Pearson

Mark Scheme (Results)

November 2021

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

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November 2021
Publications Code 1CH0_1F_2111_MS

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.

Question number	Answer	Mark
1(a)(i)	to make plants grow more/ faster/ bigger	(1) AO1

Question number	Answer	Mark
1(a)(ii)	K: potassium N: nitrogen P: phosphorus all three correct (2); one or two correct (1)	(2) AO2

Question number	Answer	Mark
1(b)(i)	P: burette (1) Q: pipette (1)	(2) AO1

Question number	Answer	Mark
1(b)(ii)	P / burette	(1) AO1

Question number	Answer		Mark
1(b)(iii)	A description including • heat (1) and any one from • use of Bunsen burner (1) • until all water evaporates/ disappears (1) • until some water evaporates then leave (1) • leave in warm place/ windowsill (1)	ignore filtering	(2) AO1

Question number	Answer	Additional guidance	Mark
2(a)(i)	freezing / solidifying / solidification	ignore frozen	(1) AO1

Question number	Answer	Mark
2(a)(ii)	<table><tr><td>the molecules move faster in water than in ice</td><td>✓ (1)</td></tr><tr><td>the molecules are more randomly arranged in ice than in water</td><td></td></tr><tr><td>the molecules start moving when water becomes ice</td><td></td></tr><tr><td>the molecules are arranged regularly in ice but not in water</td><td>✓ (1)</td></tr><tr><td>the molecules have more energy in ice than in water</td><td></td></tr></table> Allow any marks in the boxes. If three boxes are ticked, give **one** mark **only** if **both** correct boxes are ticked If four or five boxes ticked, no marks awarded	(2) AO1

Question number	Answer	Additional guidance	Mark
2(b)(i)	An explanation linking • pure water contains {only water (molecules)/ only one substance} / impure water contains more than one substances (1) • identification <u>from label</u> of impurity: dissolved solids/ calcium (ions) / sodium (ions) / hydrogencarbonate (ion) / ions	ignore all references to pH	(2) AO3

Question number	Answer	Mark
2(b)(ii)	pH (=7)	(1) AO2

Question number	Answer	Mark
2(b)(iii)	15 mg with or without working scores 2 • 250/1000 (1) (=0.250) • 60 x 250/1000 (1) (=15) OR • 1000/250 (1) = 4 • 60/4 (1) (=15)	**(2)** **AO2**

Question number	Answer	Mark
2(c)	It is on left / in group 2 / column 2	**(1)** **AO2**

Question number	Answer	Mark
3(a)	**C** hydrogen + oxygen → water is the only correct answer **A**, **B** and **D** are incorrect as water is the product	**(1)** **AO1**

Question number	Answer	Mark
3(b)	A description to include any two from • bright light at start (1) • fades/ gets dimmer (1) • then goes out (1)	**(2)** **AO2**

Question number	Answer	Mark
3(c)	**B** the element used for rod P is the only correct answer **A**, **C** and **D** are incorrect because the electrode material must be changed	**(1)** **AO2**

Question number	Answer	Mark
3(d)(i)	An explanation including any two from • air/oxygen excluded (1) • water excluded (1) • air/oxygen/water needed for corrosion (1)	**(2)** **AO2**

Question number	Answer	Mark
3(d)(ii)	An explanation including • zinc is more reactive (than iron) (1) • so reacts instead (1)	**(2)** **AO1**

Question number	Answer	Mark
4(a)(i)	chromium + oxygen → chromium oxide	(1) AO2

Question number	Answer	Mark
4(a)(ii)	**D** oxidation is the only correct answer. **A**, **B** are incorrect because these are physical changes. **C** is incorrect because there is no acid-base reaction.	(1) AO1

Question number	Answer	Mark
4(a)(iii)	152 with or without working scores 2. (52 x 2) + (16 x 3) (1) = 152 (1)	(2) AO2

