



Cambridge IGCSE™

COMBINED SCIENCE

0653/62

Paper 6 Alternative to Practical

March 2021

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 March 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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	<p><u>'List rule' guidance</u></p> <p>For questions that require <i>n</i> responses (e.g. State two reasons ...):</p> <ul style="list-style-type: none"> • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked <i>ignore</i> in the mark scheme should not count towards <i>n</i>. • Incorrect responses should not be awarded credit but will still count towards <i>n</i>. • 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 <i>n</i> 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)	bubbles / fizzes / effervesces ;	1
1(b)(i)	63 ;	1
1(b)(ii)	<i>any one from:</i> glucose is needed for respiration ; glucose is needed for CO ₂ production ; glucose speeds up respiration ;	1
1(b)(iii)	to find out, if yeast is needed / if glucose reacts on its own ;	1
1(b)(iv)	rounded bottom (of test-tube) / meniscus (of water) ;	1
1(b)(v)	limewater and goes milky ;	1
1(b)(vi)	<i>any one from:</i> time ; glucose concentration ; yeast concentration ; temperature ;	1
1(c)(i)	<i>any one from:</i> lower temperature ; less yeast (cells) added ; less glucose added ; less time ;	1
1(c)(ii)	13 ;	1
1(c)(iii)	higher concentration of glucose gives higher volume gas ; remains the same, at 10 to 11 / above 10 ;	2
1(c)(iv)	gas syringe / measuring cylinder ;	1
1(c)(v)	<i>any one from:</i> lower volume of gas (in 5 minutes) ; slower rate of gas made ;	1

Question	Answer	Marks										
2(a)(i)	more precise ;	1										
2(a)(ii)	(because it is a pale) blue ;	1										
2(b)(i)	wash with water / pour water through residue / pour water through filter funnel ;	1										
2(b)(ii)	white ;	1										
2(c)	<p><i>headings</i> – test / experiment AND results / observations ;</p> <p>test described as small volume of ammonia added followed by excess and results entered correctly for small volume followed by excess ;</p> <p>test described as small volume of sodium hydroxide followed by excess and results entered correctly for small volume followed by excess ;</p> <p>e.g.</p> <table border="1" data-bbox="651 783 1626 1110"> <thead> <tr> <th data-bbox="651 783 1323 847">test</th> <th data-bbox="1323 783 1626 847">observations</th> </tr> </thead> <tbody> <tr> <td data-bbox="651 847 1323 911">(four) drops / little, aqueous sodium hydroxide</td> <td data-bbox="1323 847 1626 911">blue ppt.</td> </tr> <tr> <td data-bbox="651 911 1323 975">excess / lots, aqueous sodium hydroxide</td> <td data-bbox="1323 911 1626 975">blue ppt.</td> </tr> <tr> <td data-bbox="651 975 1323 1038">little / drops, aqueous ammonia</td> <td data-bbox="1323 975 1626 1038">blue ppt.</td> </tr> <tr> <td data-bbox="651 1038 1323 1102">excess / lots, aqueous ammonia</td> <td data-bbox="1323 1038 1626 1102">dark blue solution</td> </tr> </tbody> </table>	test	observations	(four) drops / little, aqueous sodium hydroxide	blue ppt.	excess / lots, aqueous sodium hydroxide	blue ppt.	little / drops, aqueous ammonia	blue ppt.	excess / lots, aqueous ammonia	dark blue solution	3
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Question	Answer	Marks
3	<p>One marking point from each section and any <u>two</u> others:</p> <p>apparatus measuring cylinder / burette / (volumetric) pipette ; balance ;</p> <p>brief description and safety precautions add Universal Indicator <u>to acid</u> ; add calcium hydroxide (solid) to acid ; stir / complete reaction ; repeat for different masses (at least 2) or a continuous method ; repeat, each mass / whole of continuous method ; idea of using at least five, different masses / additions if continuous ; safety goggles AND protect eyes AND (from) acid / calcium hydroxide is corrosive ;</p> <p>measurements mass of calcium hydroxide ; volume of nitric acid ; colour / pH, of Universal Indicator in acid alone ; colour / pH, of Universal Indicator after adding calcium hydroxide ; using pH colour chart to match colour with pH ;</p> <p>variables constant volume of acid ; concentration of acid ;</p> <p>processing and conclusion take averages from repeated experiments ; plot graph of mass against pH ; does increasing mass of calcium hydroxide increase the pH ;</p>	7

Question	Answer	Marks
4(a)(i)	test-tube shown approximately half-full AND water level below water level in beaker ; thermometer shown with bulb fully below the level of water in test-tube ;	2
4(a)(ii)	24.5 ; 28(.0) ; both to one decimal place ;	3
4(a)(iii)	<i>any one from:</i> ensure the thermometer is read perpendicular to the scale ; stir (using a stirring rod to ensure water has even temperature throughout) ; thermometer is, in liquid / not touching beaker ;	1
4(a)(iv)	thermal energy / heat, gained from water in test-tube ; OR thermal energy / heat, from test-tube goes to water in beaker ;	1
4(b)(i)	axes vertical temperature AND °C AND horizontal time AND s / min ; sensible linear scale with plots covering at least half of grid ; points plotted correctly ;	3
4(b)(ii)	best-fit curve ;	1
4(c)(i)	0.63 ;	1
4(c)(ii)	rate decreases (over time) ;	1