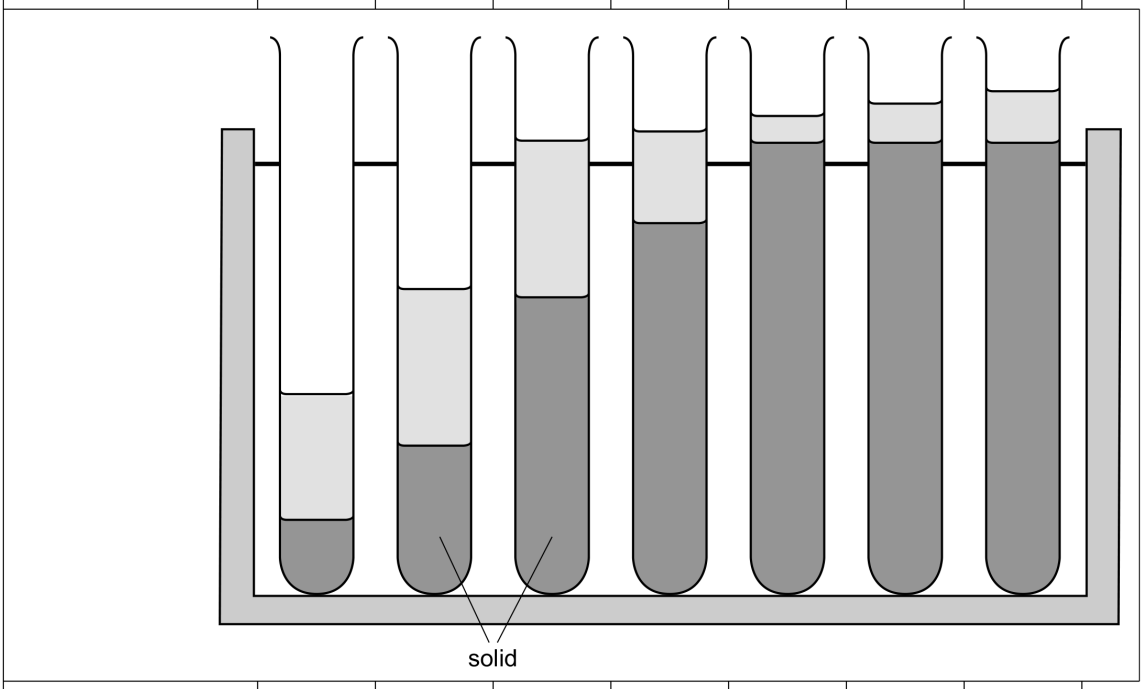
A student investigated the reaction between aqueous sodium carbonate and aqueous barium nitrate.

- A burette was filled with aqueous sodium carbonate.
- Seven test-tubes were labelled 1, 2, 3, 4, 5, 6 and 7.
- A measuring cylinder was used to pour 6 cm^3 of aqueous barium nitrate into each of the seven test-tubes in a test-tube rack.
- 1.0 cm^3 of aqueous sodium carbonate was added from the burette to test-tube 1.
- 2.0 cm^3 of aqueous sodium carbonate was added from the burette to test-tube 2.
- 4.0 cm^3 of aqueous sodium carbonate was added from the burette to test-tube 3.
- 5.0 cm^3 of aqueous sodium carbonate was added from the burette to test-tube 4.
- 6.0 cm^3 of aqueous sodium carbonate was added from the burette to test-tube 5.
- 7.0 cm^3 of aqueous sodium carbonate was added from the burette to test-tube 6.
- 8.0 cm^3 of aqueous sodium carbonate was added from the burette to test-tube 7.

A glass rod was used to stir the contents of each of the test-tubes. The contents of the test-tubes were left to stand until the solid formed had settled. A ruler was used to measure the height of the solid formed in each test-tube.

(a) Use a ruler to measure the heights of the solid formed in each test-tube shown in the diagram. Record the heights of the solid formed in the table and complete the table.