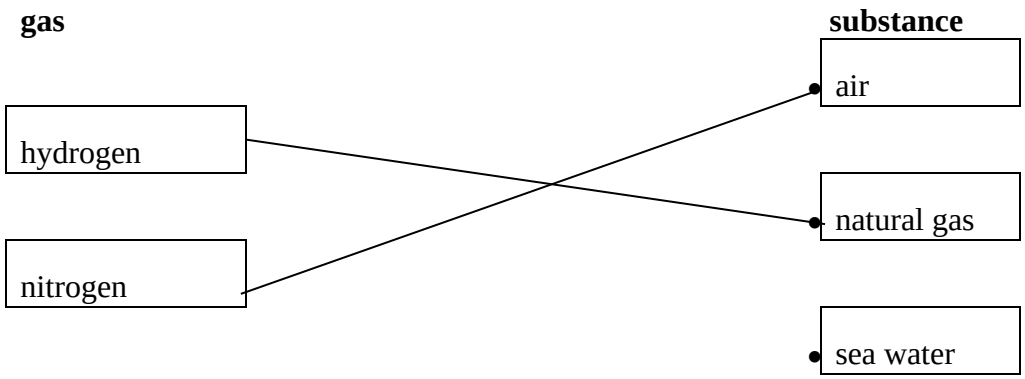
Question number	Answer	Mark
4(b)(i)	magnesium iron silver	(1) AO3

Question number	Answer	Mark
4(b)(ii)	**C** put a lighted splint at the open end of the test tube is the only correct answer **A**, **B** and **D** are incorrect because they would not work	(1) AO2

Question number	Answer	Additional guidance	Mark
4(b)(iii)	(squeaky) pop / flame	ignore references to ignites reject references to relights	(1) AO1

Question number	Answer	Mark
4(c)(i)	iron is less reactive (than carbon) ORA	(1) AO2

Question number	Answer	Mark
4(c)(ii)	electrolysis is expensive/ more expensive method than heating with carbon/ heating with carbon is cheaper/ electrolysis needs a large amount of electricity	(1) AO2

Question number	Answer	Mark
5(a)	 if two lines leave from a gas, no mark scored for that gas	(2) AO1

Question number	Answer	Mark
5(b)	backward (1) equal (1)	(2) AO1

Question number	Answer	Additional guidance	Mark
5(c)	20265000 with or without working scores 2 101325 x 200 (1) = 20265000 (Pascals) (1)	allow 20270000 / 20300000 for 2 506.625/ 506.63/ 506.6/ 507 scores 1	(2) AO2

Question number	Answer	Mark
5(d)(i)	hydrogen row: 10 4 -6	(1) AO2

Question number	Answer	Additional guidance	Mark
5(d)(ii)	$N_2 + 3\ H_2 \rightleftharpoons 2\ NH_3$ (2) Formulae of nitrogen **and** hydrogen (1)	balancing mark only if formulae correct	(2) AO2

Question number	Answer	Mark
6(a)(i)	wear safety goggles/ gloves	(1) AO3

Question number	Answer	Additional guidance	Mark
6(a)(ii)	Measure mass of solid/ use a specified mass of solid	ignore changes to stirring ignore use a full spatula	(1) AO3

Question number	Answer	Mark
6(a)(iii)	**B** from 1 to 12 is the only correct answer. **A** and **C** are incorrect because the mixture does not start or end neutral **D** is incorrect because the pH is changing in the reverse direction	(1) AO2

Question number	Answer	Additional guidance	Mark
6(a)(iv)	start: red/pink (1) end: yellow (1)	allow (1) if colours reversed	(2) AO1

Question number	Answer	Mark
6(b)(i)	test tube/ boiling tube	(1) AO1

Question number	Answer	Mark
6(b)(ii)	**A** electrode is the only correct answer. **B**, **C** and **D** are incorrect because they are not electrodes.	(1) AO2

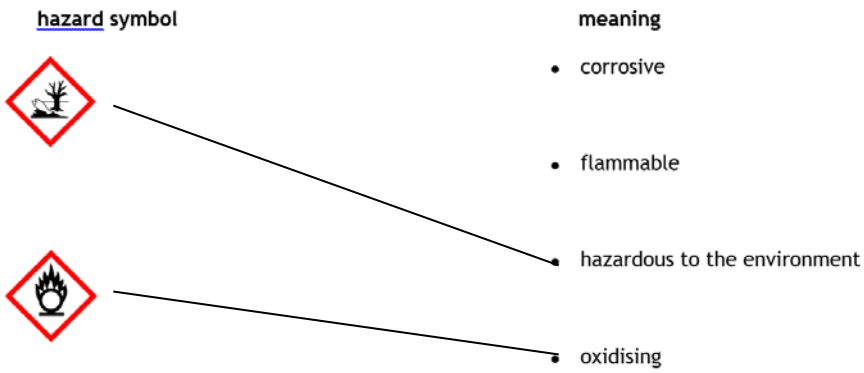
Question number	Answer	Additional guidance	Mark
6(b)(iii)	it conducts (electricity)/ is inert	ignore high melting point	(1) AO1

