Pearson
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Mark Scheme (Results)

Summer 2024

Pearson Edexcel GCSE
In Chemistry (1CH0)
Paper 2F

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Chemistry 1CH0_2F

Question number	Answer		Mark
1(a)(i)	strong / does not react (with water) / non-toxic / malleable / durable / shiny / high melting point / will not {corrode/oxidise}	ignore rust / colour change ignore references to cost	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
1(a)(ii)	an explanation linking any two from: • trees can be regrown / wood is {renewable / sustainable} / crude oil is finite (1) • trees absorb carbon dioxide when growing (1) • wood will (bio)degrade in landfill / plastic persists in landfill (1)	ignore generic answers such as 'pollution', 'bad for the environment', 'less energy' etc. plastic takes many years to decompose allow descriptions	**(2)** **AO2 1**

Question number	Answer	Mark
1(b)(i)	**C** glass is transparent is the only correct answer **B** is not correct because it is not relevant **A, D** are not useful properties	**(1)** **AO1 1**

Question number	Answer	Mark
1(b)(ii)	**A** nanoparticles are larger than atoms or small molecules is the only correct answer **B**, **C,** and **D** are incorrect because these are not made of nanoparticles	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
1(c)	38400 with or without working scores 2 • 80 x 80 = 6400 (1) • 6 x 6400 = 38400 (1)	80 x 6 = 480 (1) allow ecf	**(2)** **AO2 1**

Total for question 1 = 7 marks

Question number	Answer	Additional guidance	Mark
2(a)(i)	sulfur	ignore S	**(1)** **AO2 1**

Question number	Answer	Mark
2(a)(ii)	28	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
2(a)(iii)	• metal: sodium / Na (1) • non-metal: argon / Ar (1)	if elements swapped score max 1 do not penalise case of letters if symbols used	**(2)** **AO3 1**

Question number	Answer	Additional guidance	Mark
2(b)(i)	beaker	ignore any numbers before 'beaker' reject measuring beaker	**(1)** **AO2 2**

Question number	Answer	Additional guidance	Mark
2(b)(ii)	an explanation to include any three from: STEP 3 • collect the gas (in suitable apparatus) (1) • otherwise the gas will {disperse / escape} / hydrogen gas above the beaker is too dilute (1) OR • hold (the lighted splint) close to reaction mixture / in container (1) • that's where most of the gas will be (1) STEP 4 • dip the litmus paper into the reaction mixture (1) • so it is in contact with the (alkaline) solution / because above the beaker it does not touch the solution (1)	mark independently allow any reasonable pieces of apparatus eg test tube / boiling tube allow cover container (before applying splint) reject splint going into solution allow drop liquid onto litmus paper add to solution universal indicator / use a pH meter allow other named indicators reject blue litmus to see the change (in colour /pH)	**(3)** **AO3 3**

Total for question 2 = 8 marks

Question number	Answer	Mark
3(a)	**D** s is the only correct answer **A**, **B** and **C** are incorrect as the substance is a solid.	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
3(b)	a description including • any suitable scientific apparatus for making solution / adding sodium hydroxide (1) • dissolve solid A in **water** (1) • {mix / swirl / stir / shake} (the mixture)	 allow any suitable scientific container ignore 'add sodium hydroxide' alone ignore references to PPE allow add solid A to **water** ignore 'make a solution' mix solid and water (2)	**(3)** **AO1 2**

Question number	Answer	Additional guidance	Mark
3(c)(i)	**green** AND {solid/ precipitate} OR **green** solution {becomes paler / decolourises}	allow any shade of green but reject other colours ignore any other products / observations	**(1)** **AO1 2**

Question number	Answer	Mark
3(c)(ii)	**D** Fe^{2+} is the only correct answer **A**, **B** and **C** are incorrect as it is an Fe(II) ion	**(1) AO2 1**

