

# Mark Scheme (Results)

Summer 2015

Pearson Edexcel GCSE in  
Chemistry (5CH3F) Paper 01  
Unit C3: Chemistry in Action

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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.

### **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
<b>1(a)</b>	<b>C</b> preservative		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(b)</b>	M1 named indicator (1) M2 correct colour (1)  M2 dependent on M1	universal Indicator – yellow/orange/red methyl orange – red phenolphthalein – colourless (red/blue) litmus - red	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(c)(i)</b>	oxygen (1)	O <sub>2</sub> reject O	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(c)(ii)</b>	hydrogen (1)	H <sub>2</sub> reject H	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(c)(iii)</b>	carbon dioxide (1)	CO <sub>2</sub>	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1(d)</b>	ethanoic acid + ethanol → ethyl ethanoate + water (2)  left hand side (1) right hand side (1)	allow recognisable misspellings allow reactants and products in either order allow = for →  allow correct formulae if formulae are used do not allow incorrect use of the subscripts / upper / lower case	<b>(2)</b>

Total for Question 1 = 8 marks

Question Number	Answer	Acceptable answers	Mark
<b>2(a)(i)</b>	<b>D</b> sodium, Na <sup>+</sup>		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(a)(ii)</b>	<p>A description including</p> <p>M1 CLEAN</p> <ul style="list-style-type: none"> <li>(clean/dip) wire/test loop in (hydrochloric) acid (1)</li> </ul> <p>M2 SAMPLE</p> <ul style="list-style-type: none"> <li>put solid / sample on (wire/test loop) (1)</li> </ul> <p>M3 TEST</p> <ul style="list-style-type: none"> <li>hold (wire/test loop) in/at edge of (Bunsen) flame (1)</li> </ul>	<p>ignore: water, but reject: other incorrect reagent</p> <p>do not allow use of tongs / spatula etc for M1, but can score M2 and M3</p> <p>allow damp(en)/moisten splint</p> <p>allow dissolved solid / sample / solution on (wire/test loop)</p> <p>allow solid on to splint</p> <p>hold (splint) in/at edge of (Bunsen) flame</p> <p>allow solid held/put in flame</p> <p>ignore: hold <u>over</u> flame</p>	<b>(3)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(b)</b>	white (1) precipitate/solid (1)	ignore fizzing/bubbling/effervescence ppt	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(c)</b>	(red-)brown (1) precipitate / solid (1)	ignore orange ppt	<b>(2)</b>

Total for Question 2 = 8 marks

Question Number	Answer	Acceptable answers	Mark
<b>3(a)(i)</b>	neutralisation (1)	accept recognisable spelling	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(a)(ii)</b>	<b>D</b> acid + base → salt + water		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(i)</b>	17.12 - 7.02 (1) (=10.10/10.1) (g)	10.10/10.1 (g)	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(ii)</b>	$\frac{17.12 - 7.02}{2}$ (1) (=5.05) (g dm <sup>-3</sup> )	5.05 (g dm <sup>-3</sup> ) allow error carried forward from bi	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(c)(i)</b>	calcium/magnesium (1)	Ca <sup>2+</sup> / Mg <sup>2+</sup> reject CaCO <sub>3</sub>	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(c)(ii)</b>	A description linking any two from <ul style="list-style-type: none"> <li>• (with soap forms) scum (1)</li> <li>• wastes soap/more soap needed (1)</li> <li>• (forms) scale / limescale (1)</li> <li>• (scale) blocks pipes (1)</li> <li>• (scale) wastes energy (1)</li> </ul>	ignore references to cost alone	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(c)(iii)</b>	<p>An explanation linking three of</p> <ul style="list-style-type: none"> <li>• B is permanent hard water (1)</li> <li>• (permanent) because same volume of soap solution /boiling has no effect (1)</li> <li>• C is temporary hard water (1)</li> <li>• (temporary) because smaller volume of soap solution required after boiling (1)</li> </ul>	<p>allow amount for volume</p> <p>different volumes</p>	<b>(3)</b>

