CAMBRIDGE
International Education

Cambridge O Level

CHEMISTRY **5070/21**

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 applied
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. SO		
1(a)	ZnO	**1**	**ALLOW** zinc oxide / Zn
1(b)	CO_2 / SO_2	**1**	**ALLOW** carbon dioxide / sulfur dioxide
1(c)	NH_2OH	**1**	**ALLOW** hydroxylamine
1(d)	ZnO / NO	**1**	**ALLOW** zinc oxide / Zn / NO / nitrogen monoxide
1(e)	C_2H_4	**1**	**ALLOW** ethene

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Question	Answer	Marks	Guidance
2(a)		3	**FIRST LOOK AT FINAL ANSWER** • **IF any value between 7.44 and 7.56 and three sig figs = 3 MARKS** • **IF any value between 7.44 and 7.56 but not three sig figs = 2 MARKS** • **IF 0.313846 = 2 MARKS** • **IF any value between 3.20 and 3.36 and three sig figs = 2 MARKS** • **IF any value between 3.20 and 3.36 but not three sig figs = 1 MARKS** • **IF any value between 4.80 and 5.02 and three sig figs = 2 MARKS** • **IF 0.20923 = 1 MARKS**
	moles of NaN_3 = 13.6 / 65 **OR** 0.20923 (1)		**NOTE** any value from two sig figs or above including truncation **ALLOW** correct number string
	mols of N_2 = 1.5 × 13.6 / 65 **OR** 1.5 × 0.20923 **OR** 0.313846 (1)		**NOTE** any value from two sig figs or above including truncation **ALLOW ECF** from **M1**
	vol of N_2 = 7.53 (dm^3) (1)		**NOTE** for **M3** must be **three** sig figs but allow truncation **ALLOW ECF** from **M2**

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Question	Answer	Marks	Guidance
2(b)(i)	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(b)(ii)	high melting point / high boiling point (1) conducts electricity in (aqueous) solution (1)	**2**	**IGNORE** crystalline solid or solid but **ALLOW** solid at room temperature as an alternative to high melting or boiling point **IGNORE** high**er** melting or boiling point **NOTE** conducts electricity in aqueous solution scores 2 marks **ALLOW** conducts electricity as a molten liquid / does not conduct electricity as a solid as an extra marking point **ALLOW** insoluble in non-polar solvent or a named non-polar solvent or an organic solvent / soluble in water / dissolves in water as an extra marking point **ALLOW** it is white / colourless as an extra marking point **IGNORE** references to density / hard **REJECT** insoluble in water / malleable / ductile
2(b)(iii)	N_3^- (1)	**1**	**ALLOW** $Na^+ N_3^-$ but **REJECT** $Na N_3^-$ **ALLOW** $2N_3^-$ etc.

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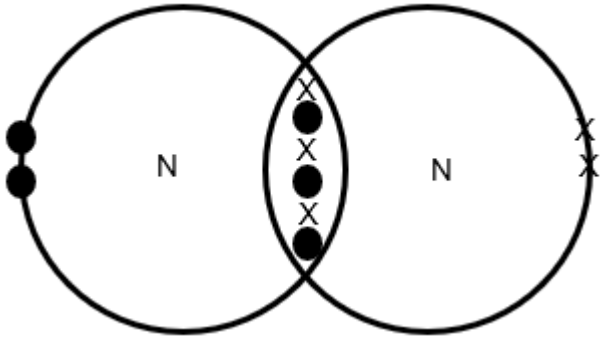
Question	Answer	Marks	Guidance
2(c)	(separation) particles are widely apart / large distance between particles / spread far apart / are far apart (1) (arrangement) random arrangement / irregular arrangement (1) (motion) moving (very) fast / have a large amount of kinetic energy / random (motion) (1)	3	**IGNORE** further apart but **ALLOW** further apart than in a liquid **ALLOW** disordered / not ordered / irregular (arrangement) / scattered **NOTE** no arrangement / not fixed are insufficient **ALLOW** move in all directions **IGNORE** move freely / not fixed **IGNORE** move faster but **ALLOW** move faster than in a liquid **IGNORE** vibration and rotation **NOTE** random can only score one mark either for **M2 or M3**
2(d)		1	**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 pair do not have to be shown as a pair **REJECT** additional non-bonded electrons

