CAMBRIDGE
International Education

Cambridge O Level

CHEMISTRY **5070/22**

Paper 2 Theory **May/June 2026**

MARK SCHEME

Maximum Mark: 80

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.

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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
	incorrect or insufficient point ignored while marking the rest of the response
	contradiction in response, mark not awarded
	benefit of the doubt given
	error carried forward applied
	incorrect point or mark not awarded
	rounding error

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Annotation	Meaning
SEEN	point has been noted, but no credit has been given or blank page seen
SF	error in number of significant figures
	pages are linked together
	used to highlight part of the response
	key point attempted / working towards marking point / incomplete answer / response seen but not credited / blank page seen
	unclear response / query

Abbreviations used within Mark Scheme

Abbreviation	Meaning
ECF	error carried forward
ORA	Or reverse argument
CON	contradiction in response, mark not awarded

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Question	Answer	Marks	Guidance
1	In **Question 1** allow the correct name but the correct formula takes precedence. In **Question 1** ignore errors in case and even the formula if it clearly identifies the correct answer from the list e.g. AL2O2		
1(a)	Al_2O_3	**1**	**ALLOW** aluminium oxide
1(b)	H_2	**1**	**ALLOW** hydrogen / H
1(c)	NH_3	**1**	**ALLOW** ammonia
1(d)	Al_2O_3	**1**	**ALLOW** aluminium oxide / Al
1(e)	C_3H_8	**1**	**ALLOW** propane

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Question	Answer	Marks	Guidance
2(a)	**M1** moles of KO_2 = 13.0 / 71 **OR** 0.18310 (1) **M2** mols of O_2 = 0.75 × 13.0 / 71 **OR** 0.75 × 0.18310 **OR** 0.13732 (1) **M3** vol of O_2 = 3.30 (dm^3) (1)	**3**	**FIRST LOOK AT FINAL ANSWER** • **IF any value in the range 3.29 and 3.50 and three sig figs = 3 MARKS** • **IF any value in the range 3.29 and 3.50 but not three sig figs = 2 MARKS** • **IF 0.13732 = 2 MARKS** • **IF any value in the range 4.32 and 4.39 and three sig figs = 2 MARKS** • **IF any value in the range 0.822 to 0.875 and three sig figs = 2 MARKS** • **IF 5.86 = 2 MARKS** • **IF 0.18310 = 1 MARKS** **NOTE** any value from two sig figs or above including truncation **ALLOW** correct number string **NOTE** any value from two sig figs or above including truncation **ALLOW ECF** from **M1** **NOTE** for **M3** must be **three** sig figs but allow truncation **ALLOW ECF** from **M2**
2(b)	O_2^-	**1**	**ALLOW** $K^+ O_2^-$ but **REJECT** KO_2^- **ALLOW** $2O_2^-$, etc.

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Question	Answer	Marks	Guidance
2(c)	regular arrangement of (alternating) positive and negative **ions**	**1**	**ALLOW** ordered structure with (alternating) positive and negative ions **ALLOW** regular arrangement of oppositely charged ions **ALLOW** regular arrangement of **cations** and **anions** **ALLOW** geometrical arrangement or pattern for regular arrangement **ALLOW** rows or layers of (alternating) positive and negative **ions** **ALLOW** reference to negative oxygen **ions** **NOTE ions** held together by **electrostatic** attraction can be taken to mean both positive and negative ions **IGNORE** giant lattice this is given in the question **REJECT** reference to macromolecules, molecules, covalent, atoms or intermolecular forces

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Question	Answer	Marks	Guidance
2(d)		**3**	**ALLOW** reference to atoms, molecules, ions or 'they' rather than particles
	M1 particles are touching each other (1)		**ALLOW** particles are close (packed) / particles are tightly packed for **M1** **REJECT little** or no separation between particles / **little** or no space between particles for **M1** **REJECT** small space between particles for **M1**
	M2 regular arrangement / ordered arrangement (1)		**ALLOW** particles are in a pattern for **M2** **ALLOW** particles are in a lattice for **M2** **ALLOW** particles are in a uniform arrangement for **M2** **IGNORE** particles in a fixed position or fixed arrangement for **M2** and **M3**
	M3 vibrating (about a fixed point) (1)		**IGNORE** rotation for **M3** **REJECT** any reference to translational motion for **M3**