Total for Question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
<b>4(a)(i)</b>	Yeast		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4(a)(ii)</b>	<b>D</b> – fractional distillation		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4(a)(iii)</b>	increases	slower reactions ignore slows down/slower reaction time	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4(b)(i)</b>	<p>An explanation including any two of the following</p> <ul style="list-style-type: none"> <li>• same <u>general</u> formula (1)</li> <li>• have similar/same chemical reactions/properties (1)</li> <li>• both saturated/(both only) have single bonds / (both) have no double bonds (1)</li> </ul>	<p><math>C_nH_{2n+2} = 2</math> marks</p> <p>allow both hydrocarbons / both contain hydrogen and carbon (only) allow both end in -ane allow (molecular) formulae differ by <math>CH_2</math></p>	<b>(2)</b>



Question Number	Answer	Acceptable answers	Mark
<b>4(b)(ii)</b>	fully correct (displayed) formula of butane (2) $  \begin{array}{cccc}  & \text{H} & \text{H} & \text{H} & \text{H} \\  &   &   &   &   \\  \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} - \text{H} \\  &   &   &   &   \\  & \text{H} & \text{H} & \text{H} & \text{H}  \end{array}  $ M1 four carbon atoms joined by single bonds (1) M2 rest of molecule correct (1)	           M2 dependent on M1  If methylpropane drawn fully correctly 1 mark	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4(c)</b>	$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$ (3) LHS (1) RHS (1) balancing of correct formulae (1)	allow correct multiples allow reactants on LHS and products on RHS in either order  ignore state symbols allow = for $\rightarrow$	<b>(3)</b>

Total for Question 4 = 10 marks

Question Number	Answer	Acceptable answers	Mark
<b>5(a)(i)</b>	<b>C</b> $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(a)(ii)</b>	reaction is reversible / goes both ways (1)	reaches equilibrium (1)	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(b)(i)</b>	A description linking  urea contains the highest percentage of nitrogen (1)  (this is important because) nitrogen enables plants to grow (1)	ignore references to oxygen	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(b)(ii)</b>	An explanation linking any <b>two</b> of the following points  (excess) fertiliser is washed into rivers (by rainfall) (1)  plants/algae (in the river) grow bigger / more quickly (1)  oxygen is used up (by bacteria) when the plants decay/die (1)  (this leads to) fish/animals die (due to lack of oxygen) (1)	allow grow better / increases growth  must indicate idea of an increase in growth/faster growth	<b>(2)</b>

Question Number	Indicative Content	Mark
<b>QWC</b>	<p data-bbox="220 241 331 280"><b>*5(c)</b></p> <p data-bbox="352 241 1118 280">A description including some of the following points</p> <p data-bbox="352 280 480 318"><b>Stage 1</b></p> <ul data-bbox="400 318 1310 459" style="list-style-type: none"> <li>• identifies pipette</li> <li>• pipette / measuring cylinder to measure out the ammonia solution (25 cm<sup>3</sup>)</li> <li>• into a suitable container, e.g. conical flask</li> </ul> <p data-bbox="352 495 480 533"><b>Stage 2</b></p> <ul data-bbox="400 533 1326 987" style="list-style-type: none"> <li>• add few drops of indicator / suitable named indicator</li> <li>• put flask on a white tile</li> <li>• identifies burette</li> <li>• fill burette with sulfuric acid solution</li> <li>• clamp burette / burette holder/stand</li> <li>• read level of burette</li> <li>• add acid from the burette</li> <li>• swirl flask (gently)</li> <li>• add drop-wise near end-point</li> <li>• until {indicator just changes colour / correct colour change for chosen indicator}</li> <li>• read level on burette</li> <li>• repeat experiment until concordant results owtte</li> </ul> <p data-bbox="352 1023 480 1061"><b>Stage 3</b></p> <ul data-bbox="400 1061 1353 1167" style="list-style-type: none"> <li>• mix the same volumes of sulfuric acid and ammonia solution (determined from the titration experiment)</li> <li>• but leaving out the indicator</li> </ul> <p data-bbox="352 1202 480 1240"><b>Stage 4</b></p> <ul data-bbox="400 1240 1302 1514" style="list-style-type: none"> <li>• pour into an evaporating dish</li> <li>• {heat the solution / leave to evaporate} to dryness, until pure salt crystals formed</li> <li>• to point of crystallisation/ concentrate solution</li> <li>• leave to cool</li> <li>• filter off crystals</li> <li>• wash with water</li> <li>• leave to dry</li> </ul>	<b>(6)</b>

