

Mark Scheme (Results)

Summer 2016

Pearson Edexcel GCSE in Chemistry
(5CH1H) Paper 01

Unit C1: Chemistry in Our

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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.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- 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.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Acceptable answers	Mark
1(a)	<p>An explanation linking</p> <p>water vapour: <u>condensed/turned to liquid/turned to water/ cooled</u> AND formed oceans/ formed <u>rain</u> (1)</p> <p>carbon dioxide: dissolved/absorbed in the {water/ oceans/rivers/lakes} (1)</p>	<p>Ignore 'turned to/ formed oceans/seas' etc if not explained how this happened</p> <p><u>photosynthesis</u> / incorporated into rocks/shells</p> <p>Ignore descriptions of photosynthesis –term is required</p>	(2)

Question Number	Answer	Acceptable answers	Mark
1(b)	<p><u>Heat</u> is: trapped / absorbed / stopped from escaping / reflected back / radiated back</p> <p><u>IR radiation</u> is absorbed etc.</p>	<p>Ignore radiation/ UV/ rays/ warmth/ light/ Sun's rays / energy/ it's an insulator/ insulates Earth/ keeps Earth warm/ greenhouse gas</p> <p>Reject references to ozone layer</p>	(1)

Question Number	Answer	Acceptable answers	Mark
1(c)	deforestation / <u>respiration</u>	<p>Ignore farming/ increased population/ breathing/ use of cars/ industry</p> <p>Reject photosynthesis/ volcanic activity</p>	(1)

Question Number	Answer	Acceptable answers	Mark
1(d)	other factors could be causing the temperature to rise / correlation is not cause / not enough data to establish trend / no data between the two stated years	<p>insufficient evidence /could be due to methane or other (greenhouse) gases</p> <p>Ignore only small temp. rise / could be anomalous etc / different percentage changes in conc. and temp.</p>	(1)

Question Number	Answer	Acceptable answers	Mark
1 (e) (i)	<p>Advantage</p> <p>Any one from:</p> <ul style="list-style-type: none"> only water is produced / no CO₂ or CO or SO₂ / no pollutants / no waste products / no toxic gases/ no harmful gases/ no hazardous gases sustainable / preserves crude oil or fossil fuels / renewable more energy per gram / per unit mass can be produced in unlimited amounts (from water) <p style="text-align: right;">(1)</p> <p>Disadvantage</p> <p>Any one from:</p> <ul style="list-style-type: none"> expensive <u>to produce</u> difficult to store/ transport limited outlets/ low availability of filling stations has to be stored in strong tanks / at high pressure <p style="text-align: right;">(1)</p>	<p>Ignore better for environment / less pollution / cleaner fuel / refs to unspecified greenhouse gases / just releases more energy</p> <p>Ignore cost arguments other than <u>production</u></p> <p>Ignore may need fossil fuel to produce hydrogen</p> <p>Ignore 'dangerous'/ explosive etc.</p>	(2)

Question Number	Answer	Acceptable answers	Mark
1 (e) (ii)	hydrogen + oxygen → water	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ <p>Reject any other symbol equation (incorrectly balanced) or mixed words and symbols / hydrogen oxide – only water allowed / energy as a product</p> <p>Allow = for →</p>	(1)

Total for Question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
2(a)	A description including magma/lava/molten/liquid rock (1) cools/forms/solidifies: slowly / over a long time / intrusively/ below Earth's surface (1)	Reject answers explaining metamorphic or sedimentary processes for both marks	(2)

Question Number	Answer	Acceptable answers	Mark
2(b)	A description including heat / high temp. (1) pressure / compressed / compacted (1)		(2)

Question Number	Answer	Acceptable answers	Mark
2(c)	An explanation linking two of the following points waste gas is sulfur dioxide / is acidic (1) calcium carbonate is a base (1) <u>neutralisation/</u> neutralise (1)	two marks can be scored with suitable balanced equation Ignore calcium carbonate is an alkali	(2)

Question Number	Answer	Acceptable answers	Mark
2(d)(i)	B decomposition		(1)

Question Number	Answer	Acceptable answers	Mark
2(d)(ii)	CaO + H ₂ O → Ca(OH) ₂ correct balanced equation (2) any two correct formulae on the correct side of the equation (1)	Allow correct multiples Ignore state symbols Ignore word equations Reject incorrect subscripts e.g. H ² O, H2O	(2)