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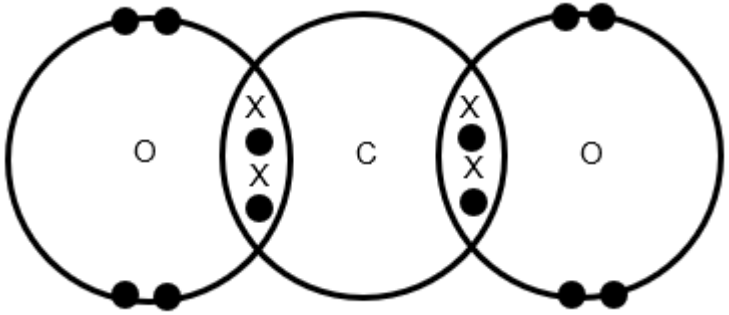
Question	Answer	Marks	Guidance
2(e)	 **M1** two double bonds shown (1) **M2** lone pairs on oxygen correct (1)	**2**	**ALLOW** all white dots, all black dots, all crosses or a mixture of black, white dots, and/or crosses **IGNORE** any inner shells shown **IGNORE** missing symbols **NOTE** lone pairs do not need to be shown as pairs **REJECT** additional non-bonded electrons for **M2**

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Question	Answer	Marks	Guidance
2(f)	weak intermolecular forces	**1**	**ALLOW** attraction for force throughout **ALLOW** easy to overcome forces between molecules / needs little energy to break intermolecular or attraction between molecules **NOTE** easier to overcome forces / less energy to overcome intermolecular forces / low(er) intermolecular forces is **not** sufficient **ALLOW** weak bonds between molecules / weak intermolecular bonds / (weak) van der Waals' forces (between molecules) / weak VDW forces **IGNORE** does not have strong intermolecular forces / less intermolecular forces / weaker intermolecular forces / little intermolecular forces **NOTE** weak intermolecular / simple molecular / simple covalent / weak forces between particles are **not** sufficient **REJECT** weak covalent bonds / weak forces between atoms / intermolecular forces between atoms **REJECT** intermolecular forces between bonds / strong intermolecular forces / intramolecular forces **REJECT** macromolecule or giant molecule / reference to ions

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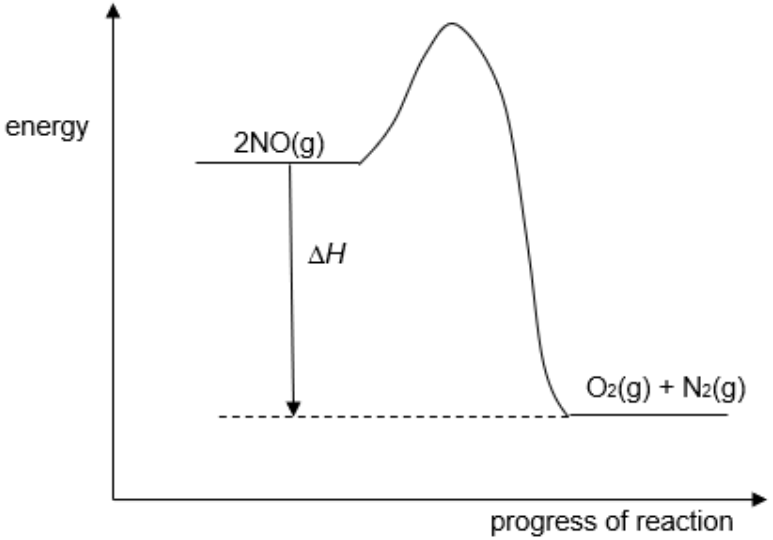
Question	Answer	Marks	Guidance
3(a)	 labels on axes (1) reactants above products and reactants on the left (1) downward arrow labelled as ΔH (1)	**3**	**ALLOW** enthalpy for energy / energy level for *y*-axis **IGNORE** kJ / kJ mol^{-1} **REJECT** energy change / enthalpy change / KE / PE for *y*-axis **ALLOW** reaction coordinate / reaction pathway for *x*-axis **REJECT** time / rate of reaction / reaction procession for *x*-axis / s **ALLOW** words reactant and products / R and P / NO for reactant and either O_2 or N_2 for product **NOTE** words take precedence over formulae NO, N_2 and O_2 **NOTE** if double headed arrow or no arrow must indicate that it is negative, e.g. ΔH –ve **ALLOW ECF** from **M2** (endothermic reaction) **IGNORE** activation energy arrow and curve
3(b)	activation energy is lowered	**1**	**ALLOW** E_a is lowered **NOTE** active energy is **not** sufficient but **ALLOW** activational energy **IGNORE** references to collisions

