Mark Scheme (Results)

November 2021

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
- Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1*		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

*there will be situations where an AO1 question will include elements of recall of knowledge directly from the specification (up to a maximum of 15%). These will be identified by an asterisk in the mark scheme.

Paper 2F Foundation Tier

Question number	Answer	Mark
1(a)	**D** does not dissolve in water **A**, **B** and **C** are not factually correct	**(1)** **AO2**

Question number	Answer	Mark
1(b)(i)	polymer	**(1)** **AO3**

Question number	Answer	Mark
1(b)(ii)	**B** electrons **A** is not correct because atoms do not move through the metallic structure. **C** is not correct because neutrons do not move through the metallic structure. **D** is not correct because protons do not move through the metallic structure.	**(1)** **AO1**

Question number	Answer	Mark
1(c)(i)	breathed in / absorbed by the skin / consumed within food and drink / medication	**(1)** **AO2**

Question number	Answer	Mark
1(c)(ii)	catalyse (harmful) reactions / build up and form blockages	**(1)** **AO1**

	Answer	Mark
1(c)(iii)	1.2 :1	**(1)** **AO2**

Question number	Answer	Mark
2(a)	any two from: concentration of acid (1) {size / shape / surface area / length} area of magnesium ribbon (1) mass of magnesium (1)	**(2)** **AO2**

Question number	Answer	Mark
2(b)	**B** measuring cylinder **A, C** and **D** do not measure volumes	**(1)** **AO2**

Question number	Answer	Mark
2(c)	magnesium has gone / no more bubbles	**(1)** **AO2**

Question number	Answer	Additional guidance	Mark
2(d)	(particles) have more energy / (particles) collide more frequently / more successful collisions	allow particles move faster	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
2(e)	$\frac{15.0}{60.0}$ (1) = 0.25 (1) ($cm^3\ s^{-1}$)	$\frac{60}{15}$ = 4 (1)	**(2)** **AO2**

Question number	Answer	Mark
3(a)(i)	(outer shell is) full/ complete	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
3(a)(ii)	An explanation linking • hydrogen is flammable / could ignite (1) • krypton is more dense than air (1) • (so krypton) air ship would not float (1)	allow krypton has a high density	**(3)** **AO3**

Question number	Answer	Mark
3(b)	had yet to be discovered / unknown / did not know about them	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
3(c)(i)	neon bar correct (1) argon bar correct (1)	if no other mark scored, allow 1 for neon -252 **and** argon -192	**(2)** **AO2**

Question number	Answer	Mark
3(c)(ii)	allow any value from -152 to -90	**(1)** **AO1**

Question number	Answer	Mark
4(a)(i)	to clean the wire / to prevent contamination of sample	**(1)** **AO1**

Question number	Answer	Mark
4(a)(ii)	so that the solid vaporises more easily / so that the solid sticks onto the wire	**(1)** **AO1**

Question number	Answer	Mark
4(a)(iii)	**A** blue-green **B** is incorrect as potassium gives a lilac flame **C** is incorrect as calcium gives an orange-red flame **D** is incorrect as sodium gives a yellow flame	**(1)** **AO2**

Question number	Answer	Additional guidance	Mark
4(b)(i)	more {accurate / sensitive / reliable}	requires no judgement / can be quantitative	**(1)** **AO1**

Question number	Answer	Mark
4(b)(ii)	single straight line of best fit through points	**(1)** **AO3**

Question number	Answer	Mark
4(b)(iii)	value consistent with candidate's line of best fit	**(1)** **AO3**

Question number	Answer	Additional guidance	Mark
4(c)	An explanation linking use hydrochloric acid (rather than sulfuric acid) (1) (as) sulfuric acid contains sulfate ions (1)	 Allow nitric acid allow use a different acid	**(2)** **AO3**

Question number	Answer	Mark
4(d)	$\frac{63.5}{159.5}$ (= 0.39811912) (1) 0.398 x 100 (= 39.811912) (1) 40 (1)	**(3)** **AO2**

Question number	Answer	Mark
5(a)(i)	halogens	(1) AO1

Question number	Answer	Additional guidance	Mark
5(a)(ii)	astatine	allow At / At_2	(1) AO1

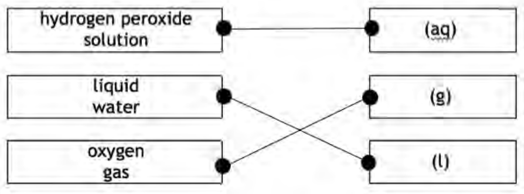
Question number	Answer	Mark
5(a)(iii)	**C** bromine **A** and **B** are not correct as they are gases at room temperature and pressure **D** is not correct as iodine is a solid at room temperature and pressure	(1) AO1

Question number	Answer	Mark
5(a)(iv)	**D** iodine **A** is not correct as fluorine is pale yellow at room temperature and pressure **B** is not correct as chlorine is green at room temperature and pressure **C** is not correct as bromine is red-brown liquid at room temperature and pressure	(1) AO1