Question number	Answer	Additional guidance	Mark
3(d)(i)	the compound does not contain {aluminium / copper / iron((II))} (ions)	allow 'contains no ions that form a precipitate'	**(1) AO3 2**

Question number	Answer		Mark
3(d)(ii)	14 mm with or without working scores 2 1.4 cm (1) 1.4 x 10 (= 14 mm) (1)	 allow measurements in the range 1.3 – 1.5 cm allow ecf for height of solution or precipitate only	**(2) AO2 2**

Total for question 3 = 9 marks

Question number	Answer	Mark
4(a)	**B** endothermic is the only correct answer. **A**, **C** and **D** are incorrect as all endothermic reactions absorb heat.	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
4(b)(i)	thermometer	ignore temperature probe	**(1)** **AO2 2**

Question number	Answer	Additional guidance	Mark
4(b)(ii)	stops polystyrene cup from falling over	allow keeps {heat / thermal energy} {in / out} allow provides insulation ignore references to keeping temperature in ignore prevents burns / too hot to pick up	**(1)** **AO3 1**

Question number	Answer	Additional guidance	Mark
4(b)(iii)	reduces {heat/thermal energy} loss / traps heat	allow maintains the temperature allow reduces {heat / thermal energy} gain allow insulation ignore references to keeping temperature in ignore references to cold {entering/leaving} polystyrene cup	**(1)** **AO3 1**

Question number	Answer	Additional guidance	Mark
4(b)(iv)	salt R: (+) 3(.0) (1) salt S: **-**1.5 (2) salt with most negative value **only** ticked (1)	reject -3(.0) for MP1 (+)1.5 scores 1	**(4)** **AO2 2**

Question number	Answer	Additional guidance	Mark
4(b)(v)	Ba^{2+}	allow Ba^{+2} / Ba2+ ignore any other ions reject subscript reject incorrect cases	**(1)** **AO2 1**

Total for question 4 = 9 marks

Question number	Answer	Mark
5(a)(i)	3 / three	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
5(a)(ii)	hydrogen	ignore H or H_2	**(1)** **AO1 1**

Question number	Answer	Mark
5(a)(iii)	**D** **X**, **Y** and **Z** is the only correct answer **A**, **B** and **C** are incorrect as every molecule is a hydrocarbon	**(1)** **AO2 1**

Question number	Answer	Mark
5(a)(iv)	**C** **X** and **Z** only is the only correct answer. **A**, **B** and **D** are incorrect as **Y** has 2 extra hydrogen atoms	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
5(b)	gas / gases (1) high(er) (1) carbon / carbon monoxide / carbon dioxide / water / soot (1)	allow LPG reject other named gases allow greater / more / larger ignore increased accept correct formulae for a product accept sulfur dioxide ignore particulates / nitrogen oxides	**(3)** **AO1 1**

Question number	Answer	Additional guidance	Mark
5(c)	an explanation of the reaction between solution W and sodium hydroxide solution linking: • (temperature increases because) it is exothermic (1) and any two from: • the pH goes down (towards 7) (1) • (because) {the sulfur dioxide (solution)/(solution) **W**} {is an acid / has a low pH / has a pH <7} (1) • which leads to a neutralisation reaction / reacts with sodium hydroxide solution (1)	{heat / thermal energy} released allow pH becomes more acidic allow goes towards {neutral /pH7} 'neutralisation is exothermic' scores for MP1 and	**(3)** **AO2 1**

		MP4	

Total for question 5 = 10 marks

Question number	Answer	Additional guidance	Mark
6(a)	colour: red-brown / reddish-brown / brownish-red / dark red (1) physical state: liquid (1)	ignore orange / brown / red (alone)	**(2)** **AO1 1**

Question number	Answer	Additional guidance	Mark
6(b)(i)	hydrogen + brom**ine** → hydrogen brom**ide** (2) hydrogen + brom**ine** → (1) → hydrogen brom**ide** (only) (1)	if balanced equation attempted, must have correct formulae and correct balancing: $H_2 + Br_2 \rightarrow 2\ HBr$ (2)	**(2)** **AO2 1**

