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# Mark Scheme (Results)

November 2020

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

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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.

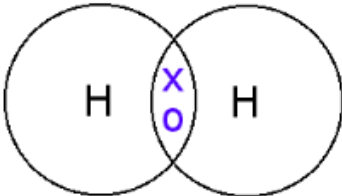
Assessment Objective		Command Word	
Strand	Element	Describe	Explain
AO1*		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide 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.

Question number	Answer	Mark
1(a)	C dissolving A, B, D – these answers are about different processes	(1)

Question number	Answer	Additional guidance	Mark
1(b)(i)	sodium + hydrochloric acid (1) → sodium chloride + hydrogen (1)	allow reactants either way round allow products either way round  reject 'sodium chlorine'  allow Na + HCl → NaCl + H <sub>2</sub> (1) 2Na + 2HCl → 2NaCl + H <sub>2</sub> (2)	(2)

Question number	Answer	Mark
1(b)(ii)	B flammable A corrosive has a different hazard symbol C oxidising has a different hazard symbol D toxic has a different hazard symbol	(1)

Question number	Answer	Additional guidance	Mark
1(b)(iii)		allow dots or crosses or mixture allow other suitable symbols	(1)

Question number	Answer	Additional guidance	Mark
1(c)(i)	pH meter	allow universal indicator / pH paper ignore datalogger alone ignore pH scale / pH strip ignore indicator alone	(1)

Question number	Answer	Additional guidance	Mark
1(c)(ii)	7 / seven	allow pH7 / PH7	(1)

**Total for Question 1 = 7 marks**

Question number	Answer	Mark
2(a)(i)	C 2.8.7 A, B, D do not represent electronic configurations	(1)

Question number	Answer	Additional guidance	Mark
2(a)(ii)	An explanation linking <ul style="list-style-type: none"> <li>• in {outer / 3<sup>rd</sup>} shell (1)</li> <li>• seven electrons (1)</li> </ul> or <ul style="list-style-type: none"> <li>• number of electrons in outer shell (1)</li> <li>• is the same as group number (1)</li> </ul>	allow last shell / outer ring MP2 depends on MP1  allow 7 is the last number of the electronic configuration / OWTTE (1)	(2)

Question number	Answer	Additional guidance	Mark
2(b)(i)	An explanation linking <ul style="list-style-type: none"> <li>• same number of electrons and protons (1)</li> <li>• so charges {cancel / balance one another} (1)</li> </ul>	allow same number of positive and negative charges	(2)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	37 – 17 (1) (= 20) (neutrons)	allow 20 without working  reject '- 20'	(1)

Question number	Answer	Additional guidance	Mark
2(b)(iii)	An explanation linking <ul style="list-style-type: none"> <li>• atoms {of same element / with same number of protons} / same atomic number (1)</li> <li>• different number of neutrons / different mass number (1)</li> </ul>	ignore electrons reject neutrons  reject protons /electrons	(2)

**Total for Question 2 = 8 marks**

Question number	Answer	Additional guidance	Mark
3(a)(i)	Haber	ignore spelling	(1)

Question number	Answer	Additional guidance	Mark
3(a)(ii)	nitrogen + hydrogen = ammonia (3) reactants {= / →}(1) {= / →} product (1) = (1)	allow reactant either way round nitrogen + hydrogen → ammonia (2) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (3) incorrectly balanced equation scores 2 max allow: correct formulae (1) reversible sign (1) balancing (1)	(3)

Question number	Answer	Additional guidance	Mark
3(b)	one nitrogen (atom) and three hydrogen (atoms) (1)	allow 1 N and 3 H (atoms) (1)	(1)

Question number	Answer	Additional guidance	Mark
3(c)(i)	C ammonium nitrate  A, B, D are incorrect names		(1)

Question number	Answer	Additional guidance	Mark
3(c)(ii)	An explanation linking any two from <ul style="list-style-type: none"> <li>• crops require fertilisers to grow (1)</li> <li>• fertilisers contain N / P / K compounds (1)</li> <li>• promote plant growth (1)</li> <li>• increased yield (means greater profits) (1)</li> </ul>		(2)