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Question	Answer	Marks	Guidance
2(e)	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)(i)	energy of products less than energy of reactants	**1**	**ALLOW** ΔH arrow goes downwards **ALLOW** energy or enthalpy of reactant more than energy of product **IGNORE** ΔH is negative **IGNORE** reference to bond making and bond forming / energy or heat is released **NOTE** has a negative gradient is **not** sufficient but **ALLOW** $\Delta \boldsymbol{H}$ has a negative gradient **ALLOW** level of reactants is higher than level of products / reactants are above products
3(a)(ii)	bond breaking endothermic **AND** bond making exothermic / energy absorbed to break bonds **AND** energy released on making bonds (1) more energy released than absorbed (1)	**2**	**ALLOW** heat in place of energy **REJECT** energy used for bond making **NOTE** this is independent of **M1** **NOTE** more energy released during making bonds than absorbed during bond breaking = 2 marks **IGNORE** more bonds made than broken **REJECT** more energy used in bond making than bond breaking **IGNORE** bond making energy is more than bond breaking energy but **ALLOW M1** correct **AND** bond making energy is more than bond breaking energy = 2 marks

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Question	Answer	Marks	Guidance
3(b)	**minimum** energy that colliding particles must have in order to react	**1**	**NOTE** activation energy is **not** sufficient **ALLOW minimum** energy for a reaction to occur **ALLOW minimum** energy to initiate a reaction

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Question	Answer	Marks	Guidance
3(c)	**advantage** **any one from**: water is the **only** product / **no** carbon dioxide made (1) higher efficiency (1) quieter (1) transfer more energy per gram of fuel (1) (hydrogen is) a renewable (source of energy) (1) **disadvantage** **any one from**: idea of difficult to store the **hydrogen** (under pressure) (1) limited availability of **hydrogen** (1)	**2**	**NOTE** assume answers refer to the fuel cell but **ALLOW ORA** if petrol or gasoline specified **ALLOW no** carbon monoxide made / **no** carbon emissions **IGNORE** does not produce toxic gases, harmful gases or oxides of nitrogen **IGNORE** environmentally friendly / green / non-polluting / no greenhouse gases / global warming / less polluting **IGNORE** more effective **NOTE** comparison of thermal energy produced is not sufficient **ALLOW** saves fossil fuels / hydrogen is not a limited resource / sustainable **IGNORE** safer / references to cost / oxygen is renewable **IGNORE** lightweight / compact **ALLOW hydrogen** is difficult to store **ALLOW** few filling stations for **hydrogen** **ALLOW fuel cells** don't last as long as petrol engines **ALLOW** less efficient **at** low temperature **IGNORE** hydrogen is flammable / explosive **IGNORE** expensive / expensive to run **IGNORE** it is difficult to store unqualified by hydrogen

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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
	particles are less crowded / distance between particles is greater / fewer particles per unit volume (1)		**ALLOW** fewer particles in the same space / fewer particles in the same area / fewer particles per dm^3 / less concentrated particles / particles further apart particles get further apart **IGNORE** particles take up more space **REJECT** particles have more/less kinetic energy / particles are moving faster / slower / activation energy changes for **M1**
	fewer collisions per second / lower collision frequency (1)		**ALLOW** collisions less often / decreased collision rate **IGNORE** less chance of collision / reference to successful / slower collisions / fewer collisions per unit volume / fewer collisions with energy above activation energy **IGNORE** particles less compact / particles less dense **NOTE** fewer collisions or fewer 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
	particles move slower / particles have less kinetic energy (1)		**ALLOW** less kinetic energy between particles **IGNORE** less kinetic energy if no reference to particles / particles move less / particles move further apart or closer together **IGNORE** particles lose energy / particles lose thermal energy / particles do not have enough energy **REJECT** particles gain less kinetic energy for **M1**
	less successful collisions / fewer collisions with equal or more than activation energy / fewer particles with equal or more than activation energy / less effective collisions / less energetic collisions (1)		**ALLOW** fewer particles have enough activation energy / fewer particles have minimum energy needed to react **IGNORE** fewer fruitful collisions / successive collisions / less powerful collisions / slower collisions / less significant collisions **NOTE** fewer collisions / lower collision frequency / decreased rate of collisions / less chance of a collision **not** sufficient but **ALLOW** less effective collision rate / less successful collision rate **REJECT** activation energy decreases or increases for **M2** **REJECT** no successful collisions