Question number	Answer	Additional guidance	Mark
6(b)(ii)	neutralisation	allow exothermic / acid-base	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
6(c)	reacts {very, very quickly / extremely quickly / reacts instantly / fastest}	must imply faster than "very quickly" allow 'faster than chlorine'	**(1)** **AO3 2b**

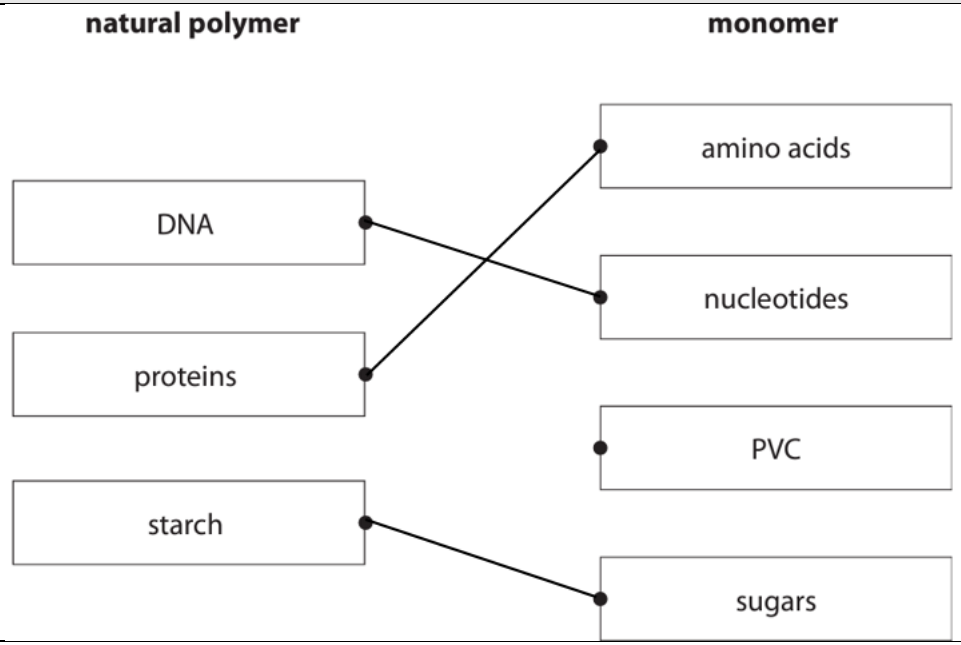
Question number	Answer	Additional guidance	Mark
6(d)	mass of potassium = 164 (g) **AND** mass of bromine = 336 (g) with or without working scores 3 potassium : $\frac{32.8}{100}$ x 500 (1) = 164 (g) (1) bromine : 500 – 164 = 336 g (1)	mass of potassium = 164 (g) **OR** mass of bromine = 336 (g) with or without working scores 2 If answers on answer line are the wrong way round with or without working, score 2 marks If 164 or 336 appear on the incorrect final answer line, score 1 ecf for correct evaluation of a percentage for bromine allow 100 – 32.8 = 67.2 $\frac{67.2}{100}$ x 500 = 336	**(3)** **AO2 1**

Total for question 6 = 9 marks

Question number	Answer	Additional guidance	Mark
7(a)(i)	(covalent / molecular) **bond**	allow shared pair of electrons / chemical bonds ignore 'double bond(s)' alone reject ionic / **inter**molecular	**(1)** **AO3 1**

Question number	Answer	Additional guidance	Mark
7(a)(ii)	an explanation linking L is an alkene because • L contains carbon and hydrogen <u>only</u> / is a hydrocarbon (1) • and has a {C=C / double} bond / unsaturated (1)	allow • formula is C_4H_8 (1) • which matches general formula of alkenes C_nH_{2n} (where n = 4) (1)	**(2)** **AO1 1**