**Total for Question 3 = 8 marks**

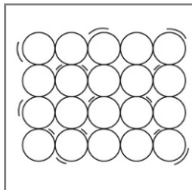
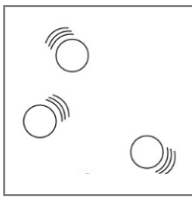
Question number	Answer	Additional guidance	Mark
4(a)	arranged by order of (relative) atomic mass / (in Mendeleev's early periodic table) gaps / missing elements / fewer elements / noble gases were not present	assume answer refers to Mendeleev's table unless specifically referred to modern table so reverse arguments apply	(1)

Question number	Answer	Additional guidance	Mark
4(b)(i)	aluminium chloride	reject 'aluminium chlorine'	(1)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	neutralisation	allow acid + base allow 'acid-base' allow 'exothermic'	(1)

Question number	Answer	Additional guidance	Mark
4(c)(i)	$\text{Ga}_2\text{O}_3$	allow $\text{Ga}_2\text{O}_3$ / $\text{GA}_2\text{O}_3$  reject $\text{Ga}^2\text{O}^3$	(1)

Question number	Answer	Mark
4(c)(ii)	<p><b>B</b> ionic</p> <p><b>A</b> giant covalent structures do not conduct electricity at all  <b>C</b> metallic structures conduct when solid  <b>D</b> simple molecular structures do not conduct electricity when molten and have low melting points</p>	(1)

Question number	Answer	Additional guidance	Mark
4(d)(i)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>solid (1) (regular arrangement and touching)</p> </div> <div style="text-align: center;">  <p>gas (1) (widely spaced, fewer shown)</p> </div> </div>		(2)



Question number	Answer	Additional guidance	Mark
4(d)(ii)	condensing / condensation		(1)

Question number	Answer	Additional guidance	Mark
4(e)	An explanation linking <ul style="list-style-type: none"> <li>• electrons (1)</li> <li>• can move / are delocalised (1)</li> </ul>	MP2 depends on MP1  allow charged particles can move / are delocalised (1)	(2)

**Total for Question 4 = 10 marks**

Question number	Answer	Additional guidance	Mark
5(a)	$100 - 65 - 7 - 3$ (1) (= 25)	25 alone scores 1	(1)

Question number	Answer	Additional guidance	Mark																		
5(b)	<table border="1"> <thead> <tr> <th></th> <th>true</th> <th>false</th> </tr> </thead> <tbody> <tr> <td>iron is a poor conductor of heat</td> <td></td> <td>✓</td> </tr> <tr> <td>iron can act as a catalyst</td> <td>✓</td> <td></td> </tr> <tr> <td>iron forms compounds that are coloured</td> <td>✓</td> <td></td> </tr> <tr> <td>iron has a low density</td> <td></td> <td>✓</td> </tr> <tr> <td>iron has a very high melting point</td> <td>✓</td> <td></td> </tr> </tbody> </table>		true	false	iron is a poor conductor of heat		✓	iron can act as a catalyst	✓		iron forms compounds that are coloured	✓		iron has a low density		✓	iron has a very high melting point	✓		(first tick given)  4 correct ticks = 3 marks 3 or 2 correct ticks = 2 marks 1 correct tick = 1 mark	(3)
	true	false																			
iron is a poor conductor of heat		✓																			
iron can act as a catalyst	✓																				
iron forms compounds that are coloured	✓																				
iron has a low density		✓																			
iron has a very high melting point	✓																				

Question number	Answer	Additional guidance	Mark
5(c)(i)	alloys stronger / pure metals weaker / alloys more corrosion resistant	ignore harder ignore 'more desirable properties'	(1)

Question number	Answer	Additional guidance	Mark
5(c)(ii)	$0.40 \times 30$ (1) (= 12) $\frac{12}{100}$ (1) (= 0.12)(g)	0.12 (g) without working (2)	(2)

Question number	Answer	Additional guidance	Mark
5(d)	An explanation linking <ul style="list-style-type: none"> <li>voltage decreases</li> <li>as {reactant / transition metal} used up</li> </ul>	allow highest rate of reaction at the beginning of the reaction gives most voltage (1) allow reaction is complete when voltage = 0 (1)	(2)