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>4(a)</td><td>
<table>
<tr><td></td><td>concentrated aqueous potassium iodide</td><td>dilute aqueous potassium iodide</td></tr>
<tr><td>product formed at anode</td><td>iodine / I_2 (1)</td><td>oxygen (and water) / O_2 (and H_2O) (1)</td></tr>
<tr><td>product formed at cathode</td><td>hydrogen / H_2 (1)</td><td>hydrogen / H_2 (1)</td></tr>
</table>
</td><td>4</td><td>NOTE each correct answer = 1 mark

ALLOW ionic equations even if incorrect with correct product

NOTE if both formula and name given both must be correct

ALLOW O / H / I</td></tr>
<tr><td>4(b)</td><td>(anode) $2I^- \rightarrow I_2 + 2e^-$ (1)

(cathode) $K^+ + e^- \rightarrow K$ (1)</td><td>2</td><td>ALLOW correct multiples / e for e^-

IGNORE state symbols

ALLOW $2I^- - 2e^- \rightarrow I_2$

ALLOW one mark if both equations correct but at incorrect electrodes</td></tr>
<tr><td>4(c)</td><td>inert / does not react with electrolyte or products (1)

good electrical conductivity (1)</td><td>2</td><td>ALLOW does not take part in the reaction

ALLOW unreactive / does not react

IGNORE less reactive / neutral / reference to electronic shells

ALLOW insoluble as additional marking point

ALLOW high melting point as additional marking point

IGNORE high boiling point</td></tr>
</table>

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Question	Answer	Marks	Guidance
4(d)(i)	+2	**1**	**ALLOW** +II **IGNORE** 2+
4(d)(ii)	(oxidation) iodide(ion) loses electrons / oxidation number of iodine increases (1) (reduction) copper(II) ions gain electrons / oxidation number of copper decreases (1)	**2**	**REJECT** iodine loses electrons but **ALLOW** iodine ions lose electrons **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 **AND** reduction involves gaining electrons **OR** oxidation involves oxidation number increasing **AND** reduction involves oxidation number decreasing for one mark if no other mark awarded

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

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Question	Answer	Marks	Guidance
5(c)	mol of aluminium = 0.12 **OR** 3.24 / 27 (1) so mols of H_2SO_4 needed = 0.12 × 1.5 **OR** 0.18 (1) actual mol of H_2SO_4 = 0.050 × 2.50 **OR** 0.125 (so not enough H_2SO_4) (1) **OR** mol of H_2SO_4 = 0.050 × 2.50 **OR** 0.125 (1) so mol of aluminium needed 0.0125 ÷ 1.5 **OR** 0.0833 (1) actual mol of aluminium = 0.12 (so excess aluminium) (1) **OR** mass aluminium needed is 2.25 g (so is in excess)	**3**	**ALLOW** at least two decimal places and truncation **NOTE** an alternative route is: • mol of aluminium = 0.12 • mol of H_2SO_4 = 0.125 mol ratio is 1:1.04 / mol ratio of H_2SO_4 to A*l* is smaller than 1:1.5
5(d)	filtration	**1**	**ALLOW** use filter paper **IGNORE** decanting / centrifuging **REJECT** distillation / evaporation