Question number	Answer	Additional guidance	Mark
7(a)(iii)	7.67415×10^{-18} with or without working scores 2 • $82500 \times 9.302 \times 10^{-23}$ (1) • $= 7.67415 \times 10^{-18}$ (1)	allow 2 or more significant figures	**(2)** **AO2 1**

Question number	Answer	Additional guidance	Mark
7(b)		3 correct scores 2 1 or 2 correct scores 1	**(2)** **AO1 1**

Question number	Indicative content	Mark
***7(c)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO2 (3 marks) AO3 (3 marks)** **E** • E is carbon dioxide • boiling point below room temperature as carbon dioxide a gas • limewater forms white precipitate with carbon dioxide • no C=C so no reaction with bromine water • carbon dioxide is non-flammable **F** • F is ethene • boiling point below room temperature as ethene is a gas • no precipitate with limewater so not carbon dioxide • contains C=C so decolorises bromine water • contains carbon and hydrogen so gives carbon dioxide and water when burned **G/ H** • G/H are ethane and butane • boiling point below room temperature as they are gases • no precipitate with limewater so not carbon dioxide • no C=C so no reaction with bromine water • contains carbon and hydrogen so gives carbon dioxide and water when burned • H has higher boiling point so bigger molecule	**(6)** **AO2 1** **AO3 1**

	• G is ethane and H is butane	

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then:
Level 1	1–2	<u>Additional Guidance</u> identifies at least 1 compound gives information about tests without identifying compounds	<u>Possible candidate response</u> F is ethene (1) E is carbon dioxide because it gives a positive test with limewater (2) carbon dioxide and water are produced in complete combustion (1) alkenes decolourise bromine water (1)
Level 2	3–4	<u>Additional Guidance</u> identifies at least 2 compounds an explanation for at least **1** compound identifies all 4 compounds	<u>Possible candidate response</u> G is ethane and E is carbon dioxide because carbon dioxide turns limewater milky (3) F is ethene because it is the only one that could turn bromine water colourless. H is butane because it has the highest boiling point (4) E – carbon dioxide, F – ethene, G – ethane, H – butane (3). E – carbon dioxide because it is the only one that doesn't burn (4)
Level 3	5–6	<u>Additional Guidance</u> identifies all compounds with explanations for at least **2** different compounds	<u>Possible candidate response</u> E – carbon dioxide, F – ethene, G – ethane, H – butane. F is ethene because it is an alkene (5) and alkenes decolourise bromine water (6) E – carbon dioxide, F – ethene, G – ethane, H – butane. E is carbon dioxide because it doesn't burn (5) and F is ethene because it is an alkene (6)

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)

Total for question 7 = 13 marks

Question number	Answer	Additional Guidance	Mark
8(a)	a diagram that includes • apparatus <u>that would collect and measure gas</u> using a gas syringe, measuring cylinder or burette (1) • label stating {**gas** syringe / measuring cylinder/ burette} (1)	mark independently ignore seals / blockages MP2 for label, independent of drawing ignore any other labels	**(2)** **AO1 2**

Question number	Answer	Additional guidance	Mark
8(b)(i)	47	allow any value from 46-48	**(1)** **AO3 2**

Question number	Answer	Additional guidance	Mark
8(b)(ii)	Answer in range 6.197 – 6.5 with or without working scores 3 Δy (gas volume) = 70 – (any number in range 24-26) = 44-46 (1) Δx (time) = 7.1 – 0 = 7.1 (1) $\frac{\Delta y}{\Delta x}$ = 6.197 – 6.479 (1)	allow 7-7.2 with or without working allow in these ranges: 6.197-6.5 scores 3 6.10-6.196 or 6.51-6.60 scores 2 6.0-6.099 or 6.61-6.70 scores 1 12.50 – 13.20 scores 2 13.21-13.75 scores 1 If answer is rounded, mark pre-rounded answer and ignore rounding if final answer not given or outside 6.0-6.70, or 12.50-13.75, then max 2 for MP1 and/ or MP2	**(3)** **AO3 2**