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Question	Answer	Marks	Guidance
3(c)	idea of maximising the amount of NO removed (from exhaust gases)	**1**	**ALLOW** more NO reacts / less NO comes out of exhaust **ALLOW** reference to toxic gas or CO instead of NO **ALLOW** to have a fast reaction / so the rate of reaction is very high **ALLOW** to increase the rate of reaction / to have a faster reaction / is more efficient **ALLOW** more particles exposed (to catalyst) / more collisions per second (with catalyst) / high number of collisions per second **NOTE** more collisions or more successful collision / more collisions involving collisions with more energy than activation energy / more chance of collision are **not** sufficient **IGNORE** idea of catalyst reacting

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Question	Answer	Marks	Guidance
3(d)		**2**	**NOTE** marking points are all comparative **IGNORE** references to equilibrium **ALLOW** atom, ion or molecule for particle
	M1 particles are more crowded / distance between particles is smaller / more particles per unit volume (1)		**ALLOW** more particles in the same space / more particles in the same area / more particles per dm^3 / more concentrated particles / particles closer together / particles come closer together **IGNORE** particles take up less space **REJECT** particles have more kinetic energy / particles are moving faster / activation energy changes for **M1** **ALLOW** collisions more often / increased collision rate
	M2 more collisions per second / greater collision frequency (1)		**IGNORE** more chance of collision / reference to successful / faster collisions / more collisions per unit volume / more collisions with energy above activation energy **IGNORE** particles more compact / particles more dense **NOTE** more collisions or more successful collisions is **not** sufficient

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Question	Answer	Marks	Guidance
3(e)		**2**	**NOTE** marking points are all comparative **IGNORE** references to equilibrium **ALLOW** atom, ion or molecule for particle
	M1 particles move faster / particles have more kinetic energy (1)		**ALLOW** more kinetic energy between particles **IGNORE** more kinetic energy if no reference to particles / particles move more / particles move further apart or closer together **IGNORE** particles gain energy / particles gain thermal energy / particles have enough energy **ALLOW** more particles have enough activation energy / more particles have minimum energy needed to react
	M2 more successful collisions / more collisions involve equal or more than activation energy / more particles with equal or more than activation energy / more effective collisions / more energetic collisions (1)		**IGNORE** more fruitful collisions / successive collisions / more powerful collisions / faster collisions / more significant collisions **NOTE** more collisions / higher collision frequency / increased rate of collisions / more chance of a collision is **not** sufficient but **ALLOW** more effective collision rate / more successful collision rate **REJECT** activation energy increases or decreases for **M2**

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Question	Answer	Marks	Guidance
4(a)	<table><tr><th></th><th>observation at anode</th><th>observation at cathode</th></tr><tr><td>copper electrodes</td><td>gets smaller / disappears / mass decreases</td><td>gets bigger / (coated with) pink (solid) / mass increases</td></tr><tr><td>graphite electrodes</td><td>bubbles / fizzes</td><td>(coated with) pink (solid) / gets bigger / mass increases</td></tr></table> [4]	**4**	**NOTE** each correct answer = 1 mark **IGNORE** correct or incorrect names of products **ALLOW** copper anode dissolves / copper anode decreases (in size) / copper cathode increases (in size) / brown (solid) at cathode / red-brown (solid) at cathode / orange (solid) at cathode **IGNORE** copper anode melts away / copper cathode coated with copper **IGNORE** at graphite anode colourless gas **ALLOW** for cathode brown (solid) / red-brown (solid) / orange (solid)
4(b)	(anode) $2I^- \rightarrow I_2 + 2e^-$ (1) (cathode) $Ba^{2+} + 2e^- \rightarrow Ba$ (1)	**2**	**ALLOW** correct multiples **ALLOW** $2I^- - 2e^- \rightarrow I_2$ **IGNORE** state symbols **ALLOW** one mark if both equations correct but at incorrect electrodes
4(c)(i)	does not react with electrolyte or products	**1**	**ALLOW** does not take part in the reaction **ALLOW** unreactive / does not react **IGNORE** less reactive / neutral / reference to electronic shells / does not dissolve / does not react easily
4(c)(ii)	platinum	**1**	**ALLOW** Pt but name of element takes precedence **ALLOW** gold / silver

