

Cambridge IGCSE™

CHEMISTRY**0620 / 62**

Paper 6 Alternative to Practical

May/June 2026

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

This document consists of **17** printed pages.

General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: - the specific content defined in the mark scheme - the specific skills defined in the mark scheme or in the level descriptions - the standard of response required as exemplified by the standardisation scripts.
2	Examiners must award whole marks (not half marks, or other fractions).
3	Examiners must award marks positively . This means that: - marks are not deducted for errors or omissions - marks are awarded for correct / valid answers as defined in the mark scheme and also for other valid answers which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate - the quality of spelling, punctuation and grammar are judged only when the mark scheme indicates that these features are specifically assessed in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must consistently apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the full range of marks defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and must not award marks with grade thresholds or grade descriptions 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	<u>'List rule' guidance</u> For questions that require <i>n</i> responses (e.g. State two reasons ...): • 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.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

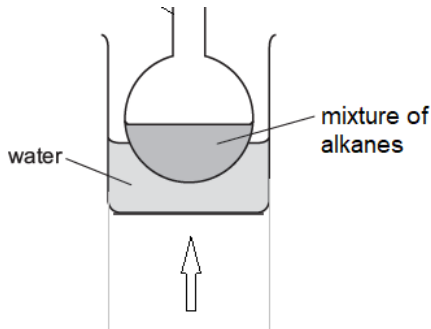
The annotations listed below were available to examiners marking this component in this series.

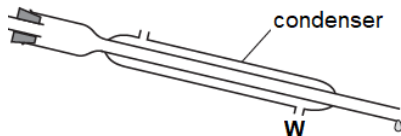
Annotations

Annotation	Meaning
	information missing or insufficient for credit
	benefit of doubt given
	contradiction in response, mark not awarded
	incorrect point or mark not awarded
	key point attempted / working towards marking point / incomplete answer / response seen but not credited / blank page seen
	error carried forward applied
	incorrect or insufficient response, mark not awarded
	response has not answered question
	benefit of doubt was considered, but the response was decided to not be sufficiently close for benefit of doubt to be applied
	incorrect point or mark not awarded
	blank page seen

Annotation	Meaning
	correct point of mark awarded

Mark Scheme Abbreviations	
;	separates marking points
/	alternative responses for the same marking point
R	reject the response
A	allow/accept the response
I	ignore the response
CON	contradiction in response, no mark
ecf	error carried forward
ora	or reverse argument
AW	alternative wording
<u>underline</u> or bold	actual word given must be used by candidate (grammatical variants excepted)
()	the word / phrase in brackets is not required but sets the context
max	indicates the maximum number of marks that can be given
MP / M	marking point

Question	Answer	Marks	Guidance
1(a)	A condenser	1	Allow condensing tube / jacket / condensator / condense tube Ignore Liebig / cooling tube / cooling jacket / delivery tube / distillation (tube) / water jacket / receiver If both correct but reversed, allow one mark
	B beaker	1	Ignore measuring / receiver Reject flask / trough / tub If both correct but reversed, allow one mark
1(b)(i)	arrow anywhere under the left-hand beaker 	1	Allow arrow that passes through the beaker to the flask / diagrams of any heating device in place of an arrow Reject arrows elsewhere on diagram unless clearly for the water flow so Ignore any arrow that is associated with a water inlet / outlet on the condenser
1(b)(ii)	alkanes / fractions / mixture is / are flammable	1	Allow flammable / inflammable alone Allow any specified alkane in mixture being flammable Allow a description of flammable / inflammable Allow (alkanes / hydrocarbons) may ignite / burn but Ignore apparatus burns Ignore too hot / explosions / maintaining a steady temperature Ignore volatile / to prevent evaporation Ignore apparatus breaking / cracking

Question	Answer	Marks	Guidance
1(c)	W written by bottom inlet to condenser. 	1	Reject W written anywhere else on diagram, including inside the condenser.
1(d)	alkane: pentane and reason: lowest boiling point	1	Allow low / lower in place of lowest Allow lowest temperature
1(e)	M1 undecane	1	Allow slips in spelling
	M2 boiling point over 100 °C / boils above boiling point of water / water boils at a lower temperature / temperature not high enough so will not reach its boiling point / water boils at 100 °C	1	M2 not awarded unless M1 correct Ignore high / highest boiling point / boiling point too high Ignore it is all that is left / everything else has evaporated

