



**EXAM PAPER MAKER**

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# YEARLY PAST PAPERS WITH TOPICAL QUESTIONS TRACKER

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Cambridge IGCSE

**Chemistry (0620) Paper 6**

[Alternative to Practical]

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**SAMPLE EDITION**  
**2020 QUESTION PAPERS & MARK SCHEMES**

*Note:*

Provided for preview purposes to demonstrate format, organisation, and content quality. The full edition contains all examination years listed. For more information, visit:

[Cambridge IGCSE Chemistry \(0620\) Product Page](#)

# Introduction

## Topical Questions Tracker: An Efficient Study Tool

A Topical Questions Tracker is a powerful tool, integrated as an appendix to Yearly Past Papers, enhancing the functionality of utilising Past Papers. This tool allows you to locate specific questions by topic, providing a much more efficient way to study for exams.

## How the Topical Questions Tracker Works

The Topical Questions Tracker is organized according to the latest syllabus of the subject. Each topic includes a comprehensive list of all relevant questions from the yearly past papers. For each question, the tracker provides:

- The paper's code
- The question number
- The sub-question number (if applicable)
- The page number where the question is located, which is hyperlinked for easy navigation

By clicking on the linked page number, you can jump directly to the corresponding page in the document, making it quick and simple to find the exact question you're looking for.

## Advantages of Topical Questions Trackers Over Traditional Past Papers

While traditional Topical Past Papers classify entire questions under a single topic, many questions contain sub-questions that may cover different topics. This can make it difficult to find specific practice material for a particular area of study.

The Topical Questions Tracker overcomes this limitation by categorizing each sub-question individually. This precise classification ensures that each part of the question is assigned to the appropriate topic, providing a more targeted and effective revision tool.

## Efficient Navigation Tips

While the Topical Questions Tracker allows you to jump directly to specific questions by clicking on the linked page numbers, navigating back to the previous page to find the next question can be time-consuming and somewhat frustrating. To streamline this process, you can utilize the 'Previous View' and 'Next View' commands in Adobe Reader.

To access these commands, navigate to the menu and select View » Go to » Previous View or Next View. Alternatively, you can use the shortcut keys for quicker navigation:

- Previous View: ALT + Left Arrow
- Next View: ALT + Right Arrow

These commands enable you to seamlessly move back and forth between the last two pages visited, enhancing your study efficiency by minimizing unnecessary navigation steps.

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# Cambridge IGCSE™

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## CHEMISTRY

0620/62

Paper 6 Alternative to Practical

February/March 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 [ ].

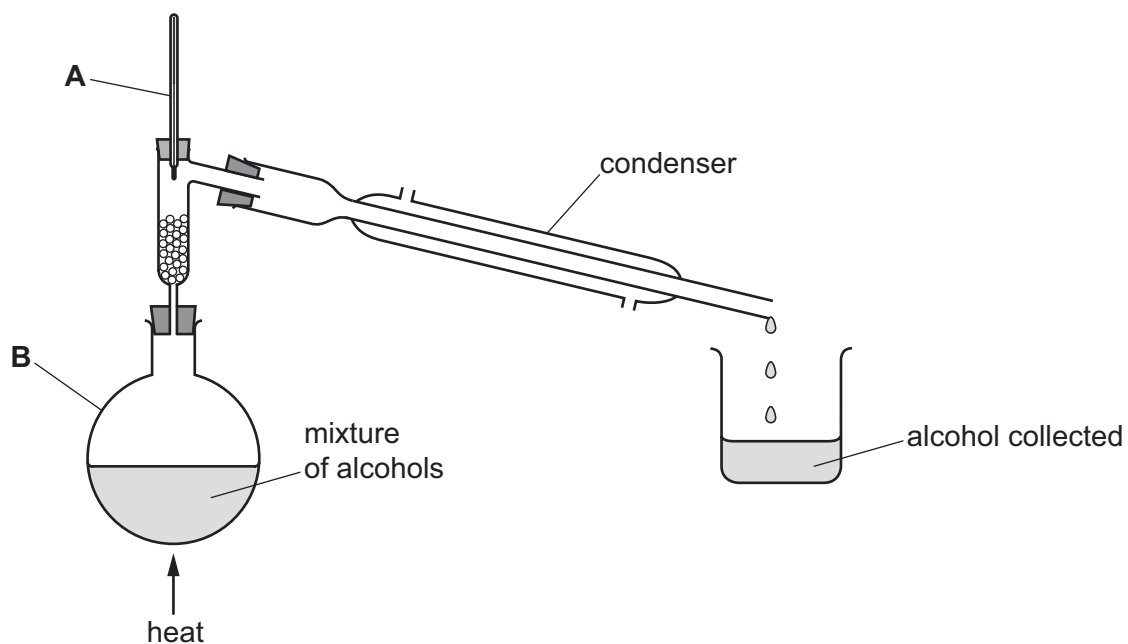
This document has **12** pages. Blank pages are indicated.



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.

.....  
..... [1]

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

alcohol collected first .....

explanation .....

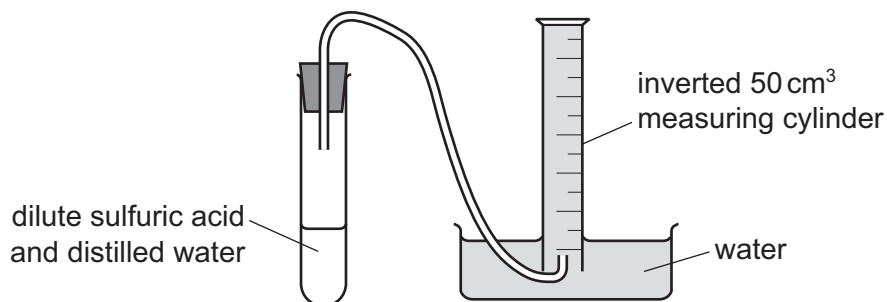
..... [2]

[Total: 8]



- 2 A student investigated the time taken to collect  $40\text{ cm}^3$  of hydrogen gas when magnesium reacts with dilute sulfuric acid.

Five experiments were done using the apparatus shown.



*Experiment 1*

- Using a measuring cylinder,  $8\text{ cm}^3$  of dilute sulfuric acid was poured into the boiling tube.
- Using a second measuring cylinder,  $12\text{ cm}^3$  of distilled water was added to the acid in the boiling tube.
- The apparatus was set up as shown in the diagram, ensuring the inverted measuring cylinder was full of water.
- The bung was removed from the boiling tube.
- A coiled length of magnesium ribbon was added to the boiling tube, the bung was immediately replaced and a timer started.
- The time taken for  $40\text{ cm}^3$  of gas to be collected was measured.
- The student felt the outside of the boiling tube.

- (a) (i) The student noticed that the boiling tube was warm.

What does this tell you about the type of reaction?

..... [1]

- (ii) Describe **one** change that could be made to the apparatus to help keep the temperature of the contents of the boiling tube constant during the reaction.

..... [1]

*Experiment 2*

- The boiling tube was rinsed out with distilled water.
- Experiment 1 was repeated using  $10\text{ cm}^3$  of dilute sulfuric acid and  $10\text{ cm}^3$  of distilled water.

*Experiment 3*

- Experiment 2 was repeated using  $12\text{ cm}^3$  of dilute sulfuric acid and  $8\text{ cm}^3$  of distilled water.

*Experiment 4*

- Experiment 2 was repeated using  $16\text{ cm}^3$  of dilute sulfuric acid and  $4\text{ cm}^3$  of distilled water.

*Experiment 5*

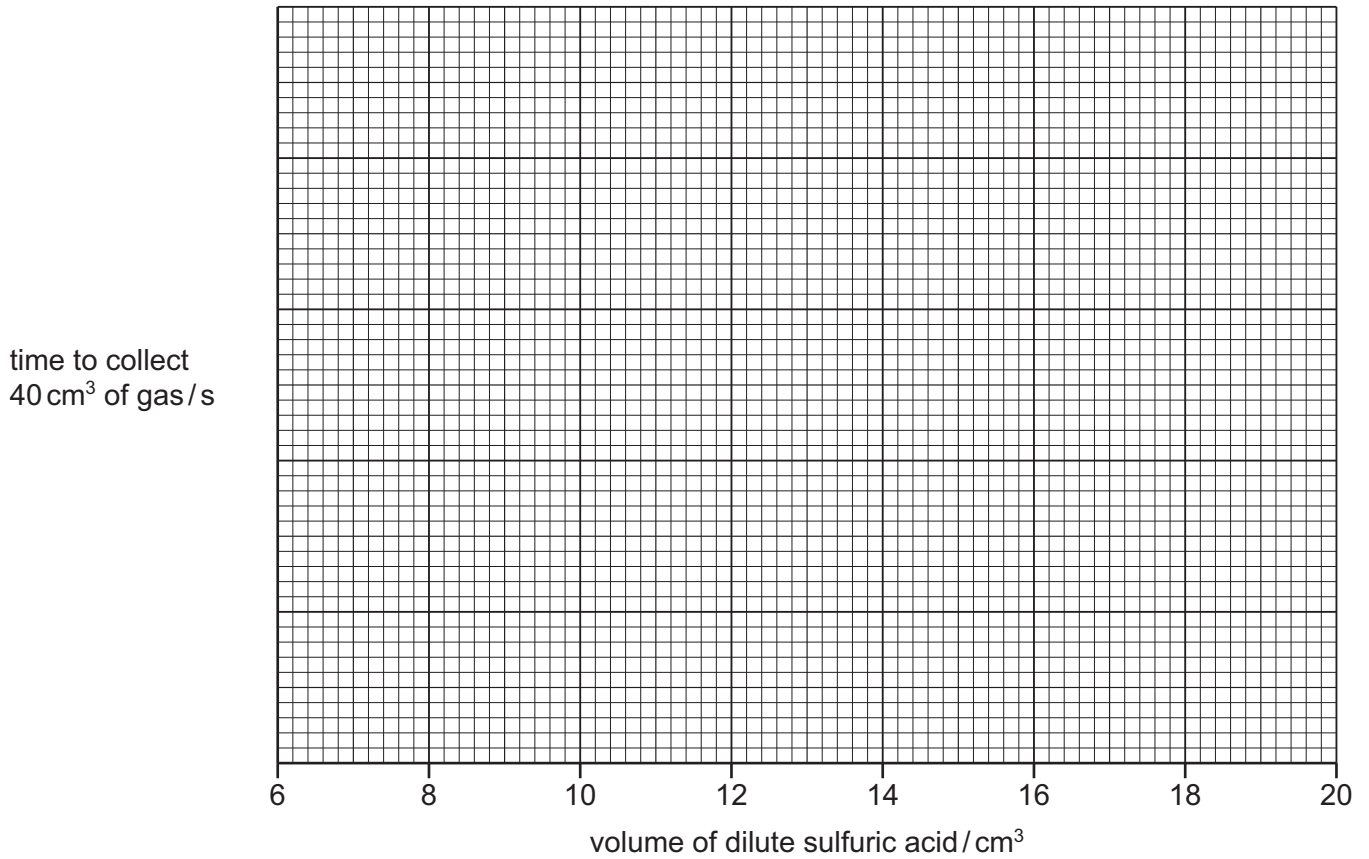
- Experiment 2 was repeated using  $20\text{ cm}^3$  of dilute sulfuric acid and no distilled water.

(b) Use the information in the description of the experiments and the timer diagrams to complete the table. Record the time in **seconds**.

experiment	volume of dilute sulfuric acid / cm <sup>3</sup>	volume of distilled water / cm <sup>3</sup>	timer diagram	time to collect 40 cm <sup>3</sup> of gas/s
1	8			
2	10			
3	12			
4	16			
5	20			

[4]

- (c) Add a suitable scale to the y-axis and plot the results from Experiments 1 to 5 on the grid. Draw a smooth line graph.



[4]

- (d) (i) **From your graph**, deduce the time taken to collect 40 cm<sup>3</sup> of gas if the experiment was repeated using 9 cm<sup>3</sup> of dilute sulfuric acid.

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

..... s  
[2]

- (ii) What volume of distilled water would be needed if the experiment was repeated using 9 cm<sup>3</sup> of dilute sulfuric acid?

..... cm<sup>3</sup> [1]

- (e) The rate of reaction can be calculated using the equation shown.

$$\text{rate of reaction} = \frac{\text{volume of gas collected}}{\text{time taken to collect the gas}}$$

- (i) Use this equation to calculate the rate of reaction in Experiment 1. Give the units for the rate of reaction you have calculated.

rate of reaction = ..... units = ..... [2]

- (ii) In which Experiment, 1, 2, 3, 4 or 5, was the rate of reaction greatest?

..... [1]

- (f) Why would measuring the volume of dilute sulfuric acid with a burette rather than a measuring cylinder be an improvement?

..... [1]

- (g) The magnesium starts to react with the dilute sulfuric acid as soon as it is added.

- (i) Why does this decrease the accuracy of the investigation?

..... [1]

- (ii) Describe **one** improvement that you could make to overcome this problem.

..... [1]

[Total: 19]

3 Solution **J** and solid **K** were analysed.

**tests on solution J**

tests	observations
<p>Solution <b>J</b> was colourless. Solution <b>J</b> was divided into three portions in three test-tubes.</p> <p><b>test 1</b></p> <p>Universal indicator paper was dipped into the first portion of solution <b>J</b>.</p>	<p>the universal indicator paper turned red</p>
<p><b>test 2</b></p> <p>A spatula measure of sodium carbonate was added to the second portion of solution <b>J</b>. The gas given off was tested.</p>	<p>effervescence was seen, the gas produced turned limewater milky</p>
<p><b>test 3</b></p> <p>1 cm<sup>3</sup> of dilute nitric acid and a few drops of aqueous silver nitrate were added to the third portion of solution <b>J</b>.</p>	<p>a white precipitate formed</p>

(a) Use the observation from **test 1** to suggest the pH of solution **J**.

pH = ..... [1]

(b) Name the gas given off in **test 2**.

..... [1]

(c) Identify solution **J**.

.....

..... [2]

**tests on solid K**

Solid **K** was ammonium nitrate.

Complete the expected observations.

Solid **K** was dissolved in water to produce solution **K**. Solution **K** was divided into two equal portions.

**(d)** About 1 cm<sup>3</sup> of dilute nitric acid and a few drops of aqueous barium nitrate were added to the first portion of solution **K**.

observations ..... [1]

**(e)** 2 cm<sup>3</sup> of aqueous sodium hydroxide was added to the second portion of solution **K**. The mixture was warmed and the gas given off was tested.

observations .....