**Total for Question 5 = 9 marks**

Question number	Answer	Mark
6(a)	<b>B</b> gold <b>A, C, D</b> – these metals too reactive to exist as uncombined elements	(1)

Question number	Answer	Additional guidance	Mark
6(b)	Any two from preserves ore reserves / reduces waste / reduces energy needed for metal extraction / preserves {habitats/ landscape / resources}	allow reduces carbon emissions ignore cheaper	(2)

Question number	Answer	Mark
6(c)	$2\text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow 4\text{Fe} + 3\text{CO}_2$	(1)

Question number	Answer	Additional guidance	Mark
6(d)	$\frac{42.5}{5000} (1) \times 100 (1) (= 0.85)$	0.85 alone scores 2	(2)

Question number	Answer	Additional guidance	Mark
6(e)	An explanation linking <ul style="list-style-type: none"> <li>carbon / C (1)</li> <li>gained oxygen (to form carbon dioxide) (1)</li> </ul>	reject other elements for MP1 allow oxidation is gain of oxygen / oxidation is loss of electrons (1)	(2)

Question number	Answer	Additional guidance	Mark
6(f)	Ti $\frac{12}{48} = 0.25$ and O $\frac{8.0}{16} = 0.5$ (1) simplest ratio 1:2 (1) empirical formula $\text{TiO}_2$ (1)	working must be shown to gain full marks allow TE Ti $\frac{48}{12} = 4$ and O $\frac{16}{8.0} = 2$ (0) simplest ratio 2:1 (1) empirical formula $\text{Ti}_2\text{O}$ (1) allow (1) for formula with numbers obtained from 1 <sup>st</sup> step with no simplest ratio	(3)

**Total for Question 6 = 11 marks**

Question number	Answer	Mark
7(a)(i)	<p>An explanation linking</p> <ul style="list-style-type: none"> <li>• both {air/oxygen} and water needed for rusting (1)</li> </ul> <p>then any two from</p> <ul style="list-style-type: none"> <li>• tube a – {air/oxygen} and water present (1)</li> <li>• tube b – only dry {air/oxygen} present / no water (1)</li> <li>• tube c – only water present (with nail) / no {air/oxygen} (1)</li> </ul>	(3)

Question number	Answer	Additional guidance	Mark
7(a)(ii)	No rusting / remains clean / does not corrode	ignore any statements about magnesium	(1)

Question number	Answer	Mark
7(a)(iii)	<p><b>C</b> the iron is oxidised</p> <p><b>The only correct answer is C</b></p> <p><b>A</b> is not correct – hydration is a different reaction  <b>B</b> is not correct – neutralisation involves an acid  <b>D</b> is not correct – reduction is loss of oxygen or gain of electrons which does not happen here</p>	(1)

Question number	Answer	Additional guidance	Mark
7(b)	improve appearance / more corrosion resistant	allow suitable alternative answers ignore cost	(1)

Question number	Indicative content	Mark
*7(c)	<p>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.</p> <p><b>AO1 (6 marks)</b></p> <ul style="list-style-type: none"> <li>• suitable use of aluminium eg cooking foil</li> <li>• related property – malleable, low toxicity, low reactivity</li> <li>• suitable use of copper eg water pipes</li> <li>• related property – low reactivity</li> <li>• suitable use of gold eg electronic contacts</li> <li>• related property – does not corrode, good electrical conductor</li> <li>• suitable use of brass eg pins for electric plugs</li> <li>• related property – strong and hard wearing</li> <li>• suitable use of magnalium eg aircraft parts</li> <li>• related property – low density</li> </ul>	(6)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels Eg - At each level, as well as content, the scientific coherency of what is stated backed up by planning detail will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	<u>Additional guidance</u> Identifies at least one property OR use of at least one metal or alloy and attempts to relate it to a suitable use.	<u>Possible candidate responses</u> <ul style="list-style-type: none"> <li>aluminium has a low density (alone)</li> <li>gold can be used in jewellery (alone)</li> <li>copper is used in wiring because it is a good conductor of electricity (upper part of level)</li> </ul>
Level 2	3–4	<u>Additional guidance</u> Identifies at least one property of two metals OR alloys and links this to their uses.	<u>Possible candidate responses</u> <ul style="list-style-type: none"> <li>copper and gold are both used in electrical wiring because they are good conductors of electricity</li> <li>copper is used in wiring because it is a good conductor of electricity. Gold is used in jewellery</li> <li>magnalium has a low density so can be used in aircraft parts. Gold can be used in jewellery because it is unreactive – upper part of level</li> </ul>
Level 3	5–6	<u>Additional guidance</u> Identifies properties of at least one metal AND one alloy and explains their uses related to these properties.	<u>Possible candidate responses</u> <ul style="list-style-type: none"> <li>copper is used in electrical wiring because it is a good conductor of electricity so a current can pass through it. Magnalium is used in aircraft parts because it has a low density</li> <li>gold is used in jewellery because it is unreactive and so will not cause irritation to the wearer. Brass is used for making electrical plug pins because it is strong, so will not break easily – upper part of level</li> </ul>