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Question	Answer	Marks	Guidance
5(e)		**3**	**IGNORE** any comments about making aqueous solution from zinc and hydrochloric acid
	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)		**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**
	M2 allow (solution) to evaporate slowly / leave (solution) to cool (1)		**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
	M3 filter off crystals, wash with water and dry with filter paper (1)		**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)	M_r of $Al_2(SO_4)_3$ = 342 or formula mass of $16H_2O$ = 288 (1) M_r of hydrated salt = 630 OR (%)$100 \times \frac{288}{630}$ (1) = 46 / 45.7 (1)	**3**	**FIRST LOOK AT ANSWER** • **IF 46 / 45.7 / 45.714 / full calculator display = 3 marks** • **IF 2.9 / 2.86 / 2.8571 / full calculator display = 2 marks** • **IF 84.2 = 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 sodium hydroxide **ALLOW** (precipitate) dissolves in excess / (precipitate) soluble in excess / colourless solution with excess **NOTE** no **ECF** from incorrect coloured precipitate

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Question	Answer	Marks	Guidance
6(a)	**any two from:** act as catalysts (1) more than one oxidation state (in compounds) (1) form coloured compounds (1)	**2**	**ALLOW** variable oxidation number / variable valency **NOTE** form coloured solutions is insufficient **NOTE** it is coloured is not sufficient **ALLOW** forms complex ions/complexes as an extra marking point
6(b)	has mobile electrons	**1**	**NOTE** delocalised electrons is **not** sufficient / free electrons is **not** sufficient **IGNORE** electrons carry charge **REJECT** moving ions
6(c)(i)	**any two from:** carbon (1) nickel (1) chromium (1)	**2**	

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Question	Answer	Marks	Guidance
6(c)(ii)	stainless steel has particles with different sizes (1) layers (of atoms or ions) in steel cannot slide as easily as in pure iron (1)	2	**ALLOW** atoms or ions for particles **IGNORE** atoms have different shapes **REJECT** steel atoms are different sizes but **ALLOW** the atoms in steel are different sizes **REJECT** for **M1** reference to steel being a compound **ALLOW** reference to molecules in **M2** but not **M1** **ALLOW** layers in iron can slide (but no layers in steel) **NOTE** atoms cannot slide as easily is **not** sufficient

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Question	Answer	Marks	Guidance
6(c)(iii)		**5**	**ALLOW** symbol equation balanced or unbalanced **NOTE** words and equations should not contradict
	coke burns/reacts with oxygen/air to make carbon dioxide / carbon + oxygen → carbon dioxide / C + O_2 → CO_2 (1)		**ALLOW** carbon for coke
	coke reacts with carbon dioxide to make carbon monoxide / carbon + carbon dioxide → carbon monoxide / C + CO_2 → 2CO (1)		**ALLOW** carbon dioxide is reduced (by coke) to carbon monoxide **IGNORE** C + CO_2 → CO (doesn't negate words)
	carbon monoxide reacts with iron(III) oxide to make iron / carbon monoxide + iron(III) oxide → carbon dioxide + iron / Fe_2O_3 + 3CO → $3CO_2$ + 2Fe (1)		**ALLOW** hematite for iron(III) oxide
	calcium carbonate forms (carbon dioxide and) calcium oxide / calcium carbonate → carbon dioxide + calcium oxide / $CaCO_3$ → CaO + CO_2 (1)		**ALLOW** limestone for calcium carbonate
	calcium oxide reacts with sand to make slag / calcium oxide + silicon dioxide → calcium silicate / CaO + SiO_2→ $CaSiO_3$ (1)		**ALLOW** calcium silicate for slag