Question	Answer	Marks	Guidance
2(a)	M1 all ten liquid volumes correct (dilute ethanoic acid recorded as 10.0 or 10) and all five volumes of distilled water are correct (100, 90, 80, 70, 60)	1	ignore trailing zeros
	M2 all 5 measuring cylinder readings correct (10, 16, 27, 46, 82)	1	ignore trailing zeroes
	M3 volume of ethanoic acid all to 1dp, and volumes of water and gas collected all with no decimal places	1	
2(b)	M1 y-axis scale in linear and points extend over half way up the y-axis scale	1	There must be a total of four ticks and crosses shown.
	M2 and M3 All points plotted correctly	2	All five corrects scores 2, any four correct scores 1. If scale non-linear then Reject points plotted in non-linear section.
	M4 best fit line	1	for correct points this should be a curve, for correct points line should pass with a small square of all points. Reject curves drawn as straight sections, individual curves between consecutive points, multiple lines (white visible in line).
2(c)(i)	M1 $(27 \div 75 =) 0.36$ correct evaluation of volume of gas in experiment 3 $\div$ 75	1	Allow 0.360 Allow ecf = gas volume in experiment 3 $\div$ 75. if ecf answer is rounded then rounding must be correct, allow 2 sig figs or more, ignore missing trailing zeros.
	M2 cm^3 / s	1	standalone mark Allow $\text{cm}^3 \text{s}^{-1}$ Allow alternatives for cm^3 such as 'ml' or 'cc' Allow secs / sec / seconds for s Allow units written as a fraction
2(c)(ii)	5	1	Allow the last one / 60 of water ecf on results if answer given is not 5

Question	Answer	Marks	Guidance
2(d)	M1 working shown on graph – construction from 77 on x-axis to line and from line to y-axis	1	minimum is a mark on the line or marks on BOTH axes
	M2 correct value	1	half small square tolerance. Allow ecf from incorrect volume on graph line but no ecf if working to random point on grid and not on the line.
	M3 units given as cm ³	1	standalone mark. Allow ml or cc
2(e)(i)	(10 cm ³ measuring cylinder is more) accurate	1	Allow precise / accuracy / (more) exact Ignore faster etc.
2(e)(ii)	M1 advantage: (more) accurate	1	If comparison is made, then it must not be to 50 cm ³ measuring cylinder Allow accurate / (more) precise / (more) exact Ignore comments of speed / ease of use / adding dropwise Ignore comments on fixed volumes
2(f)(i)	(volume of gas is) smaller	1	Allow less / small / decreases Allow more if answer makes it clear that they are referring to when gas does not escape Reject comments on rate of reaction changing Ignore comments on time taken and accuracy
2(f)(ii)	M1 experiment 5	1	Allow ecf from Table 2.1
	M2 fast(er) / makes gas (more) quickly	1	M2 is only awarded if M1 is correct Allow more gas <u>made</u> / <u>produced</u> / <u>formed</u> before stopper is put back M2 must relate to rate / speed of gas production Ignore makes most gas without reference to first few / 75 seconds / set time Ignore references to highest concentration

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Question	Answer	Marks	Guidance
2(g)	sketched line is at a higher volume (above) than the plotted line and does not meet plotted line at any point.	1	Does not need to be the same shape as the plotted line. No minimum range required

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Question	Answer	Marks	Guidance
3(a)	(solid C is) hydrated / (solid C) contains water (of crystallisation)	1	Allow water is given off / hydrous / hydrate / water evaporates Ignore 'water' alone / wet / moist / damp / water forms Reject comments on boiling point / solubility
3(b)	M1 chromium(III) / Cr^{3+}	1	the name takes precedence over an incorrect formula Allow missing oxidation state Reject incorrect oxidation state
	M2 potassium / K^+	1	
	M3 sulfate / SO_4^{2-}	1	[2] incorrect formula but containing at least two correct ions CrKSO_4 [1] incorrect formula containing one correct ion FeNaSO_4 [0] Cr (not part of a formula) SO_4 (not part of a formula) K (not part of a formula) Reject any incorrect additional ions
3(c)	no change / no reaction / no precipitate	1	Allow no observations / nothing happens / colourless (solution) Ignore ammonia made / ammonia given off / bubbling Reject any answer that implies a change, such as 'becomes colourless'
3(d)	(damp) <u>red</u> litmus turns blue	1	Ignore any additional negative gas tests Ignore fizzing / bubbling / effervescence Ignore pungent gas Reject any additional positive gas tests