Total for Question 2 = 9 marks

Question Number	Answer	Acceptable answers	Mark
3(a)	B hydrochloric acid		(1)

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	magnesium nitrate	Ignore any symbols or formulae	(1)

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	A carbon dioxide		(1)

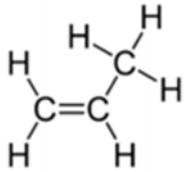
Question Number	Answer	Acceptable answers	Mark
3(c)(i)	A description including the following litmus (1) turns <u>white</u> / <u>bleaches</u> (1) second mark is dependent on the first	Allow UI paper Ignore any colour (changes) before bleaching; but reject further colour changes after bleaching	(2)

Question Number	Answer	Acceptable answers	Mark
3(c)(ii)	use fume cupboard / well ventilated room	Allow open windows Ignore gas mask / breathing apparatus etc / any other general safety precautions	(1)

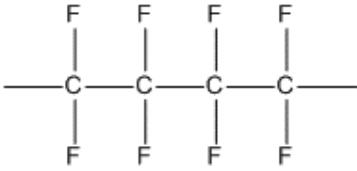
Question Number	Answer	Acceptable answers	Mark
3(c)(iii)	$2\text{HCl} \rightarrow \text{H}_2 + \text{Cl}_2$ LHS formula (1) RHS formulae (1) balancing correct formulae (1)	Allow correct multiples Ignore state symbols/ word equations Reject lower case h or c or upper case L/ incorrect subscripts e.g. H ² , H2 Allow = for →	(3)

Total for Question 3 = 9 marks

Question Number	Answer	Acceptable answers	Mark
4(a)	D unsaturated hydrocarbons		(1)

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	 <p>one C=C in a three consecutive carbon atom molecule (1)</p> <p>rest of the structure correct (1) conditional on first mark correct</p>	<p>Allow methyl group written as CH₃</p> <p>Ignore bond angles</p> <p>Penalise h/c instead of H/C for M2</p>	(2)

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	<p>A description including</p> <p>add bromine (water/solution) (1)</p> <p>In propene/alkene: turns colourless/decolourises (1)</p> <p>In propane/alkane: orange/yellow/brown / no change/does not go colourless (1)</p> <p>For incorrect reagent, score 0 (except bromide where M2 and M3 possible)</p>	<p>Ignore bromide for M1 but mark on assuming they meant bromine for M2, M3</p> <p>Ignore clear/ transparent/ discolours</p> <p>Reject incorrect bromine colour for M3 only</p> <p>Ignore red</p> <p>Ignore no reaction</p> <p>Allow 'turns orange'</p> <p>Ignore attempted descriptions (e.g. linking to saturated/unsaturated) even if wrong</p>	(3)

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	 <p>correct repeating unit (any multiple of 2; with or without brackets, continuation bonds or n) (1)</p> <p>two correct units shown with continuation bonds and no "n" (1)</p>	<p>Any answer with one or more double bonds scores (0)</p> <p>Ignore any outside brackets</p>	(2)

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	<p>(Making) any <u>named object</u> from:</p> <p>pans/kitchen utensils /skis/ bearings /burette taps/ carpets/clothing</p> <p>or</p> <p>as a lubricant</p>	Allow sensible alternatives	(1)

Question Number	Answer	Acceptable answers	Mark
4(d)	<p>Any one from</p> <p>recycle/incinerate/burn/combust</p>	<p>reuse the items made from polymers</p> <p>Allow descriptions e.g. melt AND remould</p>	(1)

Total for Question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
5(a)(i)	B aluminium oxide is reduced		(1)

Question Number	Answer	Acceptable answers	Mark
5(a)(ii)	<p>An explanation linking lead is {<u>lower</u> in reactivity series/ <u>less</u> reactive} than iron or aluminium or carbon (1)</p> <p>AND one from</p> <p>lead (oxide) can be reduced by carbon/ carbon can displace lead from its oxide</p> <p><u>lead oxide</u> is less stable / more easily reduced than iron oxide or aluminium oxide</p> <p>electrolysis is expensive/ reduction with carbon is cheap(er) (1)</p>	<p>M1 requires comparison</p> <p>carbon is oxidised / oxygen is displaced</p> <p>Allow descriptions e.g oxygen is removed from lead oxide by carbon</p>	(2)