<b>Level</b>	<b>0</b>	No rewardable content
<b>1</b>	<b>1 - 2</b>	<ul style="list-style-type: none"> <li>• a limited description e.g. limited description of one stage / add one solution to the other</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>
<b>2</b>	<b>3 - 4</b>	<ul style="list-style-type: none"> <li>• a simple description e.g. one stage in detail / attempt to describe more than one stage</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>
<b>3</b>	<b>5 - 6</b>	<ul style="list-style-type: none"> <li>• a detailed description e.g. add sulphuric acid to ammonia using indicator appropriately, good detail of equipment and of titration technique and some mention of producing crystals / detail description of producing crystals with some mention of titration</li> <li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>

Total for Question 5 = 12 marks

Question Number	Answer	Acceptable answers	Mark
<b>6(a)</b>	Cl <sup>-</sup> and OH <sup>-</sup>	Reject if any other ions given Allow names / chloride and hydroxide	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>6(b)</b>	<b>D</b> lead and bromine		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>6(c)</b>	A explanation to include:  oxidation is the loss of electrons (1)  reduction is the gain of electrons (1)	oxidation is the gain of electrons <b>AND</b> reduction is the loss of electrons (1)	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>6(d)</b>	A explanation to include any two from:  to put a layer of one metal onto another metal (1)  change / improve the appearance (of metal objects) (1)  improve the resistance to corrosion (of metal objects) (1)  qualified reference to cost eg thin layer of expensive metal on cheaper metal (1)	allow to give shiny appearance / look nicer  allow prevents corrosion ignore rusting unless linked to iron/steel	<b>(2)</b>

Question Number		Indicative Content	Mark
<b>QWC</b>	<b>*6(e)</b>	<p>An explanation including some of the following points</p> <p><b>copper chloride powder</b></p> <ul style="list-style-type: none"> <li>• does not conduct</li> <li>• solid ionic compounds do not conduct</li> <li>• ions not free to move</li> </ul> <p><b>copper chloride solution</b></p> <ul style="list-style-type: none"> <li>• conducts</li> <li>• (ionic) solutions conduct</li> <li>• ions are free to move</li> <li>• red-brown solid is copper/copper produced at cathode</li> <li>• yellow green gas is chlorine/chlorine produced at anode</li> </ul> <p><b>explanation in terms of ions for copper chloride solution</b></p> <ul style="list-style-type: none"> <li>• negatively charged ions/chloride ions attracted to the anode</li> <li>• positively charged ions/copper ions attracted to the cathode</li> </ul> <p>More detailed explanation of electrode reactions/half equations not required but must be credited</p>	<b>(6)</b>
<b>Level</b>	<b>0</b>	No rewardable content	
<b>1</b>	<b>1 - 2</b>	<ul style="list-style-type: none"> <li>• a limited explanation e.g. products are identified</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>	
<b>2</b>	<b>3 - 4</b>	<ul style="list-style-type: none"> <li>• a simple explanation e.g. identifies the products and limited explanation of either powder or solution</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>	
<b>3</b>	<b>5 - 6</b>	<ul style="list-style-type: none"> <li>• a detailed explanation e.g. a detailed explanation of copper chloride solution identifying the products</li> <li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>	

Total for Question 6 = 12 marks