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Question	Answer	Marks	Guidance
4(d)(i)	**+**2	**1**	**ALLOW** +II **IGNORE** 2+
4(d)(ii)	(oxidation) magnesium (atom) loses electrons / oxidation number of magnesium increases (1) (reduction) copper(II) ions gain electrons / oxidation number of copper decreases (1)	**2**	**NOTE** ionic half equation is **not** sufficient needs reference to what is happening with the electrons **IGNORE** number of electrons lost or gained **ALLOW** (reduction) copper ions gain electrons **ALLOW** oxidation number of copper ions decreases **REJECT** copper gains electrons / copper is reduced **ALLOW** oxidation involves losing electrons or oxidation number increases **AND** reduction involves gaining electrons or oxidation number decreases for one mark if no other mark awarded

Question	Answer	Mark	Guidance
5(a)	bubbles / fizzes / effervesces / colourless solution obtained	**1**	**IGNORE** zinc dissolves **ALLOW** pieces of zinc get smaller / zinc disappears **IGNORE** reaction mixture gets warmer
5(b)	to use up all the acid	**1**	**IGNORE** to get pure zinc chloride

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Question	Answer	Marks	Guidance
5(c)	mol of zinc = 0.04985 **OR** 3.24 / 65 (1) so mols of HCl needed = 0.04985 × 2 **OR** 0.0997 (1) actual mol of HCl = 0.050 × 1.50 **OR** 0.075 (so not enough HCl) (1) **OR** mol of HCl = 0.050 × 1.50 **OR** 0.075 (1) so mol of zinc needed = 0.075 ÷ 2 **OR** 0.0375 (1) actual mol of zinc = 0.04985 (so excess zinc) / so actual mass of zinc is 2.4375 (1)	**3**	**ALLOW** at least two decimal places and truncation **NOTE** an alternative route is: • mol of zinc = 0.04985 • mol of HCl = 0.075 • mol ratio is 1:1.5 / mol ratio of Zn to HCl is smaller than 1:2
5(d)	filtration	**1**	**ALLOW** use filter paper **IGNORE** decanting / centrifuging **REJECT** distillation / evaporation

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Question	Answer	Marks	Guidance
5(e)	**M1** heat solution to get a saturated solution / heat to reduce volume by half / heat to reach crystallisation point / heat to the first appearance of crystals (1) **M2** allow (solution) to evaporate slowly / leave (solution) to cool (1) **M3** filter off crystals, wash with water and dry with filter paper (1)	**3**	**IGNORE** any comments about making aqueous solution from zinc and hydrochloric acid **ALLOW** heat to remove some water / heat to concentrate the solution **ALLOW** boil instead of heat / evaporate instead of heat / warm instead of heat **REJECT** heat or boil to dryness for **M1** and **M2** **ALLOW** leave (solution) in a warm place, e.g. by window sill **ALLOW** leave solution for some time / leave solution for at least a day **M2 REJECT** leave to dry / use an oven to dry **ALLOW for M3** wash or rinse crystal (with water) and dry with filter paper or paper towel **ALLOW** wash with an organic solvent rather than water **IGNORE** pick out crystals **ALLOW** drying in an (warm) oven for **M3** if crystals have been washed **NOTE** for **M3** the method of drying must be stated **ALLOW** for **M3** wash crystals and then dry in a desiccator **REJECT** heat in an oven

