Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/41**

Paper 4 Alternative to Practical **May/June 2023**

MARK SCHEME

Maximum Mark: 40

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 May/June 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

© UCLES 2023

[Turn over

PUBLISHED

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.

© UCLES 2023

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.

© UCLES 2023

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.

© UCLES 2023

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.

© UCLES 2023

Question	Answer	Marks
1(a)	beaker	**1**
1(b)	prevent evaporation of solvent (from the beaker) **OR** To ensure the air in the beaker is saturated with vapour	**1**
1(c)	**M1** (start line above level of solvent so) dye doesn't dissolve off paper into solvent **M2** (start line in pencil so) line doesn't smudge / smear / travel up paper (start line in pencil as) pencil does not dissolve / pencil is insoluble	**2**
1(d)	**M1** 5.7 / 0.6 **M2** 9.5 cm	**2**

Question	Answer	Marks
2(a)(i)	**M1** initial and final readings completed correctly **M2** volume used completed correctly **M3** all readings to 1 decimal place	**3**

	Titration 1	Titration 2
final burette reading / cm^3	24.9	37.4
initial burette reading / cm^3	0.0	12.3

	Titration 1	Titration 2
volume of **A** used / cm^3	24.9	25.1

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)(ii)</td><td>initial, final readings and volume used completed correctly
<table>
<tr><td></td><td>Titration 1</td><td>Titration 2</td></tr>
<tr><td>final burette reading / cm^3</td><td></td><td>25.3</td></tr>
<tr><td>initial burette reading / cm^3</td><td></td><td>12.6</td></tr>
<tr><td>volume of B used / cm^3</td><td>12.5</td><td>12.7</td></tr>
</table></td><td>1</td></tr>
<tr><td>2(b)</td><td>25.0 and 12.6</td><td>1</td></tr>
<tr><td>2(c)</td><td>to check that the results are consistent / reproducible</td><td>1</td></tr>
<tr><td>2(d)</td><td>M1 25 / 1000 × 0.400 = 0.01(00) moles
M2 0.794 correct to 3 sig. fig.</td><td>2</td></tr>
<tr><td>2(e)</td><td>M1 0.794 × 0.5
M2 60 × M1 = 23.8 g</td><td>2</td></tr>
<tr><td>2(f)</td><td>12 g</td><td>1</td></tr>
<tr><td>2(g)</td><td>Any two from:
(Distilled water is used to) remove any chemicals from the flask
(NaOH is not used because) some NaOH would remain in flask
(NaOH is not used because) more A / B / ethanoic acid would be needed</td><td>2</td></tr>
<tr><td>2(h)</td><td>The colour change could not be (clearly) observed</td><td>1</td></tr>
</table>

© UCLES 2023

Question	Answer	Marks
3(a)(i)	**M1** warm **M2** test gas with (damp red) litmus paper **M3** paper turns blue	**3**
3(a)(ii)	hydrochloric acid contains chloride / Cl^- ions	**1**
3(a)(iii)	sodium ions would give a yellow flame	**1**
3(a)(iv)	**M1** ammonium / NH_4^+	**1**
	M2 sulfate / SO_4^{2-}	**1**
3(b)(i)	effervescence	**1**
3(b)(ii)	**M1** any workable method to introduce solution into flame **M2** blue flame of Bunsen **M3** flame changes colour to blue / green / blue-green	**3**
3(b)(iii)	**M1** (aqueous) sodium hydroxide **M2** blue ppt **M3** insoluble in excess **OR** **M1** (aqueous) ammonia **M2** blue ppt **M3** dark blue solution in excess	**3**

© UCLES 2023

Question	Answer	Marks
4	1 mark from each section and any other 2. Marks can be awarded from text or diagram. If marking from diagram apparatus must be labelled. **(1) Apparatus** • Balance • Test-tube / conical flask / beaker to hold sample and water • Equipment to measure volume of gas etc. e.g. measuring cylinder with water trough / gas syringe **(2) Method and Measurements** • Measures a mass / amount of a sample • Adds (excess) water • Reweighs or measures volume of gas produced / counts bubbles / measures time to turn limewater milky / (**IGNORE** one which goes milkier) **(3) Control** • Same mass of each sample / amount / volume **OR** calculate change in mass / volume produced per gram **OR** same surface area of baking powder • Same temperature • Measure total volume of gas produced when no further change / Measure volume of gas produced in a fixed time / Measure time taken to produce a fixed volume of gas **(4) Use of results** Sample that produces more gas / loses more mass (weight) / has more bubbles / has less time to turn milky / is milker is stored for less time or vice versa	**6**

© UCLES 2023