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CAMBRIDGE
International Education

Cambridge International AS & A Level

CHEMISTRY **9701/35**

Paper 3 Advanced Practical Skills 1 **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.

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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.

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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.

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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.

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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
	Correct point **or** mark awarded
	Incorrect point **or** mark not awarded
	Information missing or insufficient for credit
BOD	Benefit of the doubt given
CON	Contradiction in response otherwise markworthy, mark not given
DP	Error in number of decimal places
ECF	Error carried forward applied
I	Incorrect or insufficient point ignored while marking the rest of the response
RE	Rounding error
REP	Repeat error
SEEN or /	Blank page **or** part of script seen

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Annotation	Meaning
SF	Error in number of significant figures
TE	Transcription error

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Mark Scheme abbreviations

/	alternative responses for the same marking point
R	reject the response
A	accept the response
I	ignore the response
ecf	error carried forward
AVP	any valid point
ora	or reverse argument
AW	alternative wording
underline	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
M	marking point
ppt	precipitate
sf	significant figures

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Accuracy marks must be recorded on the spreadsheet provided, on an accuracy grid or on a blank part of the Supervisor's script. If using a spreadsheet or accuracy grid, this must be printed and stapled inside the Supervisor script. The relevant Supervisor results must be written and ringed on **each candidate script**.

When awarding the accuracy (Q) mark in **Question 1**, record:

- candidate's number
- candidate's volume
- mark awarded

When awarding accuracy marks in **Question 2** record:

- candidate maximum temperature change
- difference from supervisor, δ
- mark awarded

In either question, where more than half the candidates score no marks against the supervisor value, **please contact your team leader (TL).**

Reject <u>either</u> a rounding error (RE) <u>or</u> a transcription error (TE) only once in the paper. Note: Reject REs <u>only</u> in 'correctly calculates'. Reject fractions in place of decimal answers only once in the paper.

Practical issues at a centre sometimes mean that candidates cannot access all of the marks. In such cases, contact your TL. Candidate marks may need to be scaled.

Restarts: In calculations sections of quantitative analysis questions, candidates may gain credit in a question part by using either a previous incorrect answer **or** they may 'restart' the calculation using their experimental data correctly. Annotate either 'ecf' or 'allow: restart'.

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Question	Answer	Marks	Guidance
1(a)	**I** Single table with headings in space for results to show two weighings, mass of solid and a volume of gas **II** Four **unambiguous headings shown, with correct units, in list / table** • (mass of) container and Mg / **FA 2** • (mass of) container (empty or with residual Mg) • (mass of) Mg / **FA 2** (used / added) • (volume of) gas (collected) • all units correctly displayed Mass units: / g **or** in g **or** (g) **or** g by every reading Volume units: / cm^3 **or** in cm^3 **or** (cm^3) **or** cm^3 by every reading **III** Both mass readings consistently recorded to 2 or 3 decimal places (dp) **and** all volumes given as integer values **and** correct calculation of mass of **FA 2** **and** correct calculation of volume if initial and final volume recorded Examiner rounds supervisor value (if necessary) to the nearest cm^3 and writes it ringed on each candidate script. Examiner rounds the candidate value (if necessary) to the nearest cm^3 and compares this value with the calculated range.	**4**	**A** clearly labelled list. **A** volume of gas to be recorded separately in space for results. Inclusion of stopper is optional but must be consistent. **R** m for mass. **R** weight, amount. **I** headings in any extra data recorded, but **R** missing or incorrect units in extra data. **R** unqualified 'initial mass', 'final mass'. **A** in grams or in grammes for g, but **R** e.g. (grams), gram, gr, / (g), (/g). **R** ml / cc. **A** units with headings **or** next to each data item. **A** units with headings **and** next to data as long as they are both correct. **A** 4 dp. **R** weighings to 1 dp unless lack of 2 or 3 dp balance mentioned in supervisor report. **A** from data recorded in the method or in **1(b)(i).** **I** missing trailing zeroes in calculated values. Rounded supervisor value is multiplied by 0.8 and 1.2. These values are rounded to the nearest cm^3 to provide the inclusive upper and lower limits between which the candidate may score.