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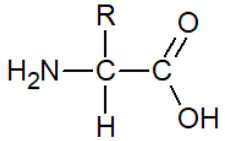
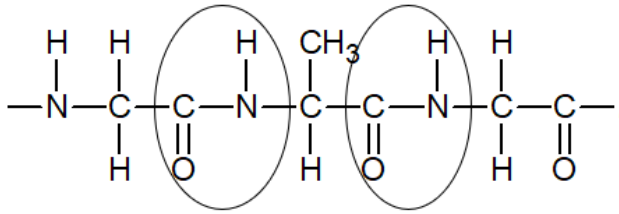
Question	Answer	Marks	Guidance
7(a)	forms compound and a small molecule / where two molecules react with loss of a small molecule	**1**	**ALLOW** where polymer and water are formed **ALLOW** reacts to form a polymer and a by-product **ALLOW** where compounds react to from a product and a small molecule **ALLOW** 2 monomers react to form a polymer and water / biproduct **ALLOW** water / small molecule is formed as a by-product **ALLOW** small molecule / simple molecule as HCl **IGNORE** water formed / water eliminated / water removed unqualified
7(b)(i)	amino acid	**1**	
7(b)(ii)		**1**	**ALLOW** displayed, structural formula or a mixture of both providing it is unambiguous
7(b)(iii)	any one circle from: 	**1**	**NOTE** if two circles drawn **both** must be around amide group

Question	Answer	Marks	Guidance
7(c)(i)	diamine (1) dicarboxylic acid (1)	**2**	**NOTE** any order **IGNORE** dicarboxylic / dicarboxyl alone **If no marks scored ALLOW 1 max** for amine and carboxylic acid
7(c)(ii)	**Any one from:** land-fills (may fill up) (1) accumulation of plastics/nylon in oceans (1) formation of toxic gases during **burning** (1)	**1**	**NOTE** reference to ozone layer or formation of hydrogen chloride = 0 mark maximum for the question **NOTE** nylon = plastic throughout **ALLOW** land dumps for land-fills / need to use land fill **NOTE** cause land pollution is **not** sufficient **ALLOW** plastics in lakes or rivers / killing or harming marine or aquatic organisms by plastic / example of killing marine or aquatic organism / blocks sewage systems **NOTE** water pollution is **not** sufficient **ALLOW** burning plastics produces carbon monoxide / burning plastics produces greenhouse gases / burning produces carbon dioxide **IGNORE** burning causes global warming **ALLOW** burning nylon produces hydrogen cyanide / NO_x / ammonia **NOTE** cause air pollution is **not** sufficient **IGNORE** litter / visual pollution **ALLOW** non-biodegradable / takes a long time to decompose as an extra marking point

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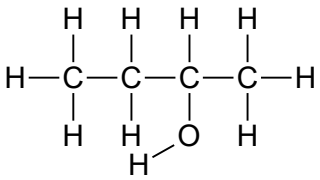
Question	Answer	Marks	Guidance
8(a)	$C_2H_4 + H_2O \rightarrow CH_3CH_2OH$ (1) **and any two from:** 300 °C (1) 60 atm / 6000 kPa (1) acid catalyst (1)	**3**	**ALLOW** as an equilibrium **ALLOW** $C_2H_4 + H_2O \rightarrow C_2H_6O$ / C_2H_5OH **ALLOW** 250 – 350 °C **ALLOW** 50 – 70 atm / 5000 – 7000 kPa **ALLOW 1 mark** for heat or high temperature **and** high pressure **IF** values for both temperature and pressure not given **ALLOW** phosphoric acid / phosphoric(V) acid / H_3PO_4 catalyst
8(b)		**1**	**NOTE** displayed formula only
8(c)(i)	ethyl propanoate	**1**	**NOTE** spelling must be correct
8(c)(ii)	$CH_3CH_2COOCH_2CH_3$	**1**	**ALLOW** displayed or structural formula or a mix but it must be unambiguous **ALLOW** $CH_3CH_2CO_2CH_2CH_3$ / $C_2H_5COOC_2H_5$

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Question	Answer	Marks	Guidance
8(c)(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
8(d)	$C_8H_{18}O$ (2)	**2**	**ALLOW** one mark for $C_8H_{17}OH$ **NOTE** consider general formula for alcohol as working out and ignore

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