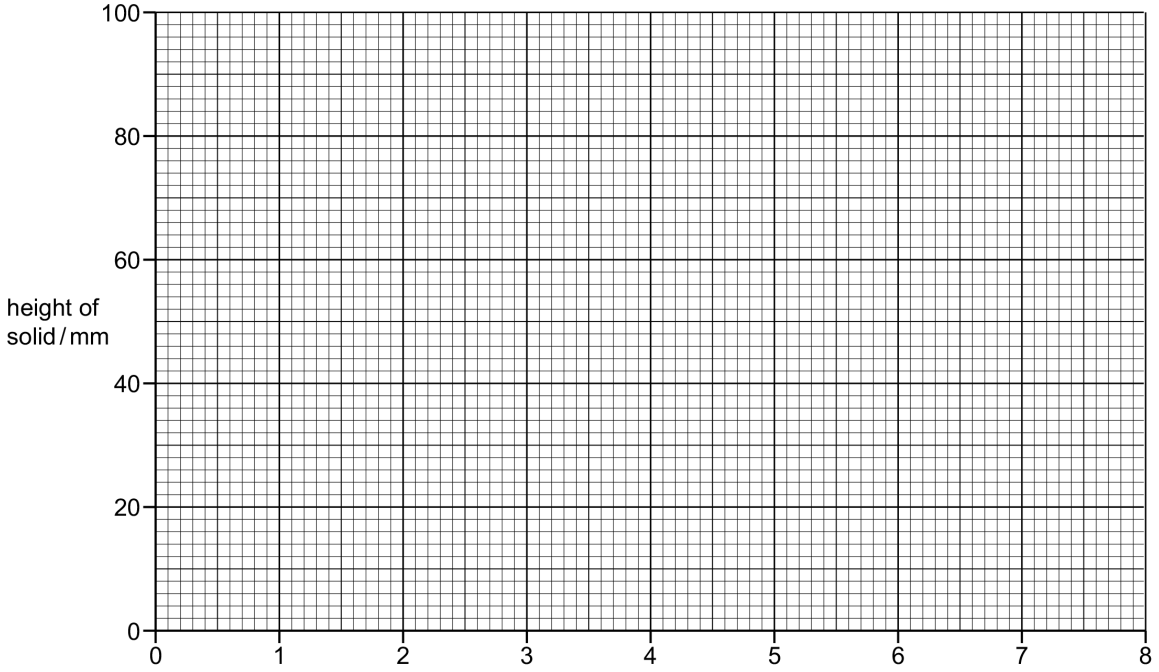
test-tube number	1	2	3	4	5	6	7
volume of aqueous sodium carbonate / cm^3							



height of solid / mm							

[3]

(b) Plot the results on the grid. Draw **two** intersecting lines of best fit. Label the *x*-axis.



[4]

(c) **From your graph**, deduce the height of the solid formed when 3.0 cm^3 of aqueous sodium carbonate is added to 6 cm^3 of aqueous barium nitrate.

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

..... mm [2]

(d) Describe the trend in the heights of the solids formed in test-tubes 1–7.

.....

.....

..... [2]

(e) Predict what would happen if the experiment were continued using three further test-tubes each containing 6 cm^3 of aqueous barium nitrate and separately adding 9.0 cm^3, 10.0 cm^3 and 11.0 cm^3 of aqueous sodium carbonate to each one.
Explain your answer.

.....

.....

..... [2]

(f) Suggest **one** change to the **apparatus** used which could be made to obtain more accurate results.

..... [1]

(g) Suggest a **different** method to measure the amount of solid formed during the experiment.

.....

.....

.....

..... [3]

(h) Suggest how the reliability of the results could be checked.

.....

..... [1]

[Total: 18]

Appendix A

Answers

1. 0620_m22_ms_62 Q: 4

Question	Answer	Marks
	1 mark each for any 6 from: • known/specified volume of fizzy drink • warmed/heated • in a suitable container • gas collected in inverted measuring cylinder over water or in a (gas) syringe • until no more gas collected / all carbon dioxide given off / no more bubbles • volume of gas measured / recorded • volume of gas in 1 dm^3 = volume collected × 1000 / volume used	6

2. 0620_s15_ms_63 Q: 6

	weighed piece of ice; melting method e.g. put into hot water; collection and measurement of gas e.g. measuring cylinder; filled with water; e.g. gas syringe (2 marks); measure volume of gas; calculate volume in 1000 g;	6	

3. 0620_s20_ms_63 Q: 2

Question	Answer	Marks
(a)	all volumes of dilute hydrochloric acid completed correctly (45, 40, 35, 30, 20, 15, 10, 5).	2
	all eight temperatures completed correctly (23, 25, 27, 29, 30, 28, 26, 24)	2
(b)	all eight points plotted correctly	2
	two suitable straight lines drawn	1
	straight lines extended so that they cross	1
(c)(i)	working shown on graph from where lines cross	1
	volume of aqueous sodium hydroxide correct for their graph	1
	volume of dilute hydrochloric acid correct based on their recorded volume of sodium hydroxide	1

Question	Answer	Marks
(c)(ii)	correct value based on graph drawn	1
	°C	1
(c)(iii)	dilute hydrochloric acid **and** as volume less than sodium hydroxide	1
(d)	lines under plotted line	1
	maximum temperature at same volume as plotted line	1
(e)(i)	advantage: more accurate	1
	disadvantage: slower	1
(f)	repeat and compare	2