.....

..... [2]

[Total: 7]



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## Cambridge IGCSE™

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**CHEMISTRY**

**0620/62**

Paper 6 Alternative to Practical

**March 2020**

MARK SCHEME

Maximum Mark: 40

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the March 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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This document consists of **7** printed pages.

**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

**Science-Specific Marking Principles**

- 1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
- 2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
- 3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
- 4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

5 'List rule' guidance (see examples below)

For questions that require *n* responses (e.g. State **two** reasons ...):

- The response should be read as continuous prose, even when numbered answer spaces are provided
- Any response marked *ignore* in the mark scheme should not count towards *n*
- Incorrect responses should not be awarded credit but will still count towards *n*
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response
- Non-contradictory responses after the first *n* responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form, (e.g.  $a \times 10^n$ ) in which the convention of restricting the value of the coefficient (*a*) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

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

Question	Answer	Marks
2(a)(i)	exothermic	1
2(a)(ii)	use a water bath	1
2(b)	all volumes of distilled water completed correctly (12, 10, 8, 4, zero / 0 / none / –)	1
	all times completed correctly, all five correct scores 2, four correct scores 1 (72, 45, 33, 23, 16)	2
	all times to number of seconds only	1
2(c)	suitable y-axis scale	1
	plotting – all five correct scores 2, four correct scores 1	2
	suitable best fit line	1

Question	Answer	Marks
2(d)(i)	correct reading from graph (expected 54–56)	1
	working shown on graph	1
2(d)(ii)	11 (cm <sup>3</sup> )	1
2(e)(i)	0.56 ecf from results table (correct calculation of 40 / time for experiment 1)	1
	cm <sup>3</sup> / s	1
2(e)(ii)	5	1
2(f)	more accurate	1
2(g)(i)	gas escapes (before bung inserted) / gas not collected	1
2(g)(ii)	any description of method that prevents gas loss such as partitioned container, suspend magnesium on thread, etc.	1

Question	Answer	Marks
3	<b>Tests on solution J</b>	1
3(a)	1	1
3(b)	carbon dioxide	1
3(c)(i)	hydrochloric acid / HCl hydrogen (ions) / H <sup>+</sup> chloride (ions) / Cl <sup>-</sup>	2
	<b>Tests on solid K</b>	1
3(d)	no change	1

Question	Answer	Marks
3(e)	(red) litmus	1
	(litmus) turns blue	1

Question	Answer	Marks
4	Any 6 from: <ul style="list-style-type: none"><li>• crush / grind root</li><li>• with pestle / mortar</li><li>• with water / solvent</li><li>• place (drop of) liquid / colour on paper</li><li>• conduct chromatography</li><li>• (bottom of) paper placed in a suitable solvent / water</li><li>• number of coloured substances = number of spots</li></ul>	6

## 2 2020 | May/June | Variant 1 | 0620\_s20\_qp\_61

### Topic & Sub-topic Index of Questions

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1	b(i)	Experimental techniques and chemical analysis	Chromatography	26	38
1	b(ii)	Experimental techniques and chemical analysis	Chromatography	26	38
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2	c	Stoichiometry	The mole and the Avogadro constant	28	38
2	d	Stoichiometry	Formulae	28	38
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3	a	Experimental techniques and chemical analysis	Identification of ions and gases	30	39
3	b	Experimental techniques and chemical analysis	Identification of ions and gases	30	39
3	c	Experimental techniques and chemical analysis	Identification of ions and gases	30	40
3	d	Experimental techniques and chemical analysis	Identification of ions and gases	31	40
3	e	Experimental techniques and chemical analysis	Identification of ions and gases	31	40
4		Experimental techniques and chemical analysis	Experimental design	32	40

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# Cambridge IGCSE™

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\* 9 1 0 1 2 1 5 0 2 8 \*



## CHEMISTRY

0620/61

Paper 6 Alternative to Practical

May/June 2020

1 hour

You must answer on the question paper.

No additional materials are needed.

### INSTRUCTIONS

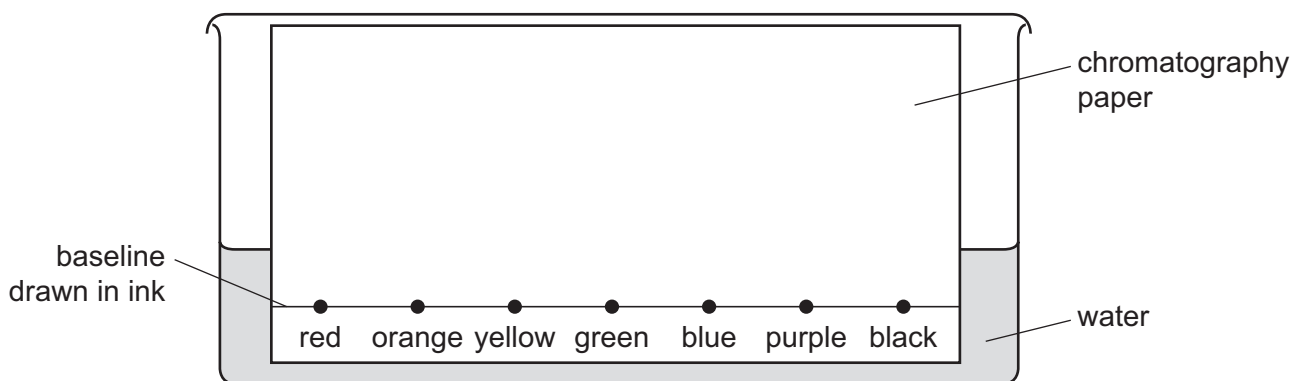
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction 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 8 pages. Blank pages are indicated.

- 1 A student investigated the dyes contained in different coloured inks using chromatography. Water was the solvent. The diagram shows how the student set up the apparatus.



- (a) Identify **two** errors in the way the student set up the apparatus.

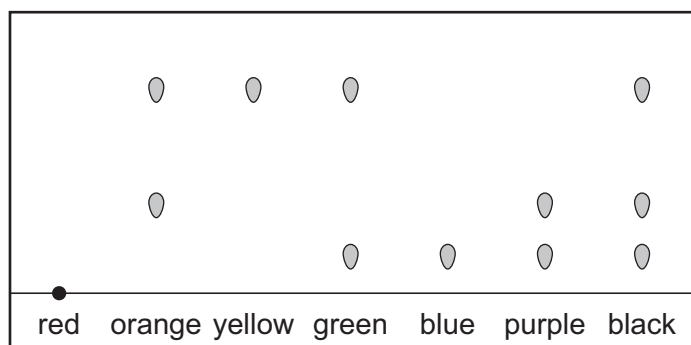
1 .....

2 .....

[2]

- (b) The student then carried out the chromatography correctly.

The diagram shows the results.



- (i) Which ink contains the greatest number of soluble dyes?

..... [1]

- (ii) Which **two** inks are made of a single soluble dye?

..... and ..... [1]

- (iii) From the chromatogram it is **not** possible to tell if the red ink contains different dyes.

Suggest how the experiment could be changed to find out if the red ink contains different dyes.

..... [1]

[Total: 5]

- 2 A student investigated the reaction between dilute hydrochloric acid and two different aqueous solutions of sodium carbonate, solution **E** and solution **F**.

Three experiments were done.

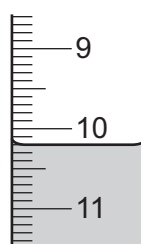
(a) *Experiment 1*

- A burette was filled up to the 0.0 cm<sup>3</sup> mark with dilute hydrochloric acid.
- Using a measuring cylinder, 25 cm<sup>3</sup> of solution **E** was poured into a conical flask.
- Five drops of thymolphthalein indicator were added to the conical flask.
- Dilute hydrochloric acid was slowly added from the burette to the conical flask, while the flask was swirled, until the solution just changed colour.

Use the burette diagrams to complete the table for Experiment 1.



initial reading



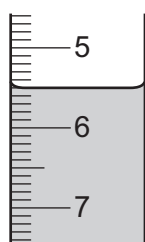
final reading

final burette reading / cm <sup>3</sup>	
initial burette reading / cm <sup>3</sup>	
volume of dilute hydrochloric acid added / cm <sup>3</sup>	

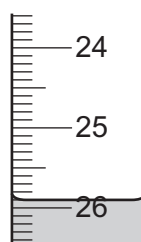
*Experiment 2*

- The conical flask was emptied and rinsed with distilled water.
- The burette was refilled with dilute hydrochloric acid.
- Experiment 1 was repeated using five drops of methyl orange indicator instead of thymolphthalein indicator.

Use the burette diagrams to complete the table for Experiment 2.



initial reading



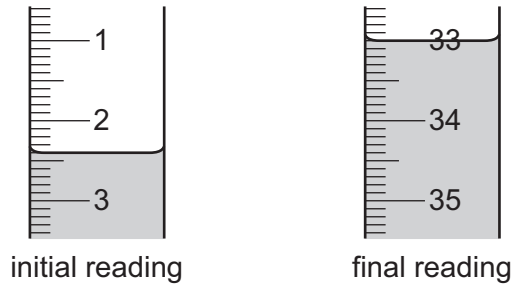
final reading

final burette reading / cm <sup>3</sup>	
initial burette reading / cm <sup>3</sup>	
volume of dilute hydrochloric acid added / cm <sup>3</sup>	

*Experiment 3*

- The conical flask was emptied and rinsed with distilled water.
- The burette was refilled with dilute hydrochloric acid.
- Using a measuring cylinder, 25 cm<sup>3</sup> of solution F was poured into the conical flask.
- Five drops of methyl orange indicator were added to the conical flask.
- Dilute hydrochloric acid was slowly added from the burette to the conical flask, while the flask was swirled, until the solution just changed colour.

Use the burette diagrams to complete the table for Experiment 3.



final burette reading / cm <sup>3</sup>	
initial burette reading / cm <sup>3</sup>	
volume of dilute hydrochloric acid added / cm <sup>3</sup>	

[5]

- (b) What colour change was observed in the conical flask in Experiment 2?

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

- (c) Compare the volumes of dilute hydrochloric acid added in Experiment 2 and Experiment 3. Explain any difference.

..... [2]

- (d) Determine the simplest whole number ratio of volumes of dilute hydrochloric acid used in Experiments 1 and 2.

ratio Experiment 1 : Experiment 2 = ..... [1]

- (e) What volume of dilute hydrochloric acid would be required if Experiment 3 was repeated using thymolphthalein indicator instead of methyl orange indicator?

volume = ..... [2]

(f) The conical flask was rinsed with distilled water between each experiment.

(i) Why was the conical flask rinsed?

.....  
..... [1]

(ii) Why does it **not** matter if a little distilled water is left in the flask after it has been rinsed?

.....  
..... [1]

(g) State **two** sources of error in the experiments. For each error suggest an improvement that would reduce the error.

source of error 1 .....

improvement 1 .....

.....

source of error 2 .....

improvement 2 .....

.....

[4]

[Total: 18]

- 3 Two solids, solid **G** and solid **H**, were analysed. Solid **G** was copper(II) carbonate. Tests were done on each solid.

**tests on solid G**

Complete the expected observations.

- (a) Solid **G** was placed in a boiling tube. An excess of dilute sulfuric acid was added to the boiling tube. Any gas produced was tested.

observations .....

.....

..... [3]

- (b) Identify the gas produced in (a).

..... [1]

- (c) Aqueous ammonia was added slowly until in excess to the solution produced in (a).

observations .....

.....

.....

..... [3]

**tests on solid H**

Tests were done and the following observations were made.

tests on solid H	observations
<b>test 1</b> Flame test	yellow flame
<b>test 2</b> Some of solid H was placed in a boiling tube. The boiling tube was heated strongly.	condensation appeared near the mouth of the boiling tube
Solid H was dissolved in distilled water. The solution was divided into two equal portions. <b>test 3</b> About 1 cm <sup>3</sup> of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the first portion of the solution.	the solution remained colourless
<b>test 4</b> About 1 cm <sup>3</sup> of dilute nitric acid followed by a few drops of aqueous barium nitrate were added to the second portion of the solution.	white precipitate

(d) What conclusion can be made from the result of **test 3**?

.....  
 ..... [1]

(e) What conclusions can be made about solid H from the results of **test 1**, **test 2** and **test 4**?

.....  
 .....  
 ..... [3]

[Total: 11]







# Cambridge IGCSE™

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**CHEMISTRY**

**0620/61**

Paper 6 Alternative to Practical

**May/June 2020**

MARK SCHEME

Maximum Mark: 40

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**Published**

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

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This document consists of **8** printed pages.

**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

**Science-Specific Marking Principles**

- 1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
- 2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
- 3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
- 4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

**5** 'List rule' guidance (see examples below)

For questions that require *n* responses (e.g. State **two** reasons ...):

- The response should be read as continuous prose, even when numbered answer spaces are provided
- Any response marked *ignore* in the mark scheme should not count towards *n*
- Incorrect responses should not be awarded credit but will still count towards *n*
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response
- Non-contradictory responses after the first *n* responses may be ignored even if they include incorrect science.