Question number	Answer	Additional guidance	Mark
8(c)	An explanation linking • rate is increased (1) • because high**er** surface area/ high**er** frequency of collisions/ more collisions <u>per second</u> (1)	If rate decreased scores 0 for whole answer allow (rate/ reaction) fast**er**, quick**er**, speed of reaction increases allow reaction takes less time/ dissolves faster reject particles have more energy for MP2 allow more area (of marble) for reactions to occur/ more contact allow more chance of collisions/ collisions happen more often ignore more (successful) collisions alone	**(2)** **AO1 1**

Question number	Answer	Mark
8(d)	**B** using acid of a lower concentration is the only correct answer **C** is incorrect because the reactants are not changed **A** and **D** are incorrect because the reaction will be faster	**(1)** **AO1 2**

Question number	Answer	Additional guidance	Mark
8(e)	measure mass (of flask)	allow weigh the flask / use {a balance / scale**s**} ignore scale alone / syringe	**(1)** **AO1 2**

Question number	Answer	Additional guidance	Mark
8(f)	colourless {liquid / solution} / no marble chips (remaining) / bubbling has stopped / clear {liquid / solution} (1)	allow no solid / no bubbling / no fizzing reject colours	**(1)** **AO1 2**

Total for question 8 = 11 marks

Question number	Answer	Additional guidance	Mark
9(a)	A description to include • add **glowing** splint (1) • it relights (1)	 reject lit splint/ flame ignore description of forming glowing splint e.g. light splint and blow it out MP2 depends on MP1	**(2)** **AO1 2**

Question number	Answer	Additional guidance	Mark
9(b)	48.942 with or without working scores (2) • 0.529 x $\frac{4.200}{2.100}$ = 1.058 (1) • 50.000-1.058 = 48.942 (1)	48.94 or 48.9 (with or without working) scores 2 49 rounded from 48.942 scores 2 49 rounded from 49.471 scores 1 49 with no or other working scores 0 allow 0.529 x 2 = 1.058 allow ecf for 50 – calculated mass of oxygen 49.471 scores 1	**(2)** **AO2 1**

Question number	Answer	Additional guidance	Mark
9(c)(i)	An explanation linking: • (the gas atoms) have full <u>outer</u> shell(s) (1) • so they do not {gain/ lose/ transfer/ share} <u>electrons</u> (1)	mark independently ignore mention of numbers of electrons allow outer orbital / outer energy level allow do not form ions ignore it does not react / does not gain a charge	**(2)** **AO1 1**

Question number	Answer	Mark
9(c)(ii)	**D** argon is unreactive is the only correct answer **A**, **B** and **C** are incorrect as they are irrelevant	**(1)** **AO2 1**

Question number	Indicative content	Mark
*9(d)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (6 marks)** **Photosynthesis** • plants/ trees absorb carbon dioxide • and release oxygen • in photosynthesis **Change in atmosphere** • plants/ trees overall increase amount of oxygen • plants/ trees overall reduce amount of carbon dioxide **Temperature** • carbon dioxide absorbs sun's energy that is radiated back from Earth • this increases Earth's temperature • called greenhouse effect • global warming **Changes in plant coverage over time** • plants evolved so more photosynthesis • in recent years less tree coverage • due to deforestation • so less photosynthesis • so carbon dioxide reduced from original levels but now increasing	**(6) AO1**