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Question	Answer	Marks	Guidance
5(f)	**M1** M_r of $ZnCl_2$ = 136 **OR** formula mass of $3H_2O$ = 54 (1) **M2** M_r of hydrated salt = 190 **OR** $(\%=)100\times\frac{54}{190}$ (1) **M3** = 28 / 28.4 (1)	**3**	**FIRST LOOK AT ANSWER** • **IF 28 / 28.42 / 28.421 / full calculator value = 3 marks** • **IF 9.4 / 9.5 / 9.4736842 / full calculator value = 2 marks** • **IF 39.7 = 2 marks** **ALLOW** correct number strings **ALLOW ECF** from incorrect M_r values given or implied in **M1** **ALLOW** at least two sig figs and truncation and **IGNORE** units **ALLOW** from incorrect M_r values given or implied in **M1** and/or **M2**
5(g)	white precipitate (1) soluble in excess resulting in colourless solution (1)	**2**	**ALLOW** white solid **NOTE** white precipitate as only answer **OR** colourless solution as only answer = 1 mark **IGNORE** goes milky / cloudy precipitate **NOTE** mention of fizzing = max 1 mark **IGNORE** any names given for precipitate and the solution. **NOTE** soluble white precipitate = 1 mark unless the solubility is linked to excess ammonia **ALLOW** (precipitate) dissolves in excess / (precipitate) soluble in excess / colourless solution with excess

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Question	Answer	Marks	Guidance
6(a)	have mobile electrons	1	**NOTE** delocalised electrons is **not** sufficient / free electrons is **not** sufficient **IGNORE** electrons carry charge **REJECT** moving ions
6(b)(i)	aluminium has a lower density	1	**ALLOW ORA** **ALLOW** reference to transition element instead of copper **ALLOW** aluminium has a low density / copper has a high density **IGNORE** aluminium is lighter / aluminium is lightweight **ALLOW** aluminium is silver or grey in colour / copper is pink, red brown, orange, etc. in colour **IGNORE** reference to hardness / malleability and ductility **NOTE** unqualified density or colour is **not** sufficient **REJECT** references to corrosion
6(b)(ii)	copper has coloured compounds / copper has more than one oxidation state	1	**ALLOW ORA** **ALLOW** reference to transition element instead of copper **ALLOW** copper has catalytic properties **ALLOW** copper has more than one valency / aluminium is more reactive / aluminium is higher in the reactivity series / copper does not react with dilute acids to give hydrogen **IGNORE** reference to group numbers

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Question	Answer	Marks	Guidance
6(c)(i)	zinc	1	
6(c)(ii)	**M1** brass has particles with different sizes (1) **M2** layers (of atoms or ions) in brass cannot slide (as easily as in pure copper) (1)	2	**ALLOW** atoms or ions for particles **ALLOW** copper has same sized particles **IGNORE** atoms have different shapes **REJECT** brass atoms are different sizes but **ALLOW** the atoms in brass are different sizes **REJECT** for **M1** reference to brass being a compound **ALLOW** reference to molecules in **M2** but not **M1** **ALLOW** layers in copper can slide (but no layers in brass) **NOTE** atoms cannot slide as easily is **not** sufficient
6(d)(i)	has an oxide layer (on surface) (1) outer layer is waterproof / does not let water through / is impermeable (to water and/or oxygen) (1)	2	**NOTE** references to aluminium rusting or not rusting = 1 mark maximum **NOTE M2** is independent of **M1** providing the answer is about a layer or coating **NOTE** it is a physical barrier is **not** sufficient but **ALLOW** a barrier to water, oxygen and/or air **ALLOW** insoluble in water / non-porous **IGNORE** it does not react with water / oxide layer is unreactive **NOTE** layer protects from air or water is **not** sufficient

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Question	Answer	Marks	Guidance
6(d)(ii)	aircraft (1) because it has a low density (1) **OR** overhead (electrical) cables (1) because it has a low density / has good electrical conductivity (1) **OR** window frames (1) because it is malleable / does not corrode (1)	**2**	**M2** is dependent on **M1** or a near miss for **M1** **IGNORE** lightweight / aluminium has a lower density **NOTE** reference to electricity or electrical only needed once within the answer **NOTE** used as wires unqualified is **not** sufficient for **M1** **IGNORE** it is less dense **IGNORE** used as foil / soda cans / used in food containers **ALLOW** to make surgical tools (1) because it does not corrode (1)
6(e)(i)	lowers the operating temperature (of the cell) / increases the electrical conductivity of the electrolyte	**1**	**ALLOW** lowers the melting point of the bauxite or aluminium oxide / to lower the energy requirement for the process / less heat needed in process **IGNORE** used as an electrolyte / dissolve the bauxite / reduce costs unqualified / lowers the melting point unqualified **REJECT** lowers the melting point of aluminium / it is a catalyst