**6** Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form, (e.g.  $a \times 10^n$ ) in which the convention of restricting the value of the coefficient (*a*) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

**7** Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)	spots / baseline below solvent level	1
	baseline drawn in ink	1
1(b)(i)	black	1
1(b)(ii)	yellow (and) blue	1
1(b)(iii)	use an organic solvent / different solvent	1

Question	Answer	Marks
2(a)	all six burette readings correct <ul style="list-style-type: none"> <li>• 10.2 / 0.0</li> <li>• 25.9 / 5.5</li> <li>• 33.0 / 2.4</li> </ul>	2
	all readings to 1 dp	1
	initial and final readings the correct way round	1
	all subtractions correct to calculate volume added <ul style="list-style-type: none"> <li>• 10.2</li> <li>• 20.4</li> <li>• 30.6</li> </ul>	1
2(b)	(from) yellow	1
	(to) red / pink / orange	1
2(c)	solution F more concentrated (than solution E)	1
	1.5 times	1
2(d)	1:2	1

Question	Answer	Marks
2(e)	15.3	1
	cm <sup>3</sup>	1
2(f)(i)	clean / remove residues from previous experiment	1
2(f)(ii)	does not change amount of E / F or volumes / amounts already measured	1
2(g)	errors any <b>two</b> from: <ul style="list-style-type: none"> <li>• using measuring cylinder</li> <li>• missing endpoint / misjudging colour change</li> <li>• not repeating</li> </ul> improvements any <b>two</b> from: <ul style="list-style-type: none"> <li>• use pipette (in place of measuring cylinder)</li> <li>• add more slowly</li> <li>• repeat (and find mean)</li> </ul>	4

Question	Answer	Marks
3	<b>Tests on solid G</b>	
3(a)	any <b>three</b> from: <ul style="list-style-type: none"> <li>• bubble / fizz / effervescence</li> <li>• blue solution formed</li> <li>• (gas made turns) limewater</li> <li>• milky</li> </ul>	3
3(b)	<ul style="list-style-type: none"> <li>• carbon dioxide / CO<sub>2</sub></li> </ul>	1

Question	Answer	Marks
3(c)	blue	1
	precipitate	1
	dark(er) / royal blue and dissolves / solution	1
3(d)	not a halide	1
<b>tests on solid H</b>		
3(e)	hydrated	1
	sodium / Na <sup>+</sup> sulfate / SO <sub>4</sub> <sup>2-</sup>	1
	sodium sulfate = 2 Na <sub>2</sub> SO <sub>4</sub> = 2	

Question	Answer	Marks
4	<p>add metals to HCl in a beaker / flask / test-tube</p> <p><b>fair test – max 4</b></p> <ul style="list-style-type: none"> <li>• same volume HCl</li> <li>• same concentration HCl</li> <li>• same temperature acid</li> <li>• same mass / moles / amount metals</li> <li>• same surface area / form of metal</li> </ul> <p><b>measure</b></p> <ul style="list-style-type: none"> <li>• start timing when solid added</li> <li>• stop timing when all solid gone / reaction to stop</li> </ul>	6

Question	Answer	Marks
4	<p><b>OR</b></p> <ul style="list-style-type: none"><li>• start timing when solid added</li><li>• stop timing when collected set volume of gas</li></ul> <p><b>OR</b></p> <ul style="list-style-type: none"><li>• start timing when solid added</li><li>• measure volume of gas after a set time</li></ul> <p><b>OR</b></p> <ul style="list-style-type: none"><li>• measure temperature at start</li><li>• measure temperature after reaction <b>OR</b> highest temperature reached</li></ul> <p><b>conclusion</b></p> <ul style="list-style-type: none"><li>• shortest time is most reactive</li></ul> <p><b>OR</b></p> <ul style="list-style-type: none"><li>• biggest volume of gas most reactive</li></ul> <p><b>OR</b></p> <ul style="list-style-type: none"><li>• biggest temperature change most reactive</li></ul>	

### 3 2020 | May/June | Variant 2 | 0620\_s20\_qp\_62

#### Topic & Sub-topic Index of Questions

No.	Sub Q.	Topic	Subtopic	QP Page	MS Page
1	a	Chemistry of the environment	Water	45	60
1	b	Chemistry of the environment	Water	45	60
1	c	Chemistry of the environment	Water	45	60
1	d	Chemistry of the environment	Water	45	60
1	e(i)	States of matter	Solids, liquids and gases	46	60
1	e(ii)	Experimental techniques and chemical analysis	Experimental design	46	60
2	a	Experimental techniques and chemical analysis	Experimental design	48	60
2	b	Experimental techniques and chemical analysis	Experimental design	48	60
2	c	Experimental techniques and chemical analysis	Experimental design	49	60
2	d	Chemical reactions	Rate of reaction	49	60
2	e	Experimental techniques and chemical analysis	Experimental design	49	61
2	f(i)	Experimental techniques and chemical analysis	Experimental design	49	61
2	f(ii)	Experimental techniques and chemical analysis	Experimental design	49	61
2	g(i)	Experimental techniques and chemical analysis	Experimental design	50	61
2	g(ii)	Experimental techniques and chemical analysis	Experimental design	50	61
3	a	Experimental techniques and chemical analysis	Identification of ions and gases	51	61
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3	d	Experimental techniques and chemical analysis	Identification of ions and gases	51	61
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4		Acids, bases and salts	The characteristic properties of acids and bases	53	62

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# Cambridge IGCSE™

CANDIDATE  
NAME

CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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## CHEMISTRY

0620/62

Paper 6 Alternative to Practical

May/June 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 [ ].

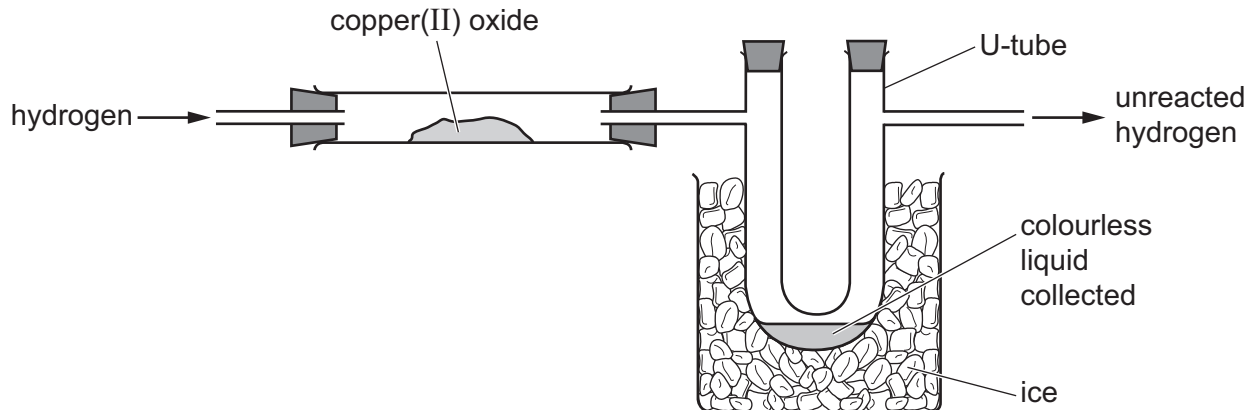
This document has **12** pages. Blank pages are indicated.





- 1 Hot copper(II) oxide reacts with hydrogen. The products are copper and steam.

The apparatus used to react copper(II) oxide with hydrogen is shown.



- (a) Draw an arrow **on the diagram** to show where the apparatus should be heated. [1]

- (b) During the reaction the colour of the copper(II) oxide changes.

State the colour change.

from ..... to ..... [1]

- (c) Identify the colourless liquid collected.

..... [1]

- (d) Explain why the U-tube is in ice.

.....  
 ..... [2]

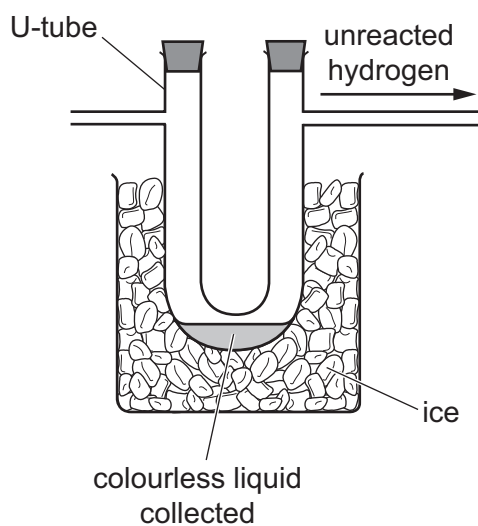
(e) (i) Large amounts of unreacted hydrogen should **not** be allowed to escape into the laboratory.

State why.

..... [1]

(ii) Complete the diagram to show how the unreacted hydrogen could be collected and its volume measured.

Label any apparatus that you draw.



[2]

[Total: 8]

- 2 A student investigated the temperature change when magnesium ribbon reacts with dilute sulfuric acid.

Five experiments were done.

*Experiment 1*

- Using a measuring cylinder, 20 cm<sup>3</sup> of dilute sulfuric acid were poured into a boiling tube.
- A thermometer was used to measure the initial temperature of the acid.
- A 1 cm length of magnesium ribbon was added to the acid in the boiling tube.
- The acid and magnesium ribbon in the boiling tube were stirred continuously using a thermometer.
- The highest temperature reached by the mixture was measured.
- The boiling tube was rinsed out with distilled water.

*Experiment 2*

- Experiment 1 was repeated using a 2 cm length of magnesium ribbon instead of the 1 cm length.

*Experiment 3*

- Experiment 1 was repeated using a 3 cm length of magnesium ribbon instead of the 1 cm length.

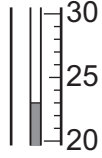
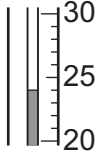
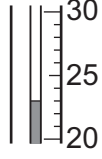
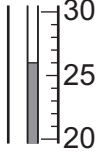
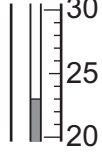
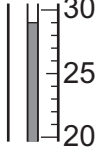
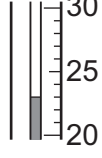
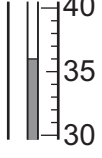
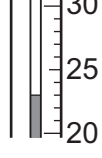
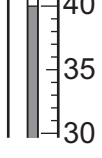
*Experiment 4*

- Experiment 1 was repeated using a 5 cm length of magnesium ribbon instead of the 1 cm length.

*Experiment 5*

- Experiment 1 was repeated using a 6 cm length of magnesium ribbon instead of the 1 cm length.

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

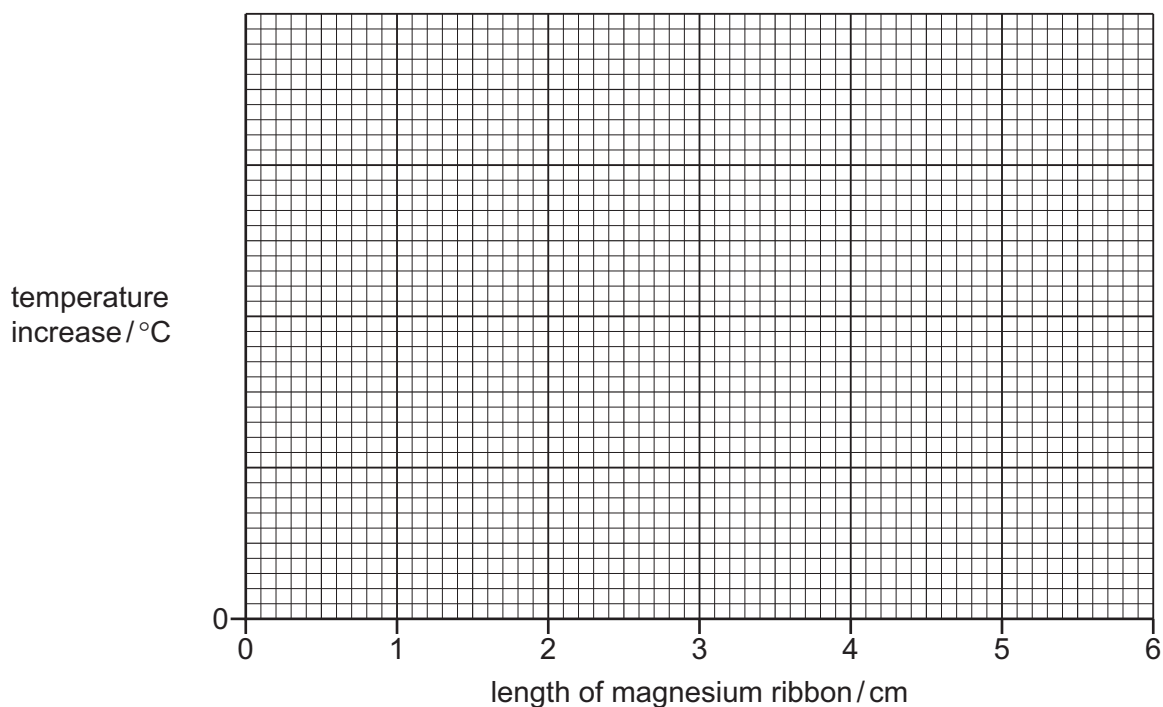
experiment	length of magnesium ribbon / cm	initial temperature		highest temperature		temperature increase / °C
		thermometer diagram	initial temperature of acid / °C	thermometer diagram	highest temperature of acid / °C	
1						
2						
3						
4						
5						

[4]

(b) In which experiment, 1, 2, 3, 4 or 5, was the temperature increase the largest?

..... [1]

- (c) Add a suitable scale to the y-axis and plot the results from Experiments 1 to 5 on the grid. Draw a smooth line graph, making sure that your line passes through (0,0).



[5]

- (d) Explain why the graph line must pass through (0,0).

.....  
 ..... [1]

- (e) **From your graph**, deduce the temperature increase if Experiment 1 is repeated using a 4 cm length of magnesium ribbon.

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

.....  
 [3]

- (f) (i) Why would carrying out the experiment in a polystyrene cup rather than a boiling tube improve the accuracy of the results?

.....  
 ..... [1]

- (ii) Sketch **on the grid** the graph you would expect if the experiment was repeated using a polystyrene cup instead of a boiling tube. [1]

(g) The volume of dilute sulfuric acid could be measured with a 20 cm<sup>3</sup> pipette.

(i) State **one** advantage of using a pipette rather than a measuring cylinder.

.....  
..... [1]

(ii) State **one** disadvantage of using a pipette rather than a measuring cylinder.

.....  
..... [1]

[Total: 18]

- 3 Two solids, solid **L** and solid **M**, were analysed. Solid **L** was chromium(III) chloride. Tests were done on each solid.

**tests on solid L**

Complete the expected observations.

Solid **L** was dissolved in distilled water to produce solution **L**. Solution **L** was divided into four portions in three test-tubes and a boiling tube.

- (a) To the first portion of solution **L** in the boiling tube, about 1 cm depth of dilute hydrochloric acid was added. The boiling tube was warmed gently.

A strip of filter paper was dipped in acidified potassium manganate(VII) solution and held at the mouth of the boiling tube.

observations ..... [1]

- (b) To the second portion of solution **L** aqueous sodium hydroxide was added slowly until it was in excess and no further changes were seen.

observations .....

.....

..... [2]

- (c) To the third portion of solution **L** aqueous ammonia was added slowly until it was in excess and no further changes were seen.

observations .....

.....

..... [2]

- (d) To the fourth portion of solution **L** about 1 cm depth of dilute nitric acid was added followed by about 1 cm depth of aqueous silver nitrate.

observations .....