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Question	Answer	Marks	Guidance
1(a)	**IV** Volume of gas recorded is within 20% of supervisor result		**A** from data recorded in the method or in **1(b)(i)**. Upper limit for the acceptable range must be $\leqslant 250\ cm^3$.
1(b)(i)	**Correctly calculates** $n(H_2)$ = volume of gas produced / 24 000 **and** answer to 2–4 sf	**1**	Penalise sf only once in **1(b)**. If no working is shown, then the answer must be correct to 3 sf.
1(b)(ii)	**Correctly uses** **(b)(i)** × 2 / 0.03 **and** answer to 2–4 sf	**1**	If no working is shown, then the answer must be correct to 3 sf.
1(b)(iii)	**Correctly uses** Uncertainty, **U** (for 2 d.p. balance) = 0.005 **and** % error in weighing **FA 2** = $^{2 \times \mathbf{U} \times 100}/_{\text{mass of FA 2 (used)}}$ **and** answer to 2–4 sf **or** Uncertainty, **U** (for 3 d.p. balance) = 0.0005 **and** % error in weighing **FA 2** = $^{2 \times \mathbf{U} \times 100}/_{\text{mass of FA 2 (used)}}$ **and** answer to 2–4 sf	**1**	For 4 dp balance, **U** = 0.00005 g. For 1 dp balance, **U** = 0.05 g.

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Question	Answer	Marks	Guidance
1(b)(iv)	**FA 2** is in excess **and** **FA 2** / Mg is still visible at the end of the experiment	**1**	**I** fizzing stops. **A** solid or residue for Mg but **R** ppt. **A** more hydrogen / bubbles produced if more acid is added. **I** not all Mg dissolves. Contact TL if there is evidence that candidates have been given an unusually low mass of Mg.
1(c)(i)	M1 Smaller volume of gas collected **or** smaller moles of gas collected **or** more gas escapes (before the bung is inserted) M2 (powdered) Mg has larger surface area **and** faster reaction **or** greater (risk of) corrosion (so Mg not in excess)	**2**	
1(c)(ii)	mass of hydrogen produced (in reaction with magnesium) is (very) small **and** (very) large percentage error	**1**	**A** hydrogen has a low M_r / is very light / is much lighter (than carbon dioxide) for mass of hydrogen produced is (very) small. **A** percentage uncertainty for percentage error.

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Question	Answer	Marks	Guidance
2(a)	**I** Complete set of results recorded **and** all volumes to .00 cm^3 or .05 cm^3 and all thermometer readings to .0 or .5 ºC **and** at least one reading at .0 and one at .5 Examiner calculates supervisor's greatest ΔT (= $T_{max} - T_{initial}$) and writes it ringed on each candidate script. Examiner calculates candidate's ΔT then calculates the difference, δ, from the supervisor value.	**1**	**A** volumes to be within 0.10 cm^3 of the intended values.
2(a)	**II** Award if $\delta \leqslant 2.0\,°C$ for supervisor $\Delta T \geqslant 10.0$ **III** Award if $\delta \leqslant 1.5\,°C$ for supervisor $\Delta T \geqslant 10.0$	**2**	For $5.0 \leqslant$ supervisor $\Delta T < 10.0$ Award **II** if $\delta \leqslant 1.5\,°C$. Award **III** if $\delta \leqslant 1.0\,°C$. For supervisor $\Delta T < 5.0$ Award **II** only if $\delta \leqslant 1.0\,°C$.