**Total for Question 7 = 12 marks**

Question number	Answer	Additional guidance	Mark
8(a)(i)	A description including <ul style="list-style-type: none"> <li>• apply lighted splint (1)</li> <li>• gas burns / (squeaky) pop (1)</li> </ul>	allow flame / ignite gas ignore 'squeaky pop test' / glowing splint  second mark is dependent on first	(2)

Question number	Answer	Mark
8(a)(ii)	<b>B</b> oxygen  <b>The only correct answer is B</b>  <b>A, C &amp; D</b> these gases are not produced in the electrolysis of sodium sulfate solution	(1)

Question number	Answer	Additional guidance	Mark
8(a)(iii)	<ul style="list-style-type: none"> <li>• electrical energy / electricity (1)</li> <li>• {decomposes / breaks down / splits} {electrolytes / (ionic) compounds / substances} (1)</li> </ul>	allow electric current  allow <b>separates</b> ions  reject decomposing elements for MP2	(2)

Question number	Answer	Additional guidance	Mark
8(b)	final answer of 114 (g dm <sup>-3</sup> ) with or without working (3)  OR <u>28.4</u> (1) (= 0.1136) 250 0.1136 x 1000 (1) (= 113.6)  = 114 (g dm <sup>-3</sup> ) (1)	allow ECF throughout  <u>250</u> (dm <sup>3</sup> ) (1) (= 0.250 (dm <sup>3</sup> )) 1000 <u>28.4</u> (1) (= 113.6) 0.250  OR <u>1000</u> (1) = 4 250 4 x 28.4 (1) (= 113.6)  Must have 3sf for MP3 0.114 scores 2  Lose MP1 if rounded incorrectly e.g, to 0.11 or 0.113 but mark on	(3)

Question number	Answer	Additional guidance	Mark
8(c)	Na <sub>2</sub> SO <sub>4</sub>	allow SO <sub>4</sub> Na <sub>2</sub> allow upper case A ignore any charges on ions reject non-subscript 2 & 4	(1)

Question number	Answer	Additional guidance	Mark
8(d)(i)	measuring cylinder(s)	allow alternative apparatus eg graduated test-tube, burette, Hofmann voltameter, gas syringe	(1)

Question number	Answer	Additional guidance	Mark
8(d)(ii)	light bulb / lamp / ammeter	allow alternative equipment eg buzzer  ignore voltmeter / data-logger alone	(1)

**Total for Question 8 = 11 marks**



Question number	Answer	Additional guidance	Mark
9(a)(i)	Left : H <sub>2</sub> SO <sub>4</sub> (1)  Right : CuSO <sub>4</sub> (1)	reject superscript numbers  reject superscript numbers  incorrect balancing max 1	(2)

Question number	Answer	Mark
9(a)(ii)	63.5 + 12 + 3x16 (1)  = 123.5 (1)	(2)

Question number	Answer	Mark
9(a)(iii)	<b>A</b> bubble the gas through limewater, limewater turns cloudy  <b>The only correct answer is A</b>  <b>B</b> is not correct because test shows only an acidic gas <b>C</b> is not correct because test shows only that the gas does not support combustion <b>D</b> is not correct because test shows only an acidic gas	(1)