Question Number	Answer	Acceptable answers	Mark
5(b)	<p>An explanation linking any three of ALUMINIUM/ PURE METAL</p> <ul style="list-style-type: none"> atoms/ions/ particles all the same size (1) {atoms/ions/layers/sheets/rows} {slide/slip/move} over each other easily (1) <p>ALLOY</p> <ul style="list-style-type: none"> added atoms are different size/ {atoms/ions} in an alloy have different sizes (1) {atoms/<u>layers/sheets/rows/structure/lattice</u>} disrupted / {cannot/harder to} move (1) 	<p>marks can be obtained from labels on diagrams <u>that equate to the marking points</u></p> <p>Ignore different shape</p> <p>Reject molecules once then mark on</p>	(3)

Question Number	Indicative Content	Mark																								
QWC	<p data-bbox="272 207 362 237">*5(c)</p> <p data-bbox="394 207 1144 268">A description/explanation including some of the following points</p> <p data-bbox="394 274 706 304">Uses and properties</p> <table border="1" data-bbox="394 304 1295 1191"> <thead> <tr> <th data-bbox="394 304 857 334"><i>Examples of use</i></th> <th data-bbox="857 304 1295 334"><i>Examples of properties</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="394 334 857 364">aluminium</td> <td data-bbox="857 334 1295 364"></td> </tr> <tr> <td data-bbox="394 364 857 540">aeroplanes, cars, bicycles, trains, trucks, ladders, window frames, door frames, greenhouses, pylons, yacht masts, walking poles</td> <td data-bbox="857 364 1295 540">low density/lightweight, strong, resistant to corrosion, malleable</td> </tr> <tr> <td data-bbox="394 540 857 641">(overhead) power/electricity cables</td> <td data-bbox="857 540 1295 641">low density/lightweight, good conductor of electricity, resistant to corrosion</td> </tr> <tr> <td data-bbox="394 641 857 741">foil, food packaging, cans, sweet wrappers, saucepans, blister packs for pills</td> <td data-bbox="857 641 1295 741">low density/lightweight [Ignore light] resistant to corrosion, malleable, non-toxic</td> </tr> <tr> <td data-bbox="394 741 857 772">copper</td> <td data-bbox="857 741 1295 772"></td> </tr> <tr> <td data-bbox="394 772 857 842">electrical wires/cables, lightning conductors</td> <td data-bbox="857 772 1295 842">good conductor of electricity, malleable, ductile</td> </tr> <tr> <td data-bbox="394 842 857 913">water pipes, roofing, coins, jewellery, statues</td> <td data-bbox="857 842 1295 913">resistant to corrosion, malleable</td> </tr> <tr> <td data-bbox="394 913 857 943">steel</td> <td data-bbox="857 913 1295 943"></td> </tr> <tr> <td data-bbox="394 943 857 1014">bridges, cars, hulls of (large) ships, construction</td> <td data-bbox="857 943 1295 1014">strong</td> </tr> <tr> <td data-bbox="394 1014 857 1044">(stainless) steel</td> <td data-bbox="857 1014 1295 1044"></td> </tr> <tr> <td data-bbox="394 1044 857 1191">cutlery, saucepans, kitchen utensils, kitchen sinks, washing machine drums, exhaust systems</td> <td data-bbox="857 1044 1295 1191">resistant to corrosion, strong</td> </tr> </tbody> </table> <p data-bbox="394 1225 768 1255">Advantages of recycling</p> <ul data-bbox="435 1286 1255 1649" style="list-style-type: none"> • saves (finite) natural reserves of metal ores / stops the metal (ore) running out • less damage to the landscape/environment since reduces the need for mining or quarrying ores • less waste metals (in landfill sites) • landfill sites will not fill up as quickly • waste (from copper mining) can be toxic/less toxic gases, such as sulfur dioxide • less energy needed to recycle than to extract (for most metals) / less carbon dioxide emissions • less expensive than using electrolysis <p data-bbox="394 1675 573 1705">Ignore cost</p>	<i>Examples of use</i>	<i>Examples of properties</i>	aluminium		aeroplanes, cars, bicycles, trains, trucks, ladders, window frames, door frames, greenhouses, pylons, yacht masts, walking poles	low density/lightweight, strong, resistant to corrosion, malleable	(overhead) power/electricity cables	low density/lightweight, good conductor of electricity, resistant to corrosion	foil, food packaging, cans, sweet wrappers, saucepans, blister packs for pills	low density/lightweight [Ignore light] resistant to corrosion, malleable, non-toxic	copper		electrical wires/cables, lightning conductors	good conductor of electricity, malleable, ductile	water pipes, roofing, coins, jewellery, statues	resistant to corrosion, malleable	steel		bridges, cars, hulls of (large) ships, construction	strong	(stainless) steel		cutlery, saucepans, kitchen utensils, kitchen sinks, washing machine drums, exhaust systems	resistant to corrosion, strong	(6)
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Level	0	No rewardable content
1	1 - 2	<ul style="list-style-type: none"> • a limited description e.g. gives one use related to a property or explain one advantage of recycling • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	<ul style="list-style-type: none"> • a simple description e.g. answer refers to at least two uses of metals giving the use related to their properties OR gives a use of a metal related to its property and a simple explanation of an advantage of recycling • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5 - 6	<ul style="list-style-type: none"> • a detailed description e.g. answer refers to at least two metals giving three uses related to their properties OR gives uses related to properties of metals and discusses recycling • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