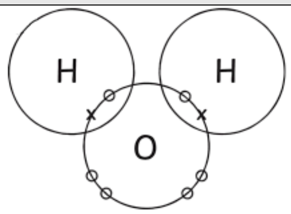
Question number	Answer	Additional guidance	Mark
5(b)	$\frac{1.19}{119}$ and $\frac{1.42}{35.5}$ (1) 0.01 : 0.04 (1) $SnCl_4$. (1)	allow ECF	(3) AO2

Question number	Answer	Additional guidance	Mark
5(c)	An explanation linking fluorine has fewer electron shells (1) (so) electron more easily attracted to nucleus (1)	allow less shielding (1) ignore fewer electrons ignore fewer outer electron shells	(2) AO1

Question number	Answer	Additional guidance	Mark
6(a)(i)	hydrogen peroxide → water + oxygen	allow symbol equation if all symbols and balancing are correct	**(1)** **AO2**

Question number	Answer	Additional guidance	Mark
6(a)(ii)	 (2) all correct (2) 1 correct (1)	reject multiple lines	**(2)** **AO1**

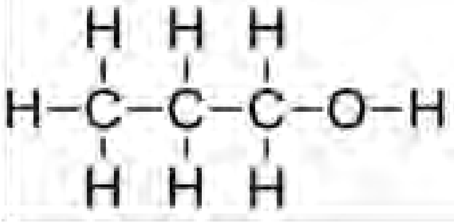
Question number	Answer	Additional guidance	Mark
6(b)	A description to include glowing splint (1) relights (1)	 MP2 is dependent on MP1	**(2)** **AO1**

Question number	Answer	Additional guidance	Mark
6(c)	 (2) OR shared pair of electrons between the oxygen and a hydrogen (1) rest of molecule correct (1)	allow dots or crosses or a mixture of both	**(2)** **AO1**

Question number	Answer	Additional guidance	Mark
6(d)(i)	Time in {s/min}	allow seconds/ minutes	**(1)** **AO3**

Question number	Answer	Additional guidance	Mark
6(d)(ii)	A description to include reaction is faster with liver (1) more {gas/oxygen} produced with liver (1)	allow ORA	**(2)** **AO3**

Question number	Answer	Mark
6(d)(iii)	A description to include bung and delivery tube (1) connected to {a gas syringe / upturned burette / upturned measuring cylinder} (1)	**(2)** **AO3**

Question number	Answer	Additional guidance	Mark
7(a)(i)	 (2) OR hydroxyl group on a carbon (1) rest of molecule correct (1)	allow OH for O-H reject any multiple bonds drawn	**(2)** **AO1**

Question number	Answer	Mark
7(a)(ii)	**C** it is oxidised **A**, **B** and **D** are incorrect as this is an oxidation reaction.	**(1)** **AO2**

Question number	Answer	Mark
7(b)(i)	0.39 with or without working scores 1 mark 152.62 – 152.23 (= 0.39) (1)	**(1)** **AO2**

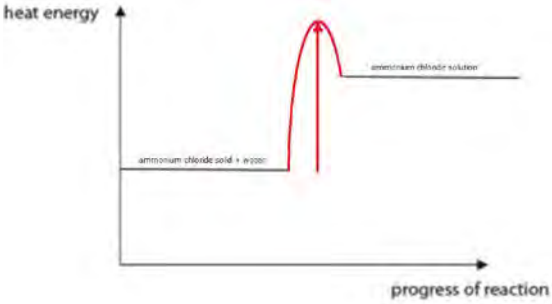
Question number	Indicative content	Mark
*7(b)(ii)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (6 marks)** • measure 100 cm^3 of water into a beaker. • place the beaker above the burner • place draft shields around the equipment • weigh the (alcohol) burner containing the alcohol • record this mass and the name of the alcohol. • place a thermometer in the water • record the initial temperature of the water • place a lid on beaker • light the wick. • heat the water so the temperature rises by 20°C. • extinguish the flame. • re-weigh the (alcohol) burner • subtract final mass from initial mass of burner and alcohol/ calculate the mass of alcohol used. • repeat with the next alcohol • using same volume of water • keep the height of the beaker the same	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	Heat the water by 20°C and then subtract the final mass from the initial mass of the burner and alcohol
Level 2	3–4	Measure 100 cm^3 of water into a conical flask, allow the alcohol to heat the water so the temperature rises by about 20°C. re-weigh the spirit burner and cap then calculate the mass of alcohol used.
Level 3	5–6	Measure 100 cm^3 of water into a conical flask/beaker. Weigh the burner and cap containing the alcohol. Record the initial temperature of the water in the flask. Allow the alcohol to heat the water so the temperature rises by about 20°C. Re-weigh the spirit burner and cap, subtract final mass from initial mass of burner and alcohol.