Question number	Answer	Mark
6(b)(iv)	**2** $HCl \rightarrow H_2 + Cl_2$	(1) AO2

Question number	Answer	Mark
7(a)(i)	malleable / malleability	(1) AO2

Question number	Answer	Additional guidance	Mark
7(a)(ii)	does not corrode/ insoluble/ unreactive/ inert / non-toxic / hard	ignore references to appearance	(1) AO2

Question number	Answer	Mark
7(b)	1560 with or without working scores 3 78 / 100 (1) 78 / 100 x 2.00 (1) (= 1.56 kg) 1.56 x 1000 (1) (= 1560 g)	(3) AO2

Question number	Answer	Additional guidance	Mark
7(c)		1 mark for each symbol. If more than one line comes from a symbol, that mark cannot be scored	(2) AO1

Question number	Indicative content	Mark
*7(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. **Colour change** • copper is red brown • black colour is copper oxide **Mass increase** • oxygen atoms are added • oxygen atoms have mass • increase in mass due to oxygen atoms • powder heated for longer • powder has more copper atoms exposed • powder reacts more • powder adds more oxygen atoms • powder has larger mass increase **Mass increase less than expected** • copper is unreactive metal • unreactive metals have slow reactions • time not enough for reaction to be complete • copper oxide only forms on surface so less forms on piece than powder • Bunsen flame not hot enough for full reaction • some copper powder may be lost to air • some copper oxide may be lost to air	**(6)** **AO2** **AO3**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) 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	Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) 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	Interpretation and evaluation of the information demonstrating throughout the skills of synthesising relevant understanding. (AO3) 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)

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	Possible candidate response • the longer the heating is the more product is formed (1) • the red-brown copper forms black copper oxide (2) • oxygen is added in heating so the mass increases (2)
Level 2	3–4	Additional Guidance	Possible candidate response • the red-brown copper forms black copper oxide by reacting with oxygen, and the added oxygen causes a mass increase (4)
Level 3	5–6	Additional Guidance Must address all aspects of question to score Level 3	Possible candidate response • the red-brown copper forms black copper oxide by reacting with oxygen, and the added oxygen causes a mass increase. The longer the copper is heated, the more oxygen is gained. However, copper is not very reactive, so it will not all react in the time given to heating even if a powder heated for 10 minutes (6).

Question number	Answer	Additional guidance	Mark
8(a)	Any two from (in modern model) • atoms are formed of sub-atomic particles (1) • atoms have a nucleus (1) • atoms contain protons (1) • atoms contain neutrons (1) • atoms contain (shells of) **electrons** (1) • atoms of same element can have different numbers of neutrons / isotopes exist (1)	allow (for Dalton's model) atoms are indivisible ignore statements that are simply the negative of those in the question reject each comparison with 'plum pudding model'	**(2)** **AO1**

Question number	Answer	Additional guidance	Mark
8(b)	molecular formula: C_2H_4 (1) empirical formula: CH_2 (1)	allow H_4C_2 allow H_2C allow use of small letter / superscripts / non-subscripts	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
8(c)(i)	$Cl_2(g) + H_2O(l) \rightleftharpoons HCl(aq) + HClO(aq)$ (3)	all three formulae (only) on correct sides of equation with no incorrect balancing (2) two formulae correct regardless of any other error (1) all three state symbols (1) Do not allow incorrect symbols or non subscripts eg CL^2	**(3)** **AO2**

Question number	Answer	Additional guidance	Mark
8(c)(ii)	H^+	if any other ions included 0 marks	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
8(c)(iii)	neutralisation	allow exothermic reject endothermic	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
8(c)(iv)	A description including any two from: • powder disappears (1) • effervescence/ bubbles/ fizzing (1) • blue solution forms (1)	allow dissolves	**(2)** **AO2**

Question number	Answer	Mark
9(a)	**C** the impurities are harmless **C** is the only correct answer. **A**, **B** and **D** are incorrect as the properties are not relevant	**(1)** **AO2**