Question	Answer	Marks	Guidance
3(e)	cream precipitate	1	Allow ppt / ppte Ignore solid / any changes on standing Reject any incorrect additional observations

Question	Answer	Marks	Guidance
4	reduction of solid method Any 6 from: MP1 crush / grind ore / break into smaller pieces / powder MP2 using a suitable method e.g. pestle and / or mortar, hammer MP3 add more reactive element / reducing agent MP4 carbon / coke / iron / zinc / aluminium / magnesium / CO / hydrogen specified MP5 heat MP6 In a suitable container (e.g. crucible, evaporating basin) MP7 tin displaced / reduced / displacement reaction to make tin	6	Ticks must show where marks are awarded, but not covering the answer so it cannot be read. Ignore irrelevant washings, dryings, weighing, crystallisation, evaporation, effervescence etc Allow methods starting with tin oxide, Reject methods starting with tin, Ignore other tin compounds MP4 does not subsume MP3 Allow correct equation Ignore replaced for displaced

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Question	Answer	Marks	Guidance
4	displacement from solution method Any 6 from: MP1 crush / grind ore / break into smaller pieces / powder MP2 using a suitable method e.g. pestle and / or mortar, hammer MP3 add a (dilute) acid MP4 suitable strong acid named (e.g. HCl, H₂SO₄, HNO₃) MP5 add metal more reactive than tin MP6 name of metal added specified (e.g. iron, zinc, magnesium) MP7 tin displaced / tin reduced / displacement reaction to make tin electrolysis of solution method Any 6 from: MP1 crush / grind ore / break into smaller pieces / powder MP2 using a suitable method e.g. pestle and / or mortar, hammer MP3 add a (dilute) acid MP4 suitable strong acid named (e.g. HCl, H₂SO₄, HNO₃) MP5 electrolysis (of solution) MP6 specified inert material for electrodes (e.g. carbon, platinum) MP7 tin obtained at the negative electrode / cathode		Allow MPs 3 & 4 for 'dil HCl' etc but Reject concentrated acids Ignore weak acids, e.g. ethanoic (MP 3 awarded but not 4) A named more reactive metal does not subsume MP5 Reject Ca and above. Allow correct equation Ignore replaced for displaced Allow MPs 3 and 4 for 'dil HCl' etc. Ignore weak acids, e.g. ethanoic acid (MP 3 awarded but not 4) Allow description of electrolysis Allow correct cathode half equation

Question	Answer	Marks	Guidance
4	electrolysis of molten ore / oxide Any 6 from: MP1 crush / grind ore / break into smaller pieces / powder MP2 using a suitable method e.g. pestle and / or mortar, hammer MP3 heat ore / oxide MP4 until molten MP5 electrolysis MP6 specified inert material for electrodes (e.g. carbon, platinum) MP7 tin obtained at the negative electrode / cathode		Allow description of electrolysis Allow correct cathode half equation

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	reduction of solid	displacement from solution	electrolysis of solution	electrolysis of molten
MP1	crush / grind ore / break into smaller pieces / powder			
MP2	using a suitable method e.g. pestle and / or mortar, hammer			
MP3	add more reactive element / reducing agent	add (dilute) acid		heat ore / oxide
MP4	identified as carbon / coke / iron / zinc / aluminium / magnesium / hydrogen / carbon monoxide	suitable strong acid named		until molten
MP5	heat	add more reactive metal	electrolysis	
MP6	in crucible / evaporating basin	suitable more reactive metal identified (up to Mg in reactivity) does not subsume MP5	specified inert material for electrodes (e.g. carbon, platinum)	
MP7	tin displaced / reduced / displacement reaction to make tin / correct equation		tin forms at cathode / cathode half equation	