..... [1]

**tests on solid M**

Tests were done and the following observations made.

tests on solid <b>M</b>	observations
<b>test 1</b> Flame test	yellow flame seen
<b>test 2</b> About 10 cm <sup>3</sup> of dilute nitric acid was added to solid <b>M</b> . Any gas produced was tested.	effervescence limewater turned milky
<b>test 3</b> About 1 cm depth of aqueous barium nitrate was added to the solution formed by adding dilute nitric acid to solid <b>M</b> in <b>test 2</b> .	no change

(e) Identify solid **M**.

..... [2]

[Total: 8]



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# Cambridge IGCSE™

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**CHEMISTRY**

**0620/62**

Paper 6 Alternative to Practical

**May/June 2020**

MARK SCHEME

Maximum Mark: 40

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

**Science-Specific Marking Principles**

- 1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
- 2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
- 3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
- 4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

5 'List rule' guidance (see examples below)

For questions that require *n* responses (e.g. State **two** reasons ...):

- The response should be read as continuous prose, even when numbered answer spaces are provided
- Any response marked *ignore* in the mark scheme should not count towards *n*
- Incorrect responses should not be awarded credit but will still count towards *n*
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response
- Non-contradictory responses after the first *n* responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form, (e.g.  $a \times 10^n$ ) in which the convention of restricting the value of the coefficient (*a*) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)	arrow under copper(II) oxide pointing up to the copper(II) oxide	1
1(b)	start: black final: brown	1
1(c)	water	1
1(d)	to cool	1
	so that the steam / gas condenses / turns into a liquid	1
1(e)(i)	flammable / explosive	1
1(e)(ii)	method of collection shown would work	1
	collection apparatus is graduated	1

Question	Answer	Marks
2(a)	lengths completed correctly (1, 2, 3, 5, 6)	1
	10 correct thermometer readings (23 × 5, 24, 26, 29, 36, 40)	2
	All temperature increases worked out correctly (1, 3, 6, 13, 17)	1
2(b)	5	1
2(c)	scale has one big square = 5	1
	all five points plotted correctly	2
	best fit line through points	1
	which passes within half a small square of (0, 0)	1
2(d)	there is no reaction (with no magnesium)	1

Question	Answer	Marks
2(e)	working shown on graph	1
	correct reading	1
	units of °C shown	1
2(f)(i)	(polystyrene is a better) insulator	1
2(f)(ii)	sketch line starts at same point as plotted line for 0 cm magnesium and then is above plotted line at all non-zero lengths of magnesium.	1
2(g)(i)	more accurate	1
2(g)(ii)	slower	1

Question	Answer	Marks
3	<b>Tests on solution L</b>	
3(a)	stays purple or no change	1
3(b)	green ppt	1
	(dissolves / soluble) producing a green solution	1
3(c)	grey-green precipitate	1
	remains in excess / does not dissolve	1
3(d)	white precipitate	1

Question	Answer	Marks
	<b>Tests on solid M</b>	
3(e)	sodium / Na <sup>+</sup>	1
	carbonate / CO <sub>3</sub> <sup>2-</sup>	1

Question	Answer	Marks
4	Any six from: <ul style="list-style-type: none"><li>• stated / equal volumes of each cleaner</li><li>• measured with pipette / measuring cylinder / burette into a beaker or flask</li><li>• named indicator added</li><li>• add hydrochloric acid</li><li>• from a burette</li><li>• until indicator changes colour</li><li>• record / calculate volume acid added</li><li>• biggest volume of acid is most concentrated</li></ul>	6

## 4 2020 | May/June | Variant 3 | 0620\_s20\_qp\_63

### Topic & Sub-topic Index of Questions

No.	Sub Q.	Topic	Subtopic	QP Page	MS Page
1	a	Experimental techniques and chemical analysis	Experimental design	65	81
1	b	Acids, bases and salts	Preparation of salts	65	81
1	c(i)	Experimental techniques and chemical analysis	Experimental design	65	81
1	c(ii)	Experimental techniques and chemical analysis	Experimental design	65	81
1	d	Experimental techniques and chemical analysis	Experimental design	65	81
2	a	Experimental techniques and chemical analysis	Experimental design	67	81
2	b	Experimental techniques and chemical analysis	Experimental design	68	81
2	c(i)	Stoichiometry	The mole and the Avogadro constant	68	81
2	c(ii)	Experimental techniques and chemical analysis	Experimental design	68	82
2	c(iii)	Acids, bases and salts	The characteristic properties of acids and bases	69	82
2	d	Experimental techniques and chemical analysis	Experimental design	69	82
2	e	Experimental techniques and chemical analysis	Experimental design	69	82
2	f	Experimental techniques and chemical analysis	Experimental design	69	82
3	a	Experimental techniques and chemical analysis	Identification of ions and gases	70	82
3	b	Experimental techniques and chemical analysis	Identification of ions and gases	70	82
3	c	Experimental techniques and chemical analysis	Identification of ions and gases	71	82
3	d	Experimental techniques and chemical analysis	Identification of ions and gases	71	82
3	e(i)	Experimental techniques and chemical analysis	Identification of ions and gases	71	82
3	e(ii)	Experimental techniques and chemical analysis	Identification of ions and gases	71	83
3	e(iii)	Experimental techniques and chemical analysis	Identification of ions and gases	71	83
4		Experimental techniques and chemical analysis	Acid–base titrations	72	83

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# Cambridge IGCSE™

CANDIDATE  
NAME

CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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## CHEMISTRY

0620/63

Paper 6 Alternative to Practical

May/June 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 [ ].

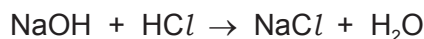
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This document has **12** pages. Blank pages are indicated.





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



Eight experiments were done.

*Experiment 1*

- A polystyrene cup was placed into a 250 cm<sup>3</sup> beaker for support.
- Using a measuring cylinder, 5 cm<sup>3</sup> of aqueous sodium hydroxide was poured into the polystyrene cup.
- Using a measuring cylinder, 45 cm<sup>3</sup> 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<sup>3</sup> of aqueous sodium hydroxide and 40 cm<sup>3</sup> of dilute hydrochloric acid.

*Experiment 3*

- Experiment 1 was repeated using 15 cm<sup>3</sup> of aqueous sodium hydroxide and 35 cm<sup>3</sup> of dilute hydrochloric acid.

*Experiment 4*

- Experiment 1 was repeated using 20 cm<sup>3</sup> of aqueous sodium hydroxide and 30 cm<sup>3</sup> of dilute hydrochloric acid.

*Experiment 5*

- Experiment 1 was repeated using 30 cm<sup>3</sup> of aqueous sodium hydroxide and 20 cm<sup>3</sup> of dilute hydrochloric acid.

*Experiment 6*

- Experiment 1 was repeated using 35 cm<sup>3</sup> of aqueous sodium hydroxide and 15 cm<sup>3</sup> of dilute hydrochloric acid.

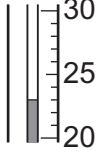
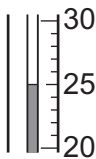
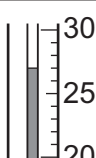
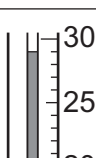
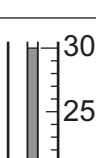
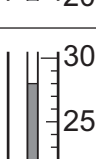
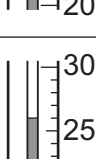
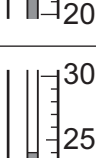
*Experiment 7*

- Experiment 1 was repeated using 40 cm<sup>3</sup> of aqueous sodium hydroxide and 10 cm<sup>3</sup> of dilute hydrochloric acid.

*Experiment 8*

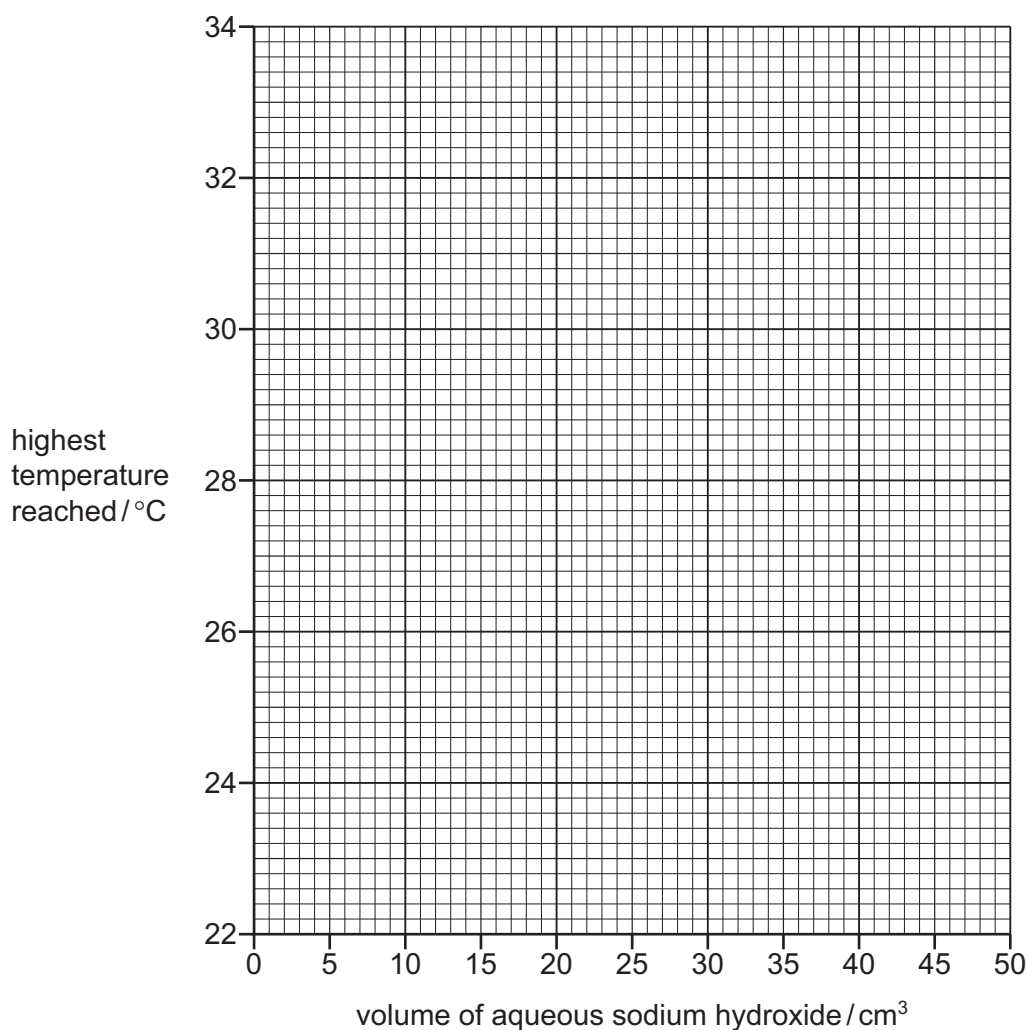
- Experiment 1 was repeated using 45 cm<sup>3</sup> of aqueous sodium hydroxide and 5 cm<sup>3</sup> of dilute hydrochloric acid.

- (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 <sup>3</sup>	volume of dilute hydrochloric acid / cm <sup>3</sup>	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<sup>3</sup>

volume of dilute hydrochloric acid = ..... cm<sup>3</sup>

[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]

- 3 Two solids, solid **N** and solid **P**, were analysed. Tests were done on each solid.

**tests on solid N**

Tests were done and the following observations made.

tests on solid <b>N</b>	observations
<p>Solid <b>N</b> was dissolved in distilled water to produce solution <b>N</b>. The solution was divided into three equal portions in three boiling tubes.</p> <p><b>test 1</b></p> <p>Aqueous sodium hydroxide was added slowly until in excess to the first portion of solution <b>N</b>.</p>	<p>white precipitate formed, the precipitate dissolved in excess aqueous sodium hydroxide forming a colourless solution</p>
<p><b>test 2</b></p> <p>Aqueous ammonia was added slowly until in excess to the second portion of solution <b>N</b>.</p>	<p>white precipitate formed, the precipitate dissolved in excess aqueous ammonia forming a colourless solution</p>
<p><b>test 3</b></p> <p>Aluminium foil and aqueous sodium hydroxide were added to the third portion of solution <b>N</b>. The mixture was heated using a Bunsen burner. Any gas produced was tested with damp red litmus paper.</p>	<p>effervescence was seen, the damp red litmus paper turned blue</p>

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

..... [1]

- (b) Identify solid **N**.

.....

..... [2]

**tests on solid P**

Solid **P** was potassium iodide.

Complete the expected observations.

**(c)** Describe the appearance of solid **P**.

..... [1]

**(d)** A flame test was done on solid **P**.

observations ..... [1]

**(e)** Solid **P** was dissolved in distilled water to produce solution **P**. Solution **P** was divided into three equal portions in three test-tubes.

**(i)** About 1 cm depth of dilute nitric acid and a few drops of aqueous silver nitrate were added to the first portion of solution **P**.

observations .....  
..... [1]

**(ii)** About 1 cm depth of dilute nitric acid and a few drops of aqueous barium nitrate were added to the second portion of solution **P**.

observations .....  
..... [1]

**(iii)** A few drops of aqueous bromine were added to the third portion of solution **P**.

observations .....  
..... [1]

[Total: 8]







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## Cambridge IGCSE™

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CHEMISTRY

0620/63

Paper 6 Alternative to Practical

May/June 2020

MARK SCHEME

Maximum Mark: 40

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**Published**

Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

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This document consists of **8** printed pages.

**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

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Marks awarded are always **whole marks** (not half marks, or other fractions).