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Question	Answer	Marks	Guidance
2(b)(i)	**I** Unambiguous labelled axes with temperature on the y-axis and volume of **FA 4** on the x-axis **or** correct units **II** Suitable linear scales that include 3 °C above highest T in table **III** All recorded points plotted correctly	**3**	**A** *y*-axis: (maximum) temperature / temp / T **or** °C. **R** C or C° or t or ΔT / T° **A** *x*-axis volume / vol / V / **FA 4** / acid / HC*l* **or** cm^3. **R** ml / cc but **A** ecf from **Q1**. **I** style of units. Data must occupy more than half the grid in both directions. **R** e.g. scales based on multiples of 3 or 7. **R** scales that don't allow plotting of all points. **R** if the scale within the plotting area is non-linear. **All** values must be plotted if scale allows. If scale does not allow then **A** for a minimum of 8 correctly plotted points (scale mark lost) provided they are all correctly plotted. Annotate script with a small dot on the *x*-axis scale or near point for each point checked. If point should be on a line, it must be on the line. If it should not be on the line, it must not be so. If not supposed to be on a line, points must be within half a small square of the correct position and in the correct small square. Blobs/thick crosses should be less than ½ a small square across and be correctly centred.

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Question	Answer	Marks	Guidance
2(b)(ii)	Two lines of best fit drawn that cover all the plotted points ignoring any points labelled anomalous **and** lines must give a sharp intersection at a temperature equal to or higher than the highest recorded temperature	**1**	**R** a straight line for the left-hand line. **R** a continuous curve where intersection should be. **A** maximum 1 (labelled) anomalous point per line.
2(b)(iii)	Correct volume of FA 4 read within half a small square and in the correct square **and** answer to either 1 or 2 dp	**1**	**R** if no intersection, e.g. a continuous curve. **R** if intersection is in a non-linear part of the scale.
2(c)(i)	**Correctly calculates** [**FA 4**] = $\frac{(25 \times 1.90)}{\textbf{(b)(iii)}}$ **and** answer to 2–4 sf	**1**	If no working is shown, then the answer must be correct to 3 sf.
2(c)(ii)	**Correct expression** $\frac{\textbf{1(b)(ii)} \times 1000}{\textbf{2(c)(i)}}$	**1**	Final answer not required but must be correct if given. Use of 1000 may be credited from final answer.
2(d)	M1 (Smaller error using titration) as uncertainty due to use of lines of best fit and / or extrapolation of lines (of best fit) is more significant M2 Easier to repeat titration / statement about concordance of titration results	**2**	**I** answers that refer to heat loss / temperature of the room. **I** reference to equipment errors **A** for either mark: idea that titration is accurate as solution may be added drop by drop to see exact end-point **or** idea that percentage error is lower for titration because more dilute solutions can be used.

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td colspan="4">FA 5 = $MnCl_2$ FA 6 = $(NH_4)_2Fe(SO_4)_2$ FA 7 = $Zn(NO_3)_2$</td></tr>
<tr><td>3(a)(i)</td><td>
<table>
<tr><th></th><th>FA 5</th><th>FA 6</th><th>FA 7</th></tr>
<tr><td>Test 1</td><td>no change</td><td>white ppt*</td><td>and no change*
1* for 2 no changes with FA 5 and FA 7</td></tr>
<tr><td></td><td>(no change)</td><td>ppt insoluble / no change*</td><td>(no change)</td></tr>
<tr><td>Test 2</td><td>(after standing) (pale) brown solution or (dark) brown ppt*</td><td>(purple solution) turns colourless / pale yellow / decolourises*</td><td>stays purple / pink / no change*</td></tr>
<tr><td>Test 3</td><td>off-white / buff / beige / (light/pale) brown ppt* (rapidly) turning (darker) brown or insoluble in excess*</td><td>green ppt* insoluble in excess * turning brown*</td><td>white ppt* soluble in excess*</td></tr>
<tr><td></td><td>no change</td><td>gas / NH_3 turns red litmus blue*</td><td>and no change*
1* for 2 no changes with FA 5 and FA 7</td></tr>
<tr><td></td><td>effervescence*
‘pops’ with a lighted splint*</td><td>effervescence*
‘pops’ with a lighted splint * if not awarded for FA 5</td><td>Effervescence / gas / NH_3 turns red litmus blue*</td></tr>
</table>
</td><td>9</td><td>2* = 1 mark to maximum of 9 marks.
R no observation penalise once then ecf.
R ’–‘ each time seen.
A no (visible) reaction.
Any use of additional reagents CONs the associated blob.
Additional or incorrect positive gas test loses the relevant gas test blob.
R solid / particles / residue for ppt.
A no ppt for no change in Test 1.