Question number	Answer	Mark
7(b)(iii)	0.02 with or without working scores 2 marks $\frac{0.36}{20}$ = (0.018) (1) 0.02 (1)	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
8(a)	46.25 / 46 with or without working scores 2 marks $\frac{200}{1000}$ (1) = 0.200 (dm^3) $\frac{9.25}{0.200}$ (1) = 46.25 / 46 OR $\frac{9.25}{200}$ = (0.04625) (1) 0.04625 x 1000 = 46.25 (1)	answer to 2 or more sig fig	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
8(b)(i)	an explanation linking two of: • {ammonium chloride solution/product} has more energy than {ammonium chloride solid and water/reactant} / ORA (1) • heat (energy) has increased / energy change is positive (1) • (therefore) heat energy has been {absorbed/taken in} (1)	ignore arguments about bond making / bond breaking	**(2)** **AO3**

Question number	Answer	Additional guidance	Mark
8(b)(ii)	 (2)	curve from reactants to products with peak higher than product energy (1) arrow labelled activation energy on correct curve (1)	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
8(c)	An explanation linking • ammonium chloride solution conducts electricity and solid ammonium chloride does not conduct electricity (1) • ammonium chloride contains **ions** (1) • in solution **ions** can move / in solid **ions** cannot move (1)	Answer must refer to both solid and solution for full marks	**(3)** **AO3**

Question number	Answer	Mark
8(d)(i)	**D**  **A** is incorrect as it is the symbol for flammable substances. **B** is incorrect as it is the symbol for corrosive substances. **C** is incorrect as it is the symbol for substances that are harmful to health.	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
8(d)(ii)	use a fume cupboard	ignore wear PPE / masks ignore wear goggles / gloves	**(1)** **AO1**

Question number	Answer	Mark
9(a)	**fractional** distillation / fractionation (1)	**(1)** **AO1**

Question number	Answer	Mark
9(b)	**C** they have the same general formula **A**, **B** and **D** not correct as compounds in homologous series have different chemical, empirical and molecular formulae.	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
9(c)	$N_2 + 2O_2 \rightarrow 2NO_2$ (2) or NO_2 (1)	other incorrect balancing max 1	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
9(d)	An explanation linking • {carbon dioxide / water} produced (1) • (the gases) absorb heat radiated from earth (1) re-radiate heat back into the atmosphere (1)	 allow formula allow traps the heat	**(3)** **AO2**

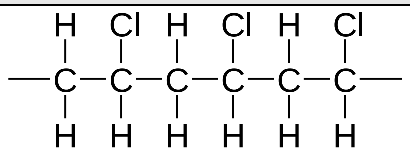
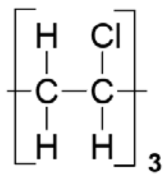
Question num	Indicative content	Mark
9(e)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (3 marks) AO2 (3 marks)** • sulfur burns at the same time as the hydrocarbon • sulfur reacts with oxygen • sulfur dioxide gas is formed • sulfur dioxide is an acidic gas • sulfur dioxide dissolves in clouds • to form sulfurous acid • which is then oxidised to form sulfuric acid • rain water becomes acidic • acid rain damages buildings / statues • damages plants/trees • runs into rivers / waterways • makes rivers/waterways acidic • kills fish/insects/waterlife • increases corrosion of metals	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	acid rain damages plants and erodes buildings
Level 2	3–4	sulfur dioxide is formed which dissolves in clouds and then acid rain runs into waterways and kills fish
Level 3	5–6	sulfur burns to form sulfur dioxide which dissolves in clouds to form sulfuric acid, the acid rains can erode limestone statues and will increase corrosion of metals making them weaker.

Question number	Answer	Mark
10(a)(i)	Any one from • need to sort polymers into different types • polymers often need to be separated from other polymers • takes time to sort by hand • containers may need to be washed before recycling • difficult to break down into their monomers • some not recyclable • requires a lot of energy	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
10(a)(ii)	A description to include • polymers persist in landfill / landfill site fills up too quickly • polymers degrade very slowly or • combustion produces gases • which may be toxic	accept polymers persist in the environment / harmful to wildlife not biodegradable / hard to decompose	**(2)** **AO1**

Question number	Answer	Additional guidance	Mark
10(b)(i)	circle around C=C	or circle around C-Cl	**(1)** **AO2**

Question number	Answer	Additional guidance	Mark
10(b)(ii)	 (3)	chain containing 6 C atoms (1) single bonds between C atoms (1) rest of structure complete (1) allow alternative arrangements allow max 2 for 	**(3)** **AO1**

Question number	Answer	Mark
10(b)(iii)	addition (polymer)	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
10(b)(iv)	relative formula mass C_2H_3Cl = 62.5 (1) 2850 x 62.5 (1) (=178125) 178000 (to 3 sig figs) (1)	without working 178000 (3) 178125 /178127 (2) allow ECF on incorrect relative formula mass	**(3)** **AO2**