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- marks are not deducted for omissions
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Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

**Science-Specific Marking Principles**

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- 2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
- 3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
- 4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

5 'List rule' guidance (see examples below)

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- Any response marked *ignore* in the mark scheme should not count towards *n*
- Incorrect responses should not be awarded credit but will still count towards *n*
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response
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6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form, (e.g.  $a \times 10^n$ ) in which the convention of restricting the value of the coefficient (*a*) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)	mortar	1
1(b)	(to) speed up (the dissolving)	1
1(c)(i)	funnel	1
1(c)(ii)	residue	1
1(d)	place in an evaporating basin and heat	1
	to the point of crystallisation	1
	cool <b>and</b> filter <b>and</b> dry crystals with filter / absorbent paper	1

Question	Answer	Marks
2(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
2(b)	all eight points plotted correctly	2
	two suitable straight lines drawn	1
	<u>straight</u> lines extended so that they cross	1
2(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
2(c)(ii)	correct value based on graph drawn	1
	°C	1
2(c)(iii)	dilute hydrochloric acid <b>and</b> as volume less than sodium hydroxide	1
2(d)	lines under plotted line	1
	maximum temperature at same volume as plotted line	1
2(e)(i)	advantage: more accurate	1
	disadvantage: slower	1
2(f)	repeat and compare	2

Question	Answer	Marks
3	<b>Tests on solid N</b>	
3(a)	ammonia	1
3(b)	zinc / Zn <sup>2+</sup>	1
	nitrate / NO <sub>3</sub> <sup>-</sup>	1
	<b>Tests on solid P</b>	
3(c)	white	1
3(d)	lilac	1
3(e)(i)	(pale) yellow precipitate	1

Question	Answer	Marks
3(e)(ii)	no change	1
3(e)(iii)	becomes brown / orange / yellow	1

Question	Answer	Marks
4	<p>any six from:</p> <p><b>gas volume method</b></p> <ul style="list-style-type: none"> <li>• weigh both washing powders or equal masses of both washing powders</li> <li>• place in suitable container (flask / boiling tube / test-tube)</li> <li>• add acid</li> <li>• to excess / until no more fizzing</li> <li>• collect gas</li> <li>• in gas syringe or by downward displacement in measuring cylinder</li> <li>• measure volume of gas</li> <li>• largest volume of gas has most sodium carbonate</li> </ul> <p><b>OR</b></p> <p><b>mass loss method</b></p> <ul style="list-style-type: none"> <li>• weigh both washing powders or equal masses of both washing powders</li> <li>• place in suitable container (flask / boiling tube / test-tube / beaker)</li> <li>• add acid</li> <li>• to excess / until no more fizzing</li> <li>• weigh mixture once acid added</li> <li>• weigh mixture at end</li> <li>• calculate mass drop</li> <li>• largest mass drop has most sodium carbonate</li> </ul>	6

Question	Answer	Marks
4	<b>OR</b> <b>titration method</b> <ul style="list-style-type: none"><li>• weigh both washing powders or equal masses of both washing powders</li><li>• place in suitable container (flask / beaker)</li><li>• dissolve in water</li><li>• add named indicator (not UI)</li><li>• add acid from burette</li><li>• stop when indicator changes colour</li><li>• record start and final reading on burette</li><li>• largest volume of acid used has most sodium carbonate</li></ul>	

## 5 2020 | Oct/Nov | Variant 1 | 0620\_w20\_qp\_61

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1	c	Organic chemistry	Alcohols	88	104
1	d	Experimental techniques and chemical analysis	Separation and purification	89	104
1	e	Experimental techniques and chemical analysis	Experimental design	89	104
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2	c	Experimental techniques and chemical analysis	Experimental design	92	105
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4		Experimental techniques and chemical analysis	Separation and purification	96	107

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# Cambridge IGCSE™

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**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 [ ].

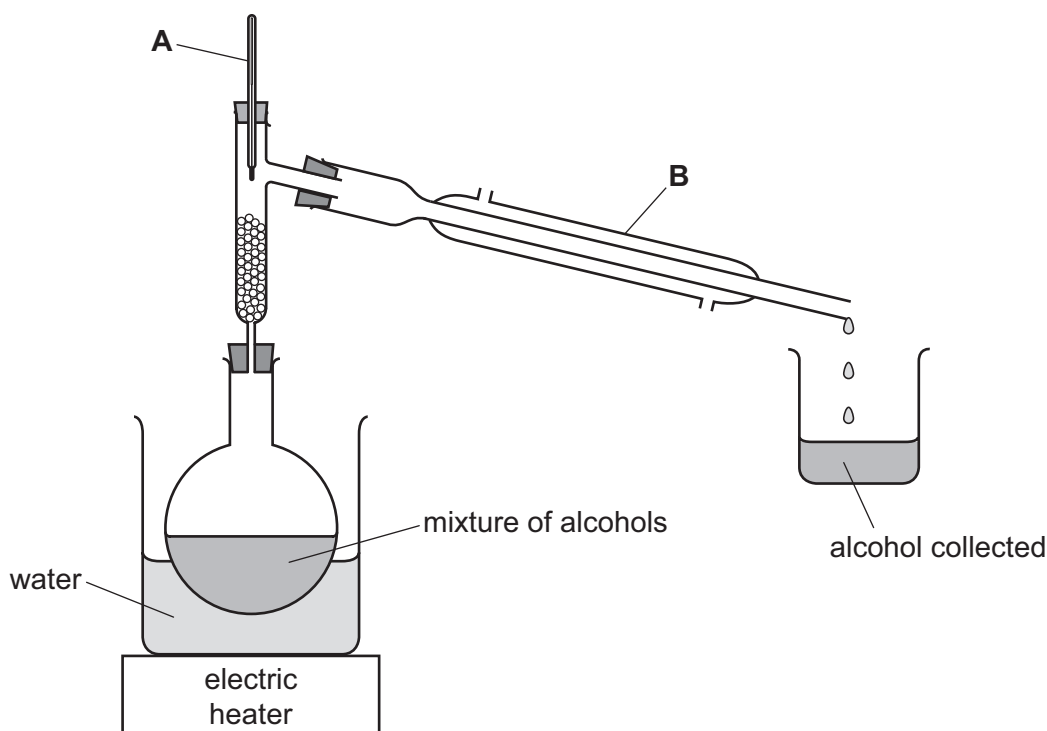
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1 The table gives the boiling points of four alcohols.

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]

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

.....  
.....  
..... [2]

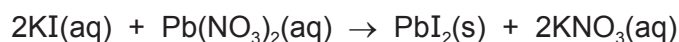
(e) Explain why the apparatus in the diagram **cannot** be used to obtain butanol from the mixture.

.....  
..... [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.



The student did seven experiments.

*Experiment 1*

- Using a 50 cm<sup>3</sup> measuring cylinder, 25 cm<sup>3</sup> of aqueous potassium iodide was poured into a beaker.
- Using a clean 50 cm<sup>3</sup> measuring cylinder, 10 cm<sup>3</sup> 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.

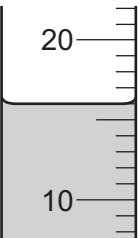
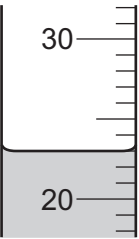


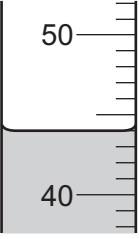
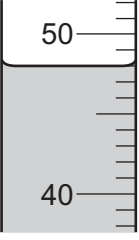
*Experiment 6*

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

*Experiment 7*

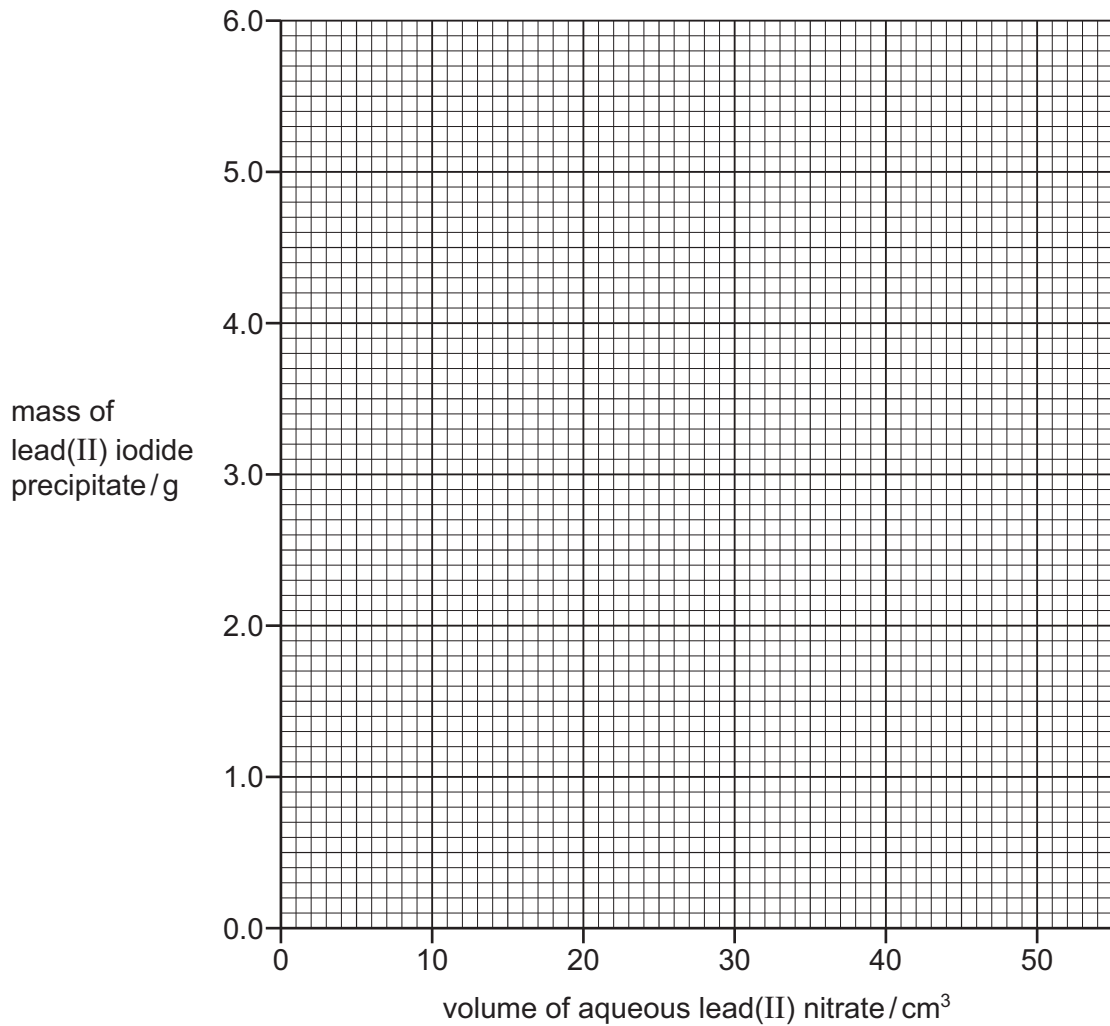
- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 6.

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

experiment	volume of aqueous potassium iodide / cm <sup>3</sup>	measuring cylinder diagram for aqueous lead(II) nitrate	volume of aqueous lead(II) nitrate / cm <sup>3</sup>	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  $20\text{ cm}^3$  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<sup>3</sup> pipette to measure the volume of aqueous potassium iodide would be an improvement.

.....  
..... [1]

(ii) State why a 25.0 cm<sup>3</sup> 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.

.....  
.....  
.....  
.....  
.....  
..... [3]

[Total: 17]

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

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

- (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<sup>3</sup> 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<sup>3</sup> 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]



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# Cambridge IGCSE™

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**CHEMISTRY**

**0620/61**

Paper 6 Alternative to Practical

**October/November 2020**

MARK SCHEME

Maximum Mark: 40

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2020 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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This document consists of **9** printed pages.

**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

## GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

## GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

## Science-Specific Marking Principles

1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.

2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.

3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).

4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

5 'List rule' guidance

For questions that require *n* responses (e.g. State **two** reasons ...):

- The response should be read as continuous prose, even when numbered answer spaces are provided.
- Any response marked *ignore* in the mark scheme should not count towards *n*.
- Incorrect responses should not be awarded credit but will still count towards *n*.
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response.
- Non-contradictory responses after the first *n* responses may be ignored even if they include incorrect science.

**6** Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g.  $a \times 10^n$ ) in which the convention of restricting the value of the coefficient ( $a$ ) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

**7** Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

<b>Examples of how to apply the list rule</b>			
State <b>three</b> reasons ... [3]			
<b>A</b>	1. Correct	✓	<b>2</b>
	2. Correct	✓	
	3. Wrong	✗	
<b>B</b> (4 responses)	1. Correct, Correct	✓, ✓	<b>3</b>
	2. Correct	✓	
	3. Wrong	ignore	
<b>C</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct, Wrong	✓, ✗	
	3. Correct	ignore	
<b>D</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct, CON (of 2.)	✗, (discount 2)	
	3. Correct	✓	
<b>E</b> (4 responses)	1. Correct	✓	<b>3</b>
	2. Correct	✓	
	3. Correct, Wrong	✓	
<b>F</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct	✓	
	3. Correct CON (of 3.)	✗ (discount 3)	
<b>G</b> (5 responses)	1. Correct	✓	<b>3</b>
	2. Correct	✓	
	3. Correct Correct CON (of 4.)	✓ ignore ignore	
<b>H</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct	✗	
	3. CON (of 2.) Correct	(discount 2) ✓	
<b>I</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct	✗	
	3. Correct CON (of 2.)	✓ (discount 2)	

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

Question	Answer	Marks
2(a)	Measuring cylinder readings: 16; 23; 29; 39; 44; 48	2
2(b)	<b>M1</b> and <b>M2</b> all points plotted correctly <b>M3</b> ruler drawn straight line through first 4 points <b>M4</b> ruler drawn straight line through last three points <b>M5</b> straight lines have been extended so that they meet / cross	5
2(c)	working on graph	1
	correct reading from their working on graph	1
2(d)	all potassium iodide reacted / used-up	1
2(e)	maximum mass of precipitate is 2.55 g	1
	maximum mass reached at half volume of plotted graph	1
2(f)(i)	(more) accurate / precise (than a measuring cylinder)	1
2(f)(ii)	(pipette measures a) fixed volume / 25 cm <sup>3</sup>	1
2(g)	filter	1
	wash / rinse residue	1
	dry <b>and</b> weigh	1

Question	Answer	Marks
<b>Tests on solid Y</b>		
3(a)	ammonia	1
3(b)	aluminium / $Al^{3+}$	1
	nitrate / $NO_3^-$	1
3(c)	(weakly) acidic	1
<b>Tests on solid Z</b>		
3(d)	green precipitate	1
	precipitate insoluble / remains / no further change	1
3(e)	no change	1
3(f)	no change / remains purple	1
3(g)	white precipitate	1

Question	Answer	Marks
4	<p><b>M1</b> whatever method is used, suitable apparatus – such as a flask or beaker – has been used.</p> <p><i>Copper(II) sulfate first</i></p> <p><b>M2</b> add water (to dissolve copper sulfate) <b>and</b> later adds propanone (to dissolve cetyl alcohol)</p> <p><b>M3</b> stir / swirl / mix</p> <p><b>M4</b> filter (to remove silicon dioxide and cetyl alcohol)</p> <p><b>M5</b> evaporate solvent from filtrate or description. This must be done for the solutions obtained using both solvents.</p> <p><b>M6</b> filter and wash / rinse residue after adding the second solvent</p> <p><b>M7</b> dry residue (silicon dioxide)</p> <p><b>OR</b></p> <p><i>cetyl alcohol first</i></p> <p><b>M2</b> add propanone (to dissolve cetyl alcohol) <b>and</b> later adds water (to dissolve copper(II) sulfate)</p> <p><b>M3</b> stir / swirl / mix</p> <p><b>M4</b> filter (to remove silicon dioxide and copper(II) sulfate)</p> <p><b>M5</b> evaporate solvent from filtrate or description. This must be done for the solutions obtained using both solvents.</p> <p><b>M6</b> filter and wash residue after adding the second solvent</p> <p><b>M7</b> dry residue (silicon dioxide)</p> <p><b>max 6</b></p>	<b>6</b>

## 6 2020 | Oct/Nov | Variant 2 | 0620\_w20\_qp\_62

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1	c	Electrochemistry	Electrolysis	110	127
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**CHEMISTRY**

**0620/62**

Paper 6 Alternative to Practical

**October/November 2020**

**1 hour**

You must answer on the question paper.