4. 0620_s21_ms_63 Q: 4

Question	Answer	Marks
	any 6 from: • specified / set volume / mass of water • measure start temperature of water • heat water using sprit burner for all three fuels **and** • start timing when heating started • heat to set temperature / set temperature rise • record time • shortest time gives out most energy **OR** • measure mass of fuel (plus spirit burner) at start • heat to set temperature / set temperature rise • measure mass of fuel (plus sprit burner) at end (and subtract from first mass to fine mass of fuel used) • smallest mass used gives out most energy **OR** • put specified mass / volume of fuel in spirit burner • burn until burner goes out • measure final temperature of water and calculate temperature rise • highest temperature (rise) gives out most energy **OR** • heat water for a specified time • measure final temp of water • calculate temperature rise • highest temperature (rise) is fuel that gives out most energy	6

5. 0620_w12_ms_63 Q: 1

(a) (i) set B (1) **accept:** D or B and D [2]

(ii) arrow positioned anywhere towards liquid (1)

(b) effect bung shoots out/test-tube cracks/shatters/explodes (1) [2]

reference to pressure (1)

(c) diagram showing delivery tube into trough with water and collecting vessel (1) [2]

labelled (1) **note:** gas syringe = 0

6. 0620_w17_ms_63 Q: 1

(a)	pestle	1
	(teat) pipette	1
(b)	to increase surface area / make it dissolve faster	1
(c)	nitric (acid)	1
(d)	residue	1
(e)	**M1** add a more reactive metal (e.g. zinc / magnesium)	1
	M2 displaces lead / filter out lead	1

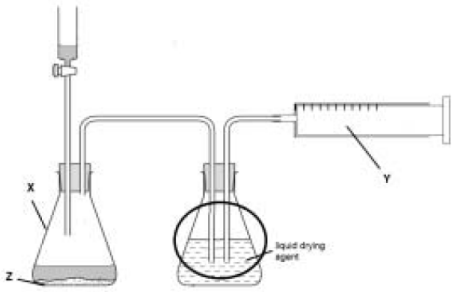
7. 0620_w20_ms_61 Q: 1

Question	Answer	Marks
(a)	**A** thermometer	1
	B (Liebig) condenser	1
(b)	fractional	1
	distillation	1
(c)	alcohols are flammable	1
(d)	heat to remove the ethanol	1
	collect propanol at 97 °C	1
(e)	water boils at 100 °C / water bath will not go above 100 °C **OR** butanol boils at over 100 °C / butanol boils at 117 °C	1

8. 0620_w21_ms_61 Q: 1

Question	Answer	Marks
(a)	(conical) flask	1
(b)	safety glasses/goggles/gloves/lab coat	1
(c)	to see colour change clearly/easily/accurately/better	1
(d)	swirl the flask	1
(e)	water: to clean / to remove residue from previous experiment	1
	acid: to remove the water	1

9. 0620_w21_ms_63 Q: 1

Question	Answer	Marks
(a)	**X** (conical) flask	1
	Y (gas) syringe	1
(b)	**Z** manganese(IV)oxide	1
(c)	arrow under and pointing at left hand conical flask	1
(d)(i)		1
(d)(ii)	liquid / drying-agent pushed out of flask	1

10. 0620_m15_ms_62 Q: 6

any **seven** from:

extraction

cut leaves up / small pieces / grind / crush (1)

use of pestle / mortar (1)

add water (1)

sand (1)

boil / heat / stir / mix / shake (1)

separation

decant / filter (1)

obtaining crystals

evaporate / heat solution (1)

to crystallising point / until crystals start to form (1)

leave to cool (1) [7]

11. 0620_m16_ms_62 Q: 1

(a)	tripod; stirring rod / stirrer;	**2**
(b)(i)	B C A;	**1**
(b)(ii)	filtration;	**1**
(c)(i)	water;	**1**
(c)(ii)	filtrate;	**1**
(d)	solid / crystals appearing on edge / glass rod test;	**1**

12. 0620_m16_ms_62 Q: 4

	any **6** from: chromatography; (pencil) baseline / origin; apply orange colour to paper; and samples of both E110 and E129; solvent / named solvent; check heights of spots of E colours against orange drink; conclusion / allow comparison to known R_f values;	**6**

13. 0620_m18_ms_62 Q: 1

(a)(i)	line drawn on diagram between base line and bottom of paper and below dot	**1**
(a)(ii)	water	**1**
(b)	dropper / teat pipette	**1**
(c)	so mixture is above / not in contact/does not run/dissolve in solvent	**1**
(d)	is two substances / contains **D**	**1**
(e)	insoluble	**1**
(f)	2.8 to 3.2 / 5	**1**
	0.56–0.64	**1**