Question number	Answer	Additional guidance	Mark
9(b)(i)	Any TWO from  <ul style="list-style-type: none"> <li>• no more bubbles / fizzing (1)</li> <li>• no further change in colour (1)</li> <li>• {solid / copper carbonate} remains at bottom of flask / no more {solid / copper carbonate} dissolves (1)</li> </ul>	ignore references to pH  allow cloudy/opaque liquid  ignore no more copper carbonate will react	(2)

Question number	Indicative content	Mark
*9(b)(ii)	<p>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.</p> <p><b>AO2 and A03 (6 marks)</b></p> <ul style="list-style-type: none"> <li>• filter mixture</li> <li>• using filter funnel and paper</li> <li>• collect filtrate / copper sulfate solution</li> <li>• in conical flask / suitable (named) container</li> <li>• pour into an evaporating basin</li> <li>• heat on water bath / on tripod over Bunsen</li> <li>• until half volume / concentrated / partially evaporated / crystals start to appear around the edge</li> <li>• remove from heat and cover with filter paper</li> <li>• allow to cool</li> <li>• and crystallise</li> <li>• separate crystals using a suitable method</li> <li>• put/place crystals onto absorbent/filter paper</li> <li>• dry in a warm place</li> </ul>	(6)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels Eg - At each level, as well as content, the scientific coherency of what is stated backed up by planning detail will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	<u>Additional guidance</u> Identifies relevant practical operations	<u>Possible candidate responses</u> <ul style="list-style-type: none"> <li>• filter the mixture (alone)</li> <li>• allow solution to crystallise (alone)</li> <li>• filter mixture using filter paper - upper part of level</li> </ul>
Level 2	3–4	<u>Additional guidance</u> Some correct sequencing of correct operations	<u>Possible candidate responses</u> <ul style="list-style-type: none"> <li>• filter mixture and collect solution/liquid</li> <li>• evaporate solution and leave to cool</li> <li>• sequence with detail – upper part of level</li> </ul>
Level 3	5–6	<u>Additional guidance</u> Sequence of operations to include two from filter to remove excess copper carbonate, crystallise (includes heating & cooling), separate crystals & dry	<u>Possible candidate responses</u> <ul style="list-style-type: none"> <li>• filter mixture then cool and crystallise</li> <li>• evaporate/heat solution then allow to cool and crystallise</li> <li>• sequence with detail – upper part of level</li> </ul>

**Total for Question 9 = 13 marks**

Question number	Answer	Additional guidance	Mark
10(a)(i)	K, L, J, N, M		(1)

Question number	Answer	Additional guidance	Mark
10(a)(ii)	(volumetric) pipette	allow burette reject dropping pipette  ignore balance	(1)

Question number	Answer	Additional guidance	Mark
10(b)(i)	An explanation linking <ul style="list-style-type: none"> <li>solution from titration contains an indicator (1)</li> <li>therefore second solution used with no indicator / indicator would contaminate salt (1)</li> </ul>	MP2 dependent on MP1  allow original mixture was contaminated by indicator so doesn't form a pure salt (2)	(2)

Question number	Answer	Additional guidance	Mark
10(b)(ii)	final answer of 120% with or without working (2)  OR  $\frac{0.84}{0.70}$ (=1.2) (1)  $\frac{0.84}{0.70} \times 100$ (=120(%)) (1)	allow any fraction x100 (1)	(2)

Question number	Answer	Additional guidance	Mark
10(b)(iii)	{the salt/solid/potassium chloride} was still wet/ not all of the water had been evaporated off		(1)

Question number	Answer	Additional guidance	Mark
<b>10(b)(iv)</b>	final answer of 80.5 with or without working (4)  OR  total mass: $56 + 36.5 (=92.5) /$ $74.5 + 18 (=92.5) (1)$  $\frac{74.5}{92.5} (= 0.8054) (1)$  $\frac{74.5}{92.5} \times 100 (=80.540) (1)$  $= 80.5 (1)$	allow ECF throughout  92.5 seen (1)          incorrect answer with working to 1 decimal place (1)  50.0/100.0 does not score MP4	<b>(4)</b>

**Total for Question 10 = 11 marks**