No additional materials are needed.

## INSTRUCTIONS

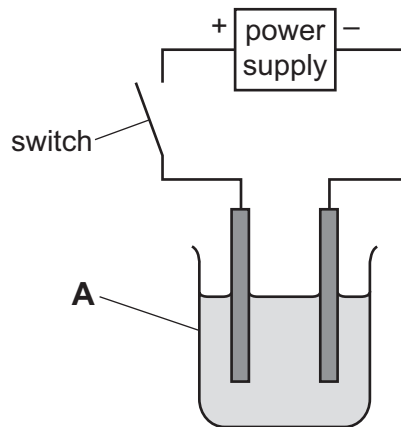
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction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

- 1 The diagram shows the apparatus used to pass an electric current through concentrated hydrochloric acid. Hydrogen and chlorine were formed at the electrodes.



- (a) Name the item of apparatus labelled **A**.

..... [1]

- (b) The electrodes were made of platinum.

- (i) Give **two** reasons why platinum is a suitable material for the electrodes.

1 .....

2 .....

[2]

- (ii) Suggest another material suitable to use as electrodes in this experiment.

..... [1]

- (c) The teacher doing this experiment wore safety glasses, gloves, had their hair tied back and stood up throughout the experiment.

State **one** other safety precaution that should be taken when doing this experiment.  
Explain your answer.

safety precaution .....

explanation .....

[2]

[Total: 6]

- 2 A student investigated the rate of a reaction between sodium metabisulfite and potassium iodate. In the reaction, starch was used as an indicator. At first the reacting mixture remained colourless but then suddenly changed to a blue-black colour.

Five experiments were done. In each experiment the total volume of liquid was 45 cm<sup>3</sup>.

*Experiment 1*

- Using a 10 cm<sup>3</sup> measuring cylinder, 5 cm<sup>3</sup> of aqueous sodium metabisulfite was poured into a beaker.
- Using another 10 cm<sup>3</sup> measuring cylinder, 5 cm<sup>3</sup> of aqueous starch was poured into the beaker.
- Using a 25 cm<sup>3</sup> measuring cylinder, 15 cm<sup>3</sup> of distilled water was poured into the beaker.
- Using another 25 cm<sup>3</sup> measuring cylinder, 20 cm<sup>3</sup> of aqueous potassium iodate was poured into the beaker. At the same time a stop-clock was started.
- The mixture in the beaker was stirred until a sudden colour change was seen.
- The stop-clock was immediately stopped and the time recorded.
- The beaker was rinsed with water.

*Experiment 2*

- Experiment 1 was repeated using 17 cm<sup>3</sup> of distilled water and 18 cm<sup>3</sup> of aqueous potassium iodate.

*Experiment 3*

- Experiment 1 was repeated using 21 cm<sup>3</sup> of distilled water and 14 cm<sup>3</sup> of aqueous potassium iodate.

*Experiment 4*

- Experiment 1 was repeated using 23 cm<sup>3</sup> of distilled water and 12 cm<sup>3</sup> of aqueous potassium iodate.

*Experiment 5*

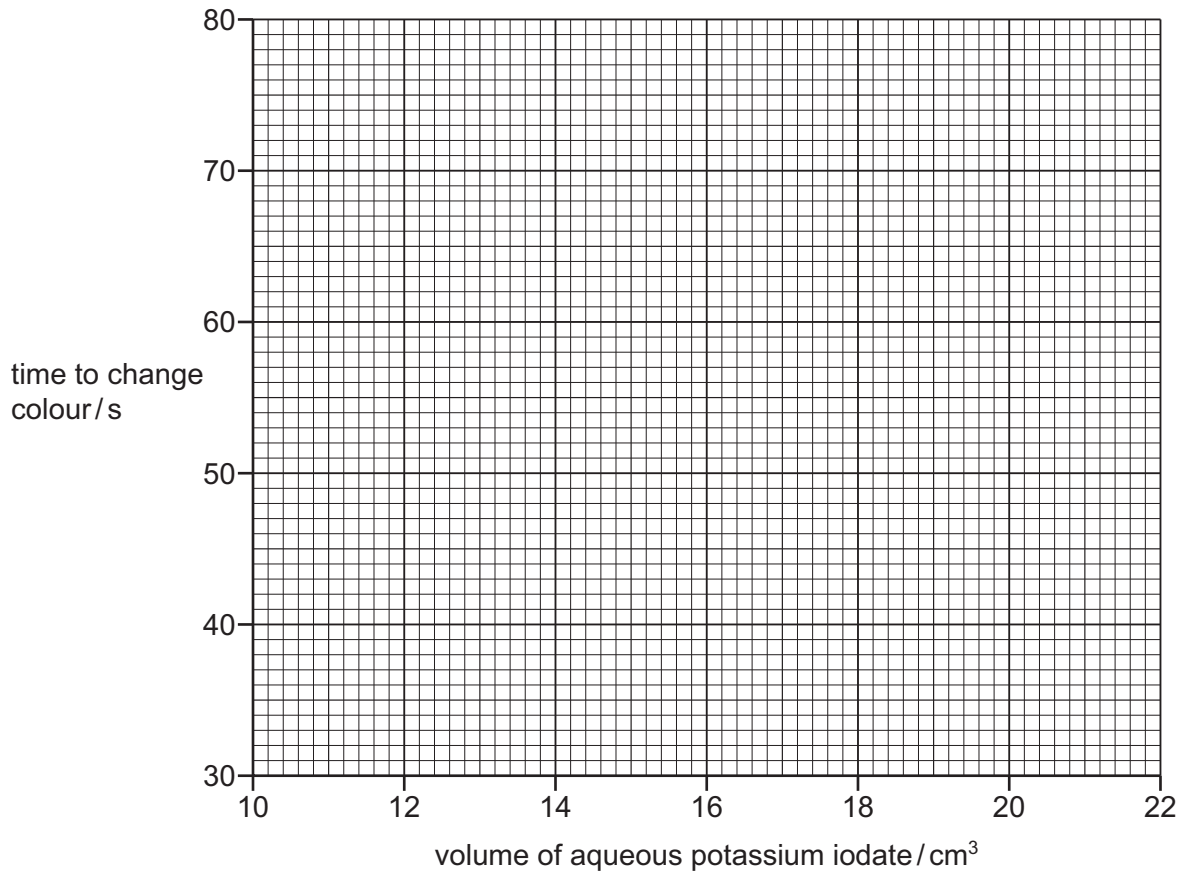
- Experiment 1 was repeated using 25 cm<sup>3</sup> of distilled water and 10 cm<sup>3</sup> of aqueous potassium iodate.

(a) Use the information in the description of the experiments and the stop-clock diagrams to complete the table. Record the times in **seconds**.

experiment	volume of aqueous sodium metabisulfite / cm <sup>3</sup>	volume of distilled water / cm <sup>3</sup>	volume of aqueous potassium iodate / cm <sup>3</sup>	stop-clock diagram	time to change colour / s
1			20		
2			18		
3			14		
4			12		
5			10		

[5]

- (b) Plot the results from Experiments 1 to 5 on the grid.  
Draw a smooth curve of best fit.



[3]

- (c) (i) **From your graph**, predict the time to change colour if  $16 \text{ cm}^3$  of aqueous potassium iodate was used.

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

time to change colour = ..... s [2]

- (ii) Calculate the volume of distilled water required if  $16 \text{ cm}^3$  of aqueous potassium iodate was used.

volume of distilled water = .....  $\text{cm}^3$  [1]

- (d) Sketch **on the grid** the graph you would expect if Experiments 1 to 5 were repeated at a higher temperature. [1]

- (e) The concentration of potassium iodate in the reaction mixture in each experiment can be calculated using the equation shown.

$$\text{concentration} = \frac{0.05 \times \text{volume of aqueous potassium iodate}}{45}$$

- (i) Calculate the concentration of potassium iodate in the reaction mixture in Experiment 2.

$$\text{concentration} = \dots\dots\dots \text{ mol/dm}^3 \quad [1]$$

- (ii) State which experiment, 1, 2, 3, 4 or 5, had the fastest rate of reaction.

..... [1]

- (f) Suggest why the volume of distilled water added to each experiment was increased as the volume of aqueous potassium iodate was decreased.

.....  
 ..... [1]

- (g) Give **one** change you could make to the apparatus used which would improve the results. Explain your answer.

change to apparatus .....

.....

explanation .....

..... [2]

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

.....  
 ..... [1]

[Total: 18]

- 3 Solid **Q** and solid **R** were analysed. Solid **Q** was zinc carbonate.  
Tests were done on each solid.

**tests on solid Q**

Complete the expected observations.

- (a) Solid **Q** was placed in a boiling tube. About 10 cm<sup>3</sup> of dilute sulfuric acid was added to the boiling tube. Any gas produced was tested.  
The contents of the boiling tube were kept for (c).

observations .....

.....

..... [3]

- (b) Identify the gas given off in (a).

..... [1]

- (c) The reaction mixture from (a) was filtered.  
The filtrate was solution **S**. 1 cm depth of solution **S** was poured into a boiling tube.

- (i) Aqueous sodium hydroxide was added dropwise and then in excess to solution **S** in the boiling tube.

observations .....

.....

..... [2]

- (ii) Explain why it is **not** possible to identify the cation contained in solution **S** from your observations in (c)(i).

.....

..... [1]

- (iii) Suggest an additional test that can be done on solution **S** to confirm the cation was Zn<sup>2+</sup>.

.....

..... [1]

**tests on solid R**

Tests were done and the following observations were made.

tests on solid <b>R</b>	observations
<p><b>test 1</b></p> <p>A flame test was done on solid <b>R</b>.</p>	<p>yellow flame</p>
<p>Solid <b>R</b> was dissolved in distilled water to produce solution <b>R</b>. The solution was divided into two equal portions in two test-tubes.</p> <p><b>test 2</b></p> <p>About 1 cm<sup>3</sup> of dilute nitric acid followed by a few drops of aqueous silver nitrate were added to the first portion of solution <b>R</b>.</p>	<p>yellow precipitate formed</p>
<p><b>test 3</b></p> <p>The second portion of solution <b>R</b> was added to 1 cm<sup>3</sup> of aqueous bromine in a test-tube.</p>	<p>the solution changed colour from orange to brown</p>

(d) Identify solid **R**.

.....  
 ..... [2]

[Total: 10]







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# Cambridge IGCSE™

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**CHEMISTRY**

**0620/62**

Paper 6 Alternative to Practical

**October/November 2020**

MARK SCHEME

Maximum Mark: 40

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

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Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
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Marks awarded are always **whole marks** (not half marks, or other fractions).

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- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
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1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.

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Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

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Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

**7** Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

<b>Examples of how to apply the list rule</b>			
State <b>three</b> reasons ... [3]			
<b>A</b>	1. Correct	✓	<b>2</b>
	2. Correct	✓	
	3. Wrong	✗	
<b>B</b> (4 responses)	1. Correct, Correct	✓, ✓	<b>3</b>
	2. Correct	✓	
	3. Wrong	ignore	
<b>C</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct, Wrong	✓, ✗	
	3. Correct	ignore	
<b>D</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct, CON (of 2.)	✗, (discount 2)	
	3. Correct	✓	
<b>E</b> (4 responses)	1. Correct	✓	<b>3</b>
	2. Correct	✓	
	3. Correct, Wrong	✓	
<b>F</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct	✓	
	3. Correct CON (of 3.)	✗ (discount 3)	
<b>G</b> (5 responses)	1. Correct	✓	<b>3</b>
	2. Correct	✓	
	3. Correct Correct CON (of 4.)	✓ ignore ignore	
<b>H</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct	✗	
	3. CON (of 2.) Correct	(discount 2) ✓	
<b>I</b> (4 responses)	1. Correct	✓	<b>2</b>
	2. Correct	✗	
	3. Correct CON (of 2.)	✓ (discount 2)	

Question	Answer	Marks
1(a)	beaker	1
1(b)(i)	conduct electricity	1
	inert	1
1(b)(ii)	carbon / graphite	1
1(d)	use a fume cupboard	1
	chlorine is toxic	1

Question	Answer	Marks
2(a)	all volumes of sodium metabisulfite completed as 5	1
	all volumes of water (15, 17, 21, 23, 25) correct.	1
	all times recorded correctly (38, 42, 53, 61, 72)	2
	all five times in seconds only	1
2(b)	all 5 points plotted correctly	2
	suitable best fit curve drawn. Line must go through / within half a square of correctly plotted points	1
2(c)(i)	correct working shown on graph	1
	time correct for their working	1
2(c)(ii)	19	1
2(d)	line is below plotted line and does not meet / touch plotted line.	1
2(e)(i)	0.02	1

Question	Answer	Marks
2(e)(ii)	1	1
2(f)	to keep total volume constant / so concentration of sodium metabisulphite does not change	1
2(g)	change: use a pipette / burette (in place of a measuring cylinder)	1
	explanation: more accurate / precise (than a measuring cylinder)	1
2(h)	repeat <b>and</b> compare the results	1