A (pale) yellow-brown solution with FA 5.
I initial red-brown colour of solution or ppt but R red-brown as final colour.

I brown ppt turning brown FA 5.
R cream / yellow / yellow-brown ppt FA 5.
R soluble white ppt (both blobs) FA 7.

Must be clear that gas / ammonia is turning the litmus blue.
A condensation or bubbles forming with FA 5, FA 7 middle box if no other change recorded but R effervescence / fizzing.
A effervescence / fizzing / bubbles for gas / ammonia with FA 6.
I gas / ammonia turning red litmus blue for FA 6 final box.
A fizzing / bubbles for effervescence but R air bubbles and I gas produced.</td></tr>
</table>

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>3(a)(ii)</td><td>
<table>
<tr><th></th><th>FA 5</th><th>FA 6</th><th>FA 7</th></tr>
<tr><td>cation(s)</td><td>Mn^{2+}</td><td>NH_4^+ / Fe^{2+}</td><td>Zn^{2+}</td></tr>
<tr><td>anion</td><td>unknown</td><td>SO_4^{2-}</td><td>NO_3^-</td></tr>
</table>
</td><td>3</td><td>Mark with blobs.
3 or 4 correct answers – 1 mark.
5 or 6 correct answers – 2 marks.
7 correct answers – 3 marks.
A correct ions without evidence unless the relevant table column is blank in which case no credit for that unknown.
R incorrect ions regardless of observations
I H^+ for **FA 5** or **FA 6**.
Additional incorrect ions in a particular box CONs the correct ion. For the **FA 6** cation box any third ion would CON one of the correct ions but an incorrect second ion is not a CON – just incorrect.
A e.g. Mn^{+2}, Mn^{++}.
A one rescue mark available for five or more correct names if zero scored from formulae but must be manganese(II), iron(II) if names used.
R incorrect name CONs correct formula but **I** manganese, iron for the relevant ions
Deduct one mark if cations and anions reversed.
R errors in capitalisation of formulae e.g. MN^{2+}, nh_4^+</td></tr>
<tr><td>3(a)(iii)</td><td>$Mn^{2+}(aq) + 2OH^-(aq) \rightarrow Mn(OH)_2(s)$

M1 correct formulae
M2 balancing **and** state symbols</td><td>2</td><td>Both marks available as ecf from Fe^{2+} or Fe^{3+} for **FA 5**.

One mark available as ecf from Al^{3+}, Ba^{2+}, Ca^{2+}, Mg^{2+} or Zn^{2+} for **FA 5** for a fully correct equation with state symbols.</td></tr>
</table>

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Question	Answer	Marks	Guidance
3(a)(iv)	reducing agent **and either** the oxidation state of Mn changes from +7 to +2 **or** the manganate is decolourised / changes from purple to colourless / changes from purple to pale yellow	**1**	**A** oxidation state of Mn decreases. **A** oxidation state of Mn changes from +7 to +4 provided a dark brown/black ppt is recorded in **FA 6** Test 2.
3(b)	green solid / powder* goes black* condensation / steamy fumes / (water) droplets / moisture (on upper part of test-tube)* gas / CO_2 tested with limewater* gives a white ppt*	**2**	2* = 1 mark. **A** turquoise / cyan / blue-green / green-blue. **R** ppt for solid. **A** green to black solid/residue for two blobs. **R** condensation reaction occurs **.** **I** melts, effervescence, white / colourless fumes, solid dissolves, mist, fog, steam, water vapour. **I** litmus turning red, gas extinguishes lighted splint.

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