Total for Question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
6(a)	B boiling point lower than Y, ease of ignition easier than Y, viscosity lower than Y.		(1)

Question Number	Answer	Acceptable answers	Mark
6(b)	$\text{C}_5\text{H}_{12} + 8\text{O}_2 \rightarrow 5\text{CO}_2 + 6\text{H}_2\text{O}$ <p>LHS formulae (1)</p> <p>RHS formulae (1)</p> <p>balancing correct formulae (1)</p>	<p>ignore state symbols</p> <p>Reject incorrect subscripts and cases e.g. CO^2, CO_2, Co_2</p> <p>Allow multiples, =</p>	(3)

Question Number	Answer	Acceptable answers	Mark
6(c)	<p>An explanation linking any two of the following</p> <p><u>sulfur dioxide/SO₂</u> (1)</p> <p>(gas) {dissolves in/ reacts with} rain /forms {acid rain/an acid/sulfuric acid} (1)</p> <p>an effect of acid rain eg: harms/kills {fish/plants}/ damages/corrodes metals/ damages/erodes/weathering {statues/ buildings}/ causes {lung damage/ breathing problems} (1)</p>	<p>Ignore sulfur/ sulfur oxide for M1 but mark on</p> <p>Ignore 'pollutes water'/ 'acidifies water/lakes' / damages habitats etc</p>	(2)

Question Number	Indicative Content	Mark
QWC	<p>*6(d)</p> <p>A description/explanation including some of the following points</p> <p>Description of experiment</p> <ul style="list-style-type: none"> • heat liquid paraffin/ alkane • (pass paraffin vapour) over hot porcelain/porous pot/catalyst • collect gas over water <p>Some of these points could be made on a labelled diagram</p> <p>Need for cracking: supply and demand</p> <ul style="list-style-type: none"> • too little gases / petrol fraction • high demand for petrol • there is more of the kerosene fraction than is needed from crude oil to match demand / ORA • stops over-production / makes better use of kerosene • produces smaller/ more in demand alkanes / more useful alkanes <p>Need for cracking: properties</p> <ul style="list-style-type: none"> • shorter molecule easier to ignite etc • produces alkenes (to make plastics)/ polymers <p>Credit correct diagrams or equations Ignore fractional distillation</p>	(6)
Level	0	No rewardable content
1	1 - 2	<ul style="list-style-type: none"> • a limited description of the need for cracking or cracking in the laboratory e.g. heat liquid paraffin and pass over catalyst • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	<ul style="list-style-type: none"> • a simple description of the need for cracking or cracking in the laboratory e.g explains two advantages/reasons for undertaking cracking • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5 - 6	<ul style="list-style-type: none"> • a detailed account to include advantages/reasons for cracking and details of the cracking process in the laboratory. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors
Total for Question 6 = 12 marks		