Question	Answer	Marks
3	<b>Tests on solid Q</b>	
3(a)	fizzing / effervescence / bubbles	1
	(some of the) solid dissolves / disappears <b>OR</b> colourless solution	1
	limewater turns milky	1
3(b)	carbon dioxide / CO <sub>2</sub>	1
3(c)(i)	white precipitate	1
	dissolves / forms a colourless solution	1
3(c)(ii)	aluminium (ions) give the same result	1
3(c)(iii)	add (excess) ammonia (solution)	1
3(d)	<b>Tests on solid R</b>	
	sodium / Na <sup>+</sup>	1
	iodide / I <sup>-</sup>	1

Question	Answer	Marks
4	Any 6 from: <ul style="list-style-type: none"><li>• weigh brass / known mass of brass</li><li>• add (dilute) <u>sulfuric</u> acid and heat / hot / warm</li><li>• excess acid</li><li>• filter</li><li>• wash and dry residue / solid</li><li>• weigh (copper) residue / solid (copper)</li><li>• percentage zinc calculated correctly</li></ul>	<b>6</b>

## 7 2020 | Oct/Nov | Variant 3 | 0620\_w20\_qp\_63

### Topic & Sub-topic Index of Questions

No.	Sub Q.	Topic	Subtopic	QP Page	MS Page
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1	b	Metals	Reactivity series	132	148
1	c	Experimental techniques and chemical analysis	Experimental design	132	148
1	d	Experimental techniques and chemical analysis	Experimental design	133	148
1	e	Experimental techniques and chemical analysis	Identification of ions and gases	133	148
2	a	Experimental techniques and chemical analysis	Experimental design	134	148
2	b	Experimental techniques and chemical analysis	Acid–base titrations	135	148
2	c(i)	Acids, bases and salts	The characteristic properties of acids and bases	135	148
2	c(ii)	Acids, bases and salts	The characteristic properties of acids and bases	135	148
2	d	Stoichiometry	The mole and the Avogadro constant	136	148
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2	f(i)	Experimental techniques and chemical analysis	Experimental design	136	149
2	f(ii)	Experimental techniques and chemical analysis	Experimental design	136	149
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3	a	Acids, bases and salts	The characteristic properties of acids and bases	137	149
3	b	Experimental techniques and chemical analysis	Identification of ions and gases	137	149
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3	d(i)	Experimental techniques and chemical analysis	Identification of ions and gases	138	149
3	d(ii)	Experimental techniques and chemical analysis	Identification of ions and gases	138	149
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3	f	Experimental techniques and chemical analysis	Identification of ions and gases	138	150
3	g	Experimental techniques and chemical analysis	Identification of ions and gases	138	150
4		Experimental techniques and chemical analysis	Experimental design	139	150

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# Cambridge IGCSE™

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NAME

CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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**CHEMISTRY**

**0620/63**

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

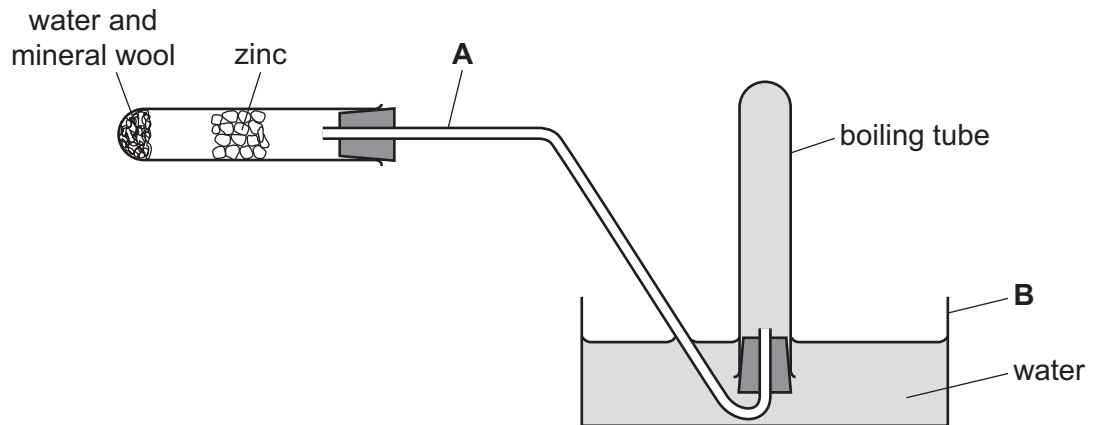
- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

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



1 Hot zinc reacts with steam to make zinc oxide and hydrogen gas.

A student wanted to use the apparatus shown to react zinc with steam and to collect the hydrogen.



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

**A** .....

**B** .....

[2]

(b) State the purpose of the mineral wool.

.....

..... [1]

(c) The apparatus shown is dangerous to use because of an error in the way it has been set up.

Identify this error.

Explain why this error makes it dangerous to use the apparatus.

error .....

.....

explanation .....

.....

[2]

(d) Add **two** arrows to the diagram to show the two places where the apparatus should be heated once the error in (c) has been corrected. [1]

(e) Describe the test for hydrogen gas.

test .....

result .....

[2]

[Total: 8]

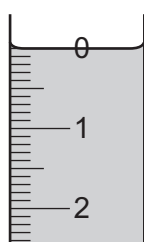
- 2 A student investigated the reaction between dilute ethanoic acid and two different solutions of sodium hydroxide labelled solution **A** and solution **B**.

Two experiments were done.

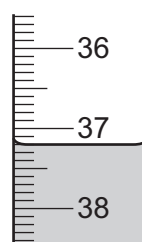
(a) *Experiment 1*

- A burette was rinsed with solution **A**.
- The burette was filled with solution **A**. Some of solution **A** was run out of the burette so that the level of solution **A** was on the burette scale.
- Using a measuring cylinder,  $25\text{ cm}^3$  of dilute ethanoic acid was poured into a conical flask.
- Five drops of thymolphthalein indicator were added to the conical flask.
- Solution **A** was added slowly from the burette to the conical flask, while the flask was swirled, until the solution just changed colour.

Use the burette diagrams to complete the table for Experiment 1.



initial reading



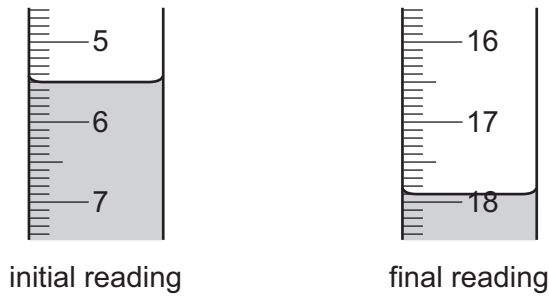
final reading

Experiment 1	
final burette reading / $\text{cm}^3$	
initial burette reading / $\text{cm}^3$	
volume of solution <b>A</b> added / $\text{cm}^3$	

Experiment 2

- The conical flask was emptied and rinsed with distilled water.
- The burette was emptied and rinsed with distilled water.
- The burette was rinsed with solution **B**.
- The burette was filled with solution **B**. Some of solution **B** was run out of the burette so that the level of solution **B** was on the burette scale.
- Using a measuring cylinder, 25 cm<sup>3</sup> of dilute ethanoic acid was poured into a conical flask.
- Five drops of thymolphthalein indicator were added to the conical flask.
- Solution **B** was added slowly from the burette to the conical flask, while the flask was swirled, until the solution just changed colour.

Use the burette diagrams to complete the table for Experiment 2.



Experiment 2	
final burette reading / cm <sup>3</sup>	
initial burette reading / cm <sup>3</sup>	
volume of solution <b>B</b> added / cm <sup>3</sup>	

[4]

(b) Explain why universal indicator is **not** a suitable indicator to use in this titration.

.....  
 ..... [1]

(c) (i) State which solution of sodium hydroxide, solution **A** or solution **B**, was the more concentrated.  
 Explain your answer.

.....  
 ..... [1]

(ii) State how many times more concentrated this solution of sodium hydroxide was than the other solution of sodium hydroxide.

.....  
 ..... [1]

- (d) Determine the volume of solution **B** that would be required if Experiment 2 was repeated with  $10\text{ cm}^3$  of dilute ethanoic acid.

.....  
 ..... [2]

- (e) Describe how the reliability of the results could be checked.

.....  
 ..... [1]

- (f) A  $25\text{ cm}^3$  pipette can be used to measure the volume of a solution.

- (i) Describe an advantage of using a  $25\text{ cm}^3$  pipette to measure the volume of the dilute ethanoic acid.

.....  
 ..... [1]

- (ii) Explain why a  $25\text{ cm}^3$  pipette could **not** be used to measure the volume of solution **A**.

.....  
 ..... [1]

- (g) (i) Explain why the burette was rinsed with distilled water in Experiment 2.

.....  
 ..... [1]

- (ii) Explain why the burette was then rinsed with solution **B**.

.....  
 ..... [1]

- (iii) State the effect that **not** rinsing the burette with solution **B** would have on the final burette reading.  
 Explain your answer.

effect .....

explanation .....

.....  
 ..... [2]

[Total: 16]

- 3 Two solids, solid **C** and solid **D**, were analysed. Tests were done on each solid.

**tests on solid C**

Tests were done and the following observations were made.

tests on solid <b>C</b>	observations
<p><b>test 1</b></p> <p>Half of solid <b>C</b> was placed in a test-tube. The solid was heated gently and then strongly.</p>	<p>steam was given off and condensation appeared at the mouth of the test-tube, the remaining solid became black</p>
<p>The remaining solid <b>C</b> was dissolved in distilled water to produce solution <b>C</b>. The solution was divided into two equal portions in two test-tubes.</p> <p><b>test 2</b></p> <p>A few drops of universal indicator solution were added to the first portion of solution <b>C</b>.</p>	<p>the solution became orange</p>
<p><b>test 3</b></p> <p>A spatula measure of solid sodium carbonate was added to the second portion of solution <b>C</b>. Any gas produced was tested.</p>	<p>effervescence was seen, the gas turned limewater milky</p>

- (a) Suggest the pH of solution **C**.

pH = ..... [1]

- (b) Identify the gas produced in **test 3**.

..... [1]

- (c) What conclusions can you make about solid **C**?

.....  
 ..... [2]

**tests on solid D**

Solid **D** was calcium chloride.

Complete the expected observations.

Solid **D** was dissolved in water to form solution **D**. Solution **D** was divided into four approximately equal portions in four test-tubes.

- (d) (i)** A few drops of aqueous sodium hydroxide were added to the first portion of solution **D**.  
 observations ..... [1]
- (ii)** An excess of aqueous sodium hydroxide was added to the mixture from **(d)(i)**.  
 observations ..... [1]
- (e)** Aqueous ammonia was added dropwise and then in excess to the second portion of solution **D**.  
 observations .....  
 ..... [2]
- (f)** About 1 cm<sup>3</sup> of dilute nitric acid and a few drops of aqueous silver nitrate were added to the third portion of solution **D**.  
 observations ..... [1]
- (g)** About 1 cm<sup>3</sup> of dilute nitric acid and a few drops of aqueous barium nitrate were added to the fourth portion of solution **D**.  
 observations ..... [1]

[Total: 10]







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Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

**7** Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)	A delivery tube	1
	B trough	1
1(b)	to hold / absorb / soak up the water	1
1(c)	error: bung in (collecting) tube / the apparatus is sealed / water cannot get out of the boiling tube	1
	explanation: (pressure would increase and so the apparatus / tube would) explode / break	1
1(d)	arrows under both zinc and mineral wool	1
1(e)	test: lighted splint	1
	result: pops	1

Question	Answer	Marks
2(a)	Experiment 1 readings correct and readings recorded correctly with final > initial (37.2; 0.0)	1
	Experiment 2 readings correct and readings recorded correctly with final > initial (17.9; 5.5)	1
	both subtractions to get volume added correct (37.2; 12.4)	1
	all results figures for both experiments recorded to 1 dp or better	1
2(b)	many colour changes / keeps changing colour / hard to determine the end point	1
2(c)(i)	B (Experiment 2) <b>and</b> volume (of B) was less (than volume of A)	1
2(c)(ii)	3 (times more concentrated)	1
2(d)	$12.4 \div 2.5 = 4.96$ or 5(.0)	1
	cm <sup>3</sup>	1

Question	Answer	Marks
2(e)	repeat <b>and</b> compare the results	1
2(f)(i)	more accurate / more precise (than a measuring cylinder)	1
2(f)(ii)	(pipette measures a) fixed volume / 25 cm <sup>3</sup>	1
2(g)(i)	to remove solution A	1
2(g)(ii)	to remove (distilled) water	1
2(g)(iii)	larger / higher / bigger	1
	the water dilutes solution B / makes solution B less concentrated	1

Question	Answer	Marks
3(a)	4	1
3(b)	carbon dioxide / CO <sub>2</sub>	1
3(c)	hydrated	1
	acid / contains H <sup>+</sup> / hydrogen ions	1
3(d)(i)	white precipitate	1
3(d)(ii)	no change <b>OR</b> remains <b>OR</b> does not dissolve	1

Question	Answer	Marks
3(e)	drops: no reaction <b>OR</b> no change <b>OR</b> remains colourless <b>OR</b> faint / slight (white) precipitate	1
	excess: no reaction <b>OR</b> no change <b>OR</b> remains colourless <b>OR</b> faint / slight (white) precipitate / precipitate remains / does not dissolve	1
3(f)	white precipitate	1
3(g)	no reaction <b>OR</b> no change <b>OR</b> remains colourless	1

Question	Answer	Marks
4	any 6 from: <ul style="list-style-type: none"> <li>• weigh toothpaste</li> <li>• add (dilute) hydrochloric acid</li> <li>• to excess / until no more fizzing</li> <li>• filter</li> <li>• wash residue / silica (with water) and dry</li> <li>• weigh residue / silica</li> <li>• <math>(\text{mass silica} / \text{initial mass}) \times 100(\%)</math></li> </ul> <p><b>max 6</b></p>	6