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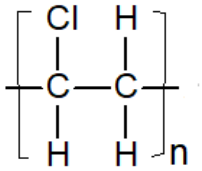
Question	Answer	Marks	Guidance
6(e)(ii)	**carbon** reacts with **oxygen** formed to produce **carbon dioxide**	**1**	**ALLOW anode** reacts with **oxygen** to form **carbon dioxide** **ALLOW** mark from a word or symbol equation **IGNORE** reference to carbon or anode burning or corroding / electrode decomposing **REJECT** electrode dissolves

Question	Answer	Mark	Guidance
7(a)	 **M1** correct repeat unit (1) **M2** continuation bonds (and n shown) (1)	**2**	**IGNORE** brackets and n they are not needed for **M1** or **M2** **ALLOW** for **M1** CHC*l*—CH_2 / CHC*l*CH_2 **NOTE** repeat unit does not need continuation bonds and can be part of a larger structure **REJECT** structures with carbon-carbon double bonds for both **M1** and **M2** **NOTE M2** is dependent on **M1** **ALLOW** two or more complete repeat units with continuation bonds for **M2**

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Question	Answer	Marks	Guidance
7(b)	**any two from:** insoluble in water (1) non-biodegradable / does not decompose / does not decay (1) unreactive (with water or air) (1)	**2**	**NOTE** insoluble unqualified / waterproof is **not** sufficient **ALLOW** decomposes (very) slowly / takes a long time (at least two hundred years) to decompose / does not degrade **IGNORE** does not decompose easily **ALLOW** cannot be hydrolysed **ALLOW** float in water as an extra marking point **IGNORE** combustion and formation of toxic gases
7(c)(i)	carbon dioxide / water	**1**	**ALLOW** CO_2 / H_2O but name take precedence **REJECT** methane
7(c)(ii)	carbon monoxide	**1**	**ALLOW** CO but name take precedence **ALLOW** hydrogen chloride / HCl
7(d)	**M1** energy associated with bonds broken = 740 + 2 × 340 **OR** 1420 **M2** energy associated with making bonds = 242 + 1077 **OR** 1319 (1) **M3** enthalpy change = 1420 – 1319	**3**	**IGNORE** sign **IGNORE** sign **ALLOW ECF** from **M1** and **M2**

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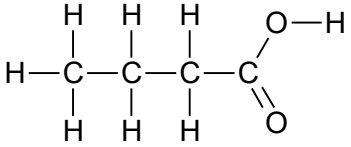
Question	Answer	Marks	Guidance
8(a)	$CH_3CH_2OH + O_2 \rightarrow CH_3COOH + H_2O$ (1) bacteria / oxygen (1)	**2**	**ALLOW** $CH_3CH_2OH + 2[O] \rightarrow CH_3COOH + H_2O$ **ALLOW** formulae to be displayed, structured or molecular formulae in the equation **ALLOW** from symbol equation even if not correct but must be O_2 **ALLOW** from word equation even if not correct **IGNORE** reference to air / acid / heat / warm **REJECT** anaerobic conditions / lack of oxygen **REJECT** high temperatures / temperatures above 50 ˚C / use of $KMnO_4$ / use of $K_2Cr_2O_7$
8(b)		**1**	**REJECT –**OH since no bond between O and H
8(c)	same molecular formula but different structural formulas	**1**	**ALLOW** structures / displayed formulas instead of structural formulas
8(d)(i)	butyl propanoate	**1**	**NOTE** spelling must be correct **REJECT** but-1-yl propanoate
8(d)(ii)	$CH_3CH_2COOCH_2CH_2CH_2CH_3$	**1**	**ALLOW** displayed or structural formula or a mix but it must be unambiguous **ALLOW** $CH_3CH_2CH_2CH_2O_2CCH_2CH_3$

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Question	Answer	Marks	Guidance
8(d)(iii)	heat / reflux / acid catalyst	**1**	**ALLOW** H_2SO_4 / H_3PO_4 / (concentrated) sulfuric acid / (concentrated) phosphoric acid **ALLOW** any quoted temperature between 50 and 165 ˚C / warm **IGNORE** high temperature / any pressure quoted / dilute sulfuric acid
8(e)	$C_8H_{16}O_2$ (2)	**2**	**ALLOW** one mark for $C_7H_{15}COOH$ / $C_7H_{15}CO_2H$ **NOTE** consider general formula for carboxylic acid as working out and ignore

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