Question number	Answer	Mark
9(b)(i)	**C** the impurities in the waste water settle to the bottom of their container **C** is the only correct answer. **A**, **B** and **D** are incorrect because no sediment is formed	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
9(b)(ii)	to remove {insoluble substances / solids}	allow named solid substances eg sand ignore materials removed by initial screening eg twigs, debris etc ignore to produce clean/pure water reject remove bacteria	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
9(b)(iii)	to kill {bacteria / microorganisms}	ignore to cleanse, purify, clean, make safe allow to remove bacteria / germs	**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
9(c)	An answer including • best amount of **A** is 150 (mg) (1) • 150 mg **A** removes more than 100 (mg) **B** (1) • so it is better to use salt **A** than salt **B** (1) OR • because (at peak activity) **B** removes a higher percentage per gram than **A** (1) • so less salt would be needed / more efficient (1) • so it is better to use salt **B** than salt **A** (1)	ignore incorrect units of mass • allow so salt B is more	**(3)** **AO3**

	OR • 150 mg of A removes 48% impurities • 100 mg of B removes 44% impurities • so salt **A** is better (than salt **B)** as more impurities are removed (1) OR • 100 mg of A removes 40% impurities • 100 mg of B removes 44% impurities • so salt B is better (than salt A**)** as more impurities are removed for same mass of salt (1)	effective in smaller quantities	

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. **SEPARATION** • distillation • solution in flask • heat • water evaporates • water vapour into condenser • cooling water jacket • water vapour condensed back to liquid • water collected in beaker • solid remains in flask • boiling point = 100 °C **TEST** • take distilled water in a test tube • add a few drops of neutral litmus/Universal Indicator • correct neutral colour OR • pH probe • pH = 7	**(6)** **AO1** **AO3**

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	Gives simple parts of the plan or describes the test to show the water is neutral. e.g. heat the solution (1) use the Bunsen burner to heat the solution (2) use universal indicator to test the water, it should turn green (2)
Level 2	3–4	Additional Guidance	Gives a more detailed plan or a simple part of the plan with the test to show the water is neutral. e.g. heat the solution with a Bunsen burner, the water evaporates at 100ºC (3) Heat the solution in a flask, the water will evaporate and move into the condenser where it turns back to a liquid (4) Heat the solution to evaporate the water and then use the condenser, use universal indicator to test the water which should turn green. (4)
Level 3	5–6	Additional Guidance	Gives a more detailed plan **and** the test to show the water is neutral. e.g. heat the solution, the water will evaporate and move to the condenser where it will cool and turn back to a liquid. Test the water neutral litmus paper (5) Use distillation, heat the solution in a flask, the water vapour moves to the condenser where it cools and turns back to a liquid. The water can be tested with a pH meter the reading should be pH 7 (6)

Question number	Answer	Additional guidance	Mark
10(a)	An explanation linking • (in pure aluminium all the atoms are the same (size) whereas) in alloy atoms are different sizes (1) • (in aluminium) {layers/rows/sheets} of atoms easily slide over each other (1) • (in alloy) {layers/rows/sheets} of atoms cannot easily slide over each other (1)	reject the use of 'molecules' once only allow ion/particle in place of atom throughout	**(3)** **AO1**

Question number	Answer	Additional guidance	Mark
10(b)	$\frac{2.00}{100}$ x 695.0 (1) (= 13.9) 695.0 – 13.9 (1) (= 681.1 (g)) OR $\frac{98.00}{100}$ (1) x 695.0 (1) (= 681.1 (g))	award full marks for correct final answer without working allow 2 or more sig.fig.	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
10(c)(i)	A description to include • the strength increases (1) AND any one from • as percentage of magnesium (by mass in the alloy) increases (1) • linearly (1) • from 0.1 % to 3.5 % magnesium (1)	MP2 is dependent on MP1	**(2)** **AO3**

Question number	Answer	Additional guidance	Mark
10(c)(ii)	(from graph) percentage by mass of magnesium = 3.0 % (1) percentage aluminium in alloy = 100 – 3 (1) (= 97 (%))	credit MP1 if written on graph ecf	**(2)** **AO3**

Question number	Answer	Additional guidance	Mark
10(d)	• improve the appearance (1) • increase resistance to corrosion (1)	allow • to improve electrical conductivity (1) • cheaper than using solid gold (1)	**(2)** **AO1**

(Total for question 10 = 11 marks)