## A Topical Questions Tracker

### A.1 States of matter

#### A.1.1 Solids, liquids and gases

0620\_s20\_qp\_62 Question: 1 e(i) QP Page: 46 MS Page: 60

### A.2 Stoichiometry

#### A.2.1 Formulae

0620\_s20\_qp\_61 Question: 2 d QP Page: 28 MS Page: 38

#### A.2.2 The mole and the Avogadro constant

0620\_s20\_qp\_61 Question: 2 c QP Page: 28 MS Page: 38

0620\_s20\_qp\_63 Question: 2 c(i) QP Page: 68 MS Page: 81

0620\_w20\_qp\_62 Question: 2 c(ii) QP Page: 108 MS Page: 121

0620\_w20\_qp\_62 Question: 2 e(i) QP Page: 114 MS Page: 127

0620\_w20\_qp\_63 Question: 2 d QP Page: 136 MS Page: 148

### A.3 Electrochemistry

#### A.3.1 Electrolysis

0620\_w20\_qp\_62 Question: 1 a QP Page: 110 MS Page: 127

0620\_w20\_qp\_62 Question: 1 b(i) QP Page: 110 MS Page: 127

0620\_w20\_qp\_62 Question: 1 b(ii) QP Page: 110 MS Page: 127

0620\_w20\_qp\_62 Question: 1 c QP Page: 110 MS Page: 127

### A.4 Chemical energetics

#### A.4.1 Exothermic and endothermic reactions

0620\_m20\_qp\_62 Question: 2 a(i) QP Page: 8 MS Page: 21

### A.5 Chemical reactions

#### A.5.1 Rate of reaction

0620\_m20\_qp\_62 Question: 2 e(i) QP Page: 11 MS Page: 22

0620\_m20\_qp\_62 Question: 2 e(ii) QP Page: 11 MS Page: 22

0620\_s20\_qp\_62 Question: 2 d QP Page: 49 MS Page: 60

0620\_w20\_qp\_61 Question: 2 d QP Page: 92 MS Page: 105

0620\_w20\_qp\_61 Question: 2 e QP Page: 92 MS Page: 105

0620\_w20\_qp\_62 Question: 2 d QP Page: 113 MS Page: 127

0620\_w20\_qp\_62 Question: 2 e(ii) QP Page: 114 MS Page: 128

0620\_w20\_qp\_62 Question: 2 f QP Page: 114 MS Page: 128

## A.6 Acids, bases and salts

### A.6.1 The characteristic properties of acids and bases

0620_m20_qp_62	Question: 3 a	QP Page: 12	MS Page: 22
0620_s20_qp_61	Question: 2 b	QP Page: 28	MS Page: 38
0620_s20_qp_61	Question: 2 e	QP Page: 28	MS Page: 39
0620_s20_qp_62	Question: 4	QP Page: 53	MS Page: 62
0620_s20_qp_63	Question: 2 c(iii)	QP Page: 69	MS Page: 82
0620_w20_qp_61	Question: 3 c	QP Page: 94	MS Page: 106
0620_w20_qp_63	Question: 2 c(i)	QP Page: 135	MS Page: 148
0620_w20_qp_63	Question: 2 c(ii)	QP Page: 135	MS Page: 148
0620_w20_qp_63	Question: 3 a	QP Page: 137	MS Page: 149

### A.6.2 Preparation of salts

0620_s20_qp_63	Question: 1 b	QP Page: 65	MS Page: 81
0620_w20_qp_63	Question: 3 c	QP Page: 137	MS Page: 149

## A.7 Metals

### A.7.1 Reactivity series

0620_m20_qp_62	Question: 2 g(i)	QP Page: 11	MS Page: 22
0620_m20_qp_62	Question: 2 g(ii)	QP Page: 11	MS Page: 22
0620_w20_qp_63	Question: 1 b	QP Page: 132	MS Page: 148

## A.8 Chemistry of the environment

### A.8.1 Water

0620_s20_qp_62	Question: 1 a	QP Page: 45	MS Page: 60
0620_s20_qp_62	Question: 1 b	QP Page: 45	MS Page: 60
0620_s20_qp_62	Question: 1 c	QP Page: 45	MS Page: 60
0620_s20_qp_62	Question: 1 d	QP Page: 45	MS Page: 60

## A.9 Organic chemistry

### A.9.1 Alcohols

0620_m20_qp_62	Question: 1 c(i)	QP Page: 5	MS Page: 21
0620_m20_qp_62	Question: 1 c(ii)	QP Page: 5	MS Page: 21
0620_m20_qp_62	Question: 1 d	QP Page: 6	MS Page: 21
0620_m20_qp_62	Question: 1 e	QP Page: 6	MS Page: 21
0620_w20_qp_61	Question: 1 c	QP Page: 88	MS Page: 104

## A.10 Experimental techniques and chemical analysis

### A.10.1 Experimental design

0620_m20_qp_62	Question: 1 a	QP Page: 5	MS Page: 21
0620_m20_qp_62	Question: 1 b	QP Page: 5	MS Page: 21
0620_m20_qp_62	Question: 2 a(ii)	QP Page: 8	MS Page: 22
0620_m20_qp_62	Question: 2 b	QP Page: 9	MS Page: 22
0620_m20_qp_62	Question: 2 c	QP Page: 10	MS Page: 22

0620_m20_qp_62	Question: 2 d(i)	QP Page: 10	MS Page: 22
0620_m20_qp_62	Question: 2 d(ii)	QP Page: 10	MS Page: 22
0620_m20_qp_62	Question: 2 f	QP Page: 11	MS Page: 22
0620_s20_qp_61	Question: 2 a	QP Page: 27	MS Page: 38
0620_s20_qp_61	Question: 2 f(i)	QP Page: 29	MS Page: 39
0620_s20_qp_61	Question: 2 f(ii)	QP Page: 29	MS Page: 39
0620_s20_qp_61	Question: 2 g	QP Page: 29	MS Page: 39
0620_s20_qp_61	Question: 4	QP Page: 32	MS Page: 40
0620_s20_qp_62	Question: 1 e(ii)	QP Page: 46	MS Page: 60
0620_s20_qp_62	Question: 2 a	QP Page: 48	MS Page: 60
0620_s20_qp_62	Question: 2 b	QP Page: 48	MS Page: 60
0620_s20_qp_62	Question: 2 c	QP Page: 49	MS Page: 60
0620_s20_qp_62	Question: 2 e	QP Page: 49	MS Page: 61
0620_s20_qp_62	Question: 2 f(i)	QP Page: 49	MS Page: 61
0620_s20_qp_62	Question: 2 f(ii)	QP Page: 49	MS Page: 61
0620_s20_qp_62	Question: 2 g(i)	QP Page: 50	MS Page: 61
0620_s20_qp_62	Question: 2 g(ii)	QP Page: 50	MS Page: 61
0620_s20_qp_63	Question: 1 a	QP Page: 65	MS Page: 81
0620_s20_qp_63	Question: 1 c(i)	QP Page: 65	MS Page: 81
0620_s20_qp_63	Question: 1 c(ii)	QP Page: 65	MS Page: 81
0620_s20_qp_63	Question: 1 d	QP Page: 65	MS Page: 81
0620_s20_qp_63	Question: 2 a	QP Page: 67	MS Page: 81
0620_s20_qp_63	Question: 2 b	QP Page: 68	MS Page: 81
0620_s20_qp_63	Question: 2 c(ii)	QP Page: 68	MS Page: 82
0620_s20_qp_63	Question: 2 d	QP Page: 69	MS Page: 82
0620_s20_qp_63	Question: 2 e	QP Page: 69	MS Page: 82
0620_s20_qp_63	Question: 2 f	QP Page: 69	MS Page: 82
0620_w20_qp_61	Question: 1 a	QP Page: 88	MS Page: 104
0620_w20_qp_61	Question: 1 e	QP Page: 89	MS Page: 104
0620_w20_qp_61	Question: 2 a	QP Page: 91	MS Page: 105
0620_w20_qp_61	Question: 2 b	QP Page: 92	MS Page: 105
0620_w20_qp_61	Question: 2 c	QP Page: 92	MS Page: 105
0620_w20_qp_61	Question: 2 f(i)	QP Page: 93	MS Page: 105
0620_w20_qp_61	Question: 2 f(ii)	QP Page: 93	MS Page: 105
0620_w20_qp_61	Question: 2 g	QP Page: 93	MS Page: 105
0620_w20_qp_62	Question: 2 a	QP Page: 112	MS Page: 127
0620_w20_qp_62	Question: 2 b	QP Page: 113	MS Page: 127
0620_w20_qp_62	Question: 2 c(i)	QP Page: 113	MS Page: 127
0620_w20_qp_62	Question: 2 g	QP Page: 114	MS Page: 128
0620_w20_qp_62	Question: 2 h	QP Page: 114	MS Page: 128
0620_w20_qp_62	Question: 4	QP Page: 117	MS Page: 129
0620_w20_qp_63	Question: 1 a	QP Page: 132	MS Page: 148
0620_w20_qp_63	Question: 1 c	QP Page: 132	MS Page: 148
0620_w20_qp_63	Question: 1 d	QP Page: 133	MS Page: 148
0620_w20_qp_63	Question: 2 a	QP Page: 134	MS Page: 148
0620_w20_qp_63	Question: 2 e	QP Page: 136	MS Page: 149
0620_w20_qp_63	Question: 2 f(i)	QP Page: 136	MS Page: 149
0620_w20_qp_63	Question: 2 f(ii)	QP Page: 136	MS Page: 149
0620_w20_qp_63	Question: 4	QP Page: 139	MS Page: 150

### A.10.2 Acid–base titrations

0620_s20_qp_63	Question: 4	QP Page: 72	MS Page: 83
0620_w20_qp_63	Question: 2 b	QP Page: 135	MS Page: 148
0620_w20_qp_63	Question: 2 g(i)	QP Page: 136	MS Page: 149
0620_w20_qp_63	Question: 2 g(ii)	QP Page: 136	MS Page: 149

0620\_w20\_qp\_63 Question: 2 g(iii) QP Page: 136 MS Page: 149

### A.10.3 Chromatography

0620\_m20\_qp\_62 Question: 4 QP Page: 14 MS Page: 23  
0620\_s20\_qp\_61 Question: 1 a QP Page: 26 MS Page: 38  
0620\_s20\_qp\_61 Question: 1 b(i) QP Page: 26 MS Page: 38  
0620\_s20\_qp\_61 Question: 1 b(ii) QP Page: 26 MS Page: 38  
0620\_s20\_qp\_61 Question: 1 b(iii) QP Page: 26 MS Page: 38

### A.10.4 Separation and purification

0620\_w20\_qp\_61 Question: 1 b QP Page: 88 MS Page: 104  
0620\_w20\_qp\_61 Question: 1 d QP Page: 89 MS Page: 104  
0620\_w20\_qp\_61 Question: 4 QP Page: 96 MS Page: 107

### A.10.5 Identification of ions and gases

0620\_m20\_qp\_62 Question: 3 b QP Page: 12 MS Page: 22  
0620\_m20\_qp\_62 Question: 3 c QP Page: 12 MS Page: 22  
0620\_m20\_qp\_62 Question: 3 d QP Page: 13 MS Page: 22  
0620\_m20\_qp\_62 Question: 3 e QP Page: 13 MS Page: 23  
0620\_s20\_qp\_61 Question: 3 a QP Page: 30 MS Page: 39  
0620\_s20\_qp\_61 Question: 3 b QP Page: 30 MS Page: 39  
0620\_s20\_qp\_61 Question: 3 c QP Page: 30 MS Page: 40  
0620\_s20\_qp\_61 Question: 3 d QP Page: 31 MS Page: 40  
0620\_s20\_qp\_61 Question: 3 e QP Page: 31 MS Page: 40  
0620\_s20\_qp\_62 Question: 3 a QP Page: 51 MS Page: 61  
0620\_s20\_qp\_62 Question: 3 b QP Page: 51 MS Page: 61  
0620\_s20\_qp\_62 Question: 3 c QP Page: 51 MS Page: 61  
0620\_s20\_qp\_62 Question: 3 d QP Page: 51 MS Page: 61  
0620\_s20\_qp\_62 Question: 3 e QP Page: 52 MS Page: 62  
0620\_s20\_qp\_63 Question: 3 a QP Page: 70 MS Page: 82  
0620\_s20\_qp\_63 Question: 3 b QP Page: 70 MS Page: 82  
0620\_s20\_qp\_63 Question: 3 c QP Page: 71 MS Page: 82  
0620\_s20\_qp\_63 Question: 3 d QP Page: 71 MS Page: 82  
0620\_s20\_qp\_63 Question: 3 e(i) QP Page: 71 MS Page: 82  
0620\_s20\_qp\_63 Question: 3 e(ii) QP Page: 71 MS Page: 83  
0620\_s20\_qp\_63 Question: 3 e(iii) QP Page: 71 MS Page: 83  
0620\_w20\_qp\_61 Question: 3 a QP Page: 94 MS Page: 106  
0620\_w20\_qp\_61 Question: 3 b QP Page: 94 MS Page: 106  
0620\_w20\_qp\_61 Question: 3 d QP Page: 95 MS Page: 106  
0620\_w20\_qp\_61 Question: 3 e QP Page: 95 MS Page: 106  
0620\_w20\_qp\_61 Question: 3 f QP Page: 95 MS Page: 106  
0620\_w20\_qp\_61 Question: 3 g QP Page: 95 MS Page: 106  
0620\_w20\_qp\_62 Question: 3 a QP Page: 115 MS Page: 128  
0620\_w20\_qp\_62 Question: 3 b QP Page: 115 MS Page: 128  
0620\_w20\_qp\_62 Question: 3 c(i) QP Page: 115 MS Page: 128  
0620\_w20\_qp\_62 Question: 3 c(ii) QP Page: 115 MS Page: 128  
0620\_w20\_qp\_62 Question: 3 c(iii) QP Page: 115 MS Page: 128  
0620\_w20\_qp\_62 Question: 3 d QP Page: 116 MS Page: 128  
0620\_w20\_qp\_63 Question: 1 e QP Page: 133 MS Page: 148  
0620\_w20\_qp\_63 Question: 3 b QP Page: 137 MS Page: 149  
0620\_w20\_qp\_63 Question: 3 d(i) QP Page: 138 MS Page: 149

0620\_w20\_qp\_63 Question: 3 d(ii) QP Page: 138 MS Page: 149  
0620\_w20\_qp\_63 Question: 3 e QP Page: 138 MS Page: 150  
0620\_w20\_qp\_63 Question: 3 f QP Page: 138 MS Page: 150  
0620\_w20\_qp\_63 Question: 3 g QP Page: 138 MS Page: 150