14. 0620_m20_ms_62 Q: 1

Question	Answer	Marks
(a)	thermometer	**1**
	(round bottom) flask	**1**
(b)	arrow to bottom entry to water jacket on condenser	**1**
(c)(i)	flammable	**1**
(c)(ii)	water bath / electric heater / heating mantle/ oil bath	**1**
(d)	cools (the vapour / alcohol)	**1**
(e)	methanol	**1**
	lowest boiling point	**1**

15. 0620_m20_ms_62 Q: 4

Question	Answer	Marks
	Any 6 from: • crush / grind root • with pestle / mortar • with water / solvent • place (drop of) liquid / colour on paper • conduct chromatography • (bottom of) paper placed in a suitable solvent / water • number of coloured substances = number of spots	**6**

16. 0620_s12_ms_61 Q: 3

(a) pestle (1) mortar (1) [2]

(b) stir/mix/shake (1) allow: heat/boil [1]

(c) diagram showing funnel (1)
indication of filter paper (1) note: labels not necessary [2]

(d) heat/evaporation (1)
to crystallising point or description (1)
in fume cupboard (1) max 2 [2]

(e) melting point/description of (1) **allow**: chromatography **ignore**: bp [1]

[Total: 8]

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17. 0620_s13_ms_62 Q: 1

(a) pestle and / or mortar (1) filter / funnel (1) [2]

(b) **(i)** labelled arrow at liquid in mortar (1)

(ii) labelled arrow at liquid in either tube or liquid in funnel or any combination (1) [2]

(c) **(i)** top line labelled (1) [1]

(ii) three (1) [1]

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18. 0620_s13_ms_63 Q: 6

variety of ways that could be used

generally appropriate solvent for named solid (1)

evaporate off solvent (1)

mention of these three terms at least once

filter (1) wash (1) dry (1)

appropriate solvent for second named solid (1) and filter

lastly wash and dry remaining solid (1)

example; add cyclohexane to the mixture to dissolve **W** (1)

filter (1) wash (1)

evaporate off cyclohexane (1)

to residue add cold water to dissolve **Y** (1) evaporate off water (1)

wash (1) dry (1) residue is **X** (1)

max 6 [6]

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19. 0620_s14_ms_61 Q: 1

(a) thermometer (1)

condenser (1)
allow condensing tube, condensating tube, etc. [2]

(b) arrows labelled – water (in) and water (out) (1) [1]

(c) fractional (1)

distillation (1) [2]

(d) **(i)** ethanol (1) [1]

(ii) temperature would rise (above 78 °C) (1) [1]

(e) alcohols are (in)flammable / catch fire / burn (1)
ignore: explode

Bunsen burner / flame / heat (1) [2]

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20. 0620_s15_ms_61 Q: 3

(a)	base line / origin clearly labelled on diagram;	**1**	
(b)	any organic solvent / ethanol / alcohol / acetone;	**1**	**R** water / acids
(c)	3;	**1**	
(d)	1 and 3 present; 2 not present; unknown dye present;	**3**	**I** reference to properties of dyes 1, 2 and 3
(e)	repeat the experiment / use a different solvent / measure R_f values;	**1**	

21. 0620_s15_ms_62 Q: 1

(a)	stand; thermometer;	**2**	
(b)	initial temperature (of water) / room temperature / temperature change; initial mass of burner / ethanol; final mass of burner / ethanol;	**3**	
(c)	half / lower temperature change / water would take longer to heat up / slower;	**1**	
(d)	higher temperature change / water would heat up quicker / copper is a better conductor;	**1**	**I** less heat loss **I** comments on strength of copper

22. 0620_s18_ms_63 Q: 4

	any **6** from: □ cut leaves into small pieces □ grind / crush with sand / ethanol □ using pestle/mortar □ decant / pour-off / filter liquid □ chromatography □ apply extract to paper (in correct location) □ description of separating colours	**Max 6**

23. 0620_s19_ms_61 Q: 2

(a)	table of results volumes of aqueous sodium carbonate boxes completed correctly 1, 2, 4, 5, 6, 7, 8 (1) heights of solid boxes completed 12, 24, 48, 60, 73, 73, 73 (1) in mm (1)	**3**
(b)	x-axis labelled as "volume of aqueous sodium carbonate / cm^3 (1) all 7 points plotted correctly (2) two intersecting straight line graphs drawn with a ruler (1)	**4**
(c)	working shown on graph in correct place (1) value from graph (1)	**2**
(d)	height increases / proportional to volume / more solid (1) level off / becomes constant (1)	**2**
(e)	same heights / at 73 mm (1) all barium nitrate reacted (1)	**2**
(f)	use burette / pipette to measure out aqueous barium nitrate / instead of measuring cylinder	**1**
(g)	filter (1) dry (1) weigh solid (1)	**3**
(h)	repeat **and** compare	**1**