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then:
Level 1	1–2	Additional Guidance simple statement about the **change** of amounts gases in the atmosphere	Possible candidate response carbon dioxide has decreased **OR** oxygen has increased (1) carbon dioxide has been absorbed **OR** oxygen has been released (1) carbon dioxide has been absorbed and oxygen has been released (2) carbon dioxide levels have decreased, oxygen levels have increased (2)
Level 2	3–4	Additional Guidance the **change** in amounts of gases in the atmosphere is linked to **EITHER** the evolution of plants **OR** changes in plant coverage **OR** a change in temperature.	Possible candidate response since plants photosynthesise, this has caused carbon dioxide levels to decrease (3) plants cause carbon dioxide levels to decrease, and oxygen levels to increase (3) plants photosynthesise which causes carbon dioxide levels to decrease and oxygen levels to increase (4) photosynthesis of evolving plants caused carbon dioxide to be absorbed and oxygen to be released (4) as trees are cut down, less photosynthesis is occurring so less carbon dioxide is absorbed (3) as trees are cut down, less photosynthesis is occurring so less carbon dioxide is absorbed and less oxygen is released (4) as carbon dioxide levels have decreased the temperature of the Earth has decreased (3) as carbon dioxide levels have decreased the temperature of the Earth has decreased due to less greenhouse gases (4)
Level 3	5–6	Additional Guidance the **change** in amounts of gases in the atmosphere is linked to the evolution of plants **AND** an **explanation** of the change in temperature **OR** the **change** in amounts of gases in the atmosphere is linked to the changes in plant coverage **AND** an **explanation** of the change in temperature.	Possible candidate response since plants have started to evolve, photosynthesis has caused carbon dioxide levels to decrease, which has led to temperatures decreasing, due to less energy from the sun being trapped in the greenhouse layer (5) since more trees are being cut down, less photosynthesis has caused carbon dioxide levels to increase, which has led to temperatures increasing, due to more energy from the sun being radiated back to Earth (5) since plants have started to evolve, photosynthesis has caused carbon dioxide levels to decrease and oxygen levels to increase, but since the amount of land covered by trees has decreased, carbon dioxide levels are rising again, which has led to temperatures increasing, due to more energy from the sun being radiated back to Earth. (6)

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3–4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5–6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Total for question 9 = 13 marks

Question number	Answer	Additional guidance	Mark
10(a)(i)	An explanation linking • wear gloves/ goggles (1) • because it is **corrosive** (1)	mark independently allow <u>safety</u> glasses/ <u>safety</u> spectacles ignore eye protection ignore burns/ corrodes allow caustic	**(2)** **AO3** **3a**

Question number	Answer	Mark
10(a)(ii)	silver nitrate	**(1)** **AO1 1**

Question number	Answer	Additional guidance	Mark
10(a)(iii)	inert/ unreactive/ does not corrode / does not break (if dropped)	allow can be moulded into shape / waterproof / non-brittle ignore durable / strong/ malleable/ rigid/ flexible/ transparent/ cost reject 'is not corrosive'/ non-corrosive	**(1)** **AO2 1**

Question number	Answer	Additional guidance	Mark
10(a)(iv)	An explanation linking • use {a different / sulfuric/ nitric} acid (1) • (as) hydrochloric acid contains chloride/Cl^- (ions) (1)	mark independently MP1 is not scored if any additional substances are added except silver nitrate or "K" allow because otherwise silver chloride forms reject 'contains chlorine' allow chlorine **ions**/ Cl **ions**	**(2)** **AO1 2**

Question number	Answer	Additional guidance	Mark
10(b)	$Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$ (3) fully correct, balanced equation (3) all three formulae only (2) any two correct formulae (1)	 allow incorrect cases/ subscripts	**(3)** **AO2 1**

Question number	Answer	Additional guidance	Mark
10(c)	85 with or without working scores 2 $CO_3 = 12 + 3 \times 16 = 60$ (1) $\frac{230 - 60}{2} = 85$ (1)	final answer of 85 2 marks 170 1 mark allow ecf for MP2 from C+ O value worked out using 12 and 16	**(2)** **AO2 1**

Total for question 10 = 11 marks