



# **Mark Scheme (Results)**

Summer 2017

Pearson Edexcel GCSE  
In Chemistry (5CH3F) Paper 01

## **Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at [www.edexcel.com](http://www.edexcel.com) or [www.btec.co.uk](http://www.btec.co.uk). Alternatively, you can get in touch with us using the details on our contact us page at [www.edexcel.com/contactus](http://www.edexcel.com/contactus).

## **Pearson: helping people progress, everywhere**

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: [www.pearson.com/uk](http://www.pearson.com/uk)

Summer 2017

Publications Code 5CH3F\_01\_1706\_MS

All the material in this publication is copyright

© Pearson Education Ltd 2017

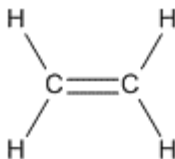
## **General Marking Guidance**

- 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.

| Question Number | Answer                                                                                                                                                                                                                                                                                       | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1(a)            | <p><b>D</b> propane</p> <p><b>The only correct answer is D</b></p> <p><b>A</b> is not correct because butane contains four carbon atoms</p> <p><b>B</b> is not correct because ethane contains two carbon atoms</p> <p><b>C</b> is not correct because methane contains one carbon atoms</p> | (1)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                            | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1(b)            | <p><b>D</b> C<sub>5</sub>H<sub>12</sub></p> <p><b>The only correct answer is D</b></p> <p><b>A</b> is not correct because the formula of a molecule of pentane is not C<sub>5</sub>H<sub>5</sub></p> <p><b>B</b> is not correct because the formula of a molecule of pentane is not C<sub>5</sub>H<sub>7</sub></p> <p><b>C</b> is not correct because the formula of a molecule of pentane is not C<sub>5</sub>H<sub>10</sub></p> | (1)  |

| Question Number | Answer                                                                                                                     | Acceptable answers                                                 | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------|
| 1(c)            | <ul style="list-style-type: none"> <li>the more carbon atoms (in a molecule) the higher the boiling point OWTTE</li> </ul> | the fewer carbon atoms (in a molecule) the lower the boiling point | (1)  |

| Question Number | Answer                                                                                                                                                                                                                             | Acceptable answers                                                                            | Mark       |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------|
| 1(d)            |  <ul style="list-style-type: none"> <li>two carbon atoms joined by double bond <b>(1)</b></li> <li>rest of molecule correct <b>(1)</b></li> </ul> | Ignore bond angles<br><br><br><br><br><br><br><br><br><br>second mark dependent of first mark | <b>(2)</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                | Mark       |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1(e)(i)         | <p><b>C</b> yeast</p> <p><b>The only correct answer is C</b></p> <p><b>A</b> is not correct because when added to glucose solution, hydrochloric acid would not form ethanol by fermentation</p> <p><b>B</b> is not correct because when added to glucose solution, sodium hydroxide would not form ethanol by fermentation</p> <p><b>D</b> is not correct because when added to glucose solution, vinegar would not form ethanol by fermentation</p> | <b>(1)</b> |

| Question Number | Answer                                                                                                                                                | Acceptable answers                                                              | Mark       |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------|
| 1(e)(ii)        | Any two from <ul style="list-style-type: none"> <li>named medical issues</li> <li>social problems</li> <li>driving and work-related issues</li> </ul> | Ignore drunk unqualified<br><br><br><br><br><br><br>Allow two from any category | <b>(2)</b> |

**(Total for Question 1 = 8 marks)**

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Mark |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2(a)            | <p><b>C</b> oxidation</p> <p><b>The only correct answer is C</b></p> <p><b>A</b> is not correct because when ethanol reacts to form ethanoic acid the type of reaction taking place is called oxidation not distillation</p> <p><b>B</b> is not correct because when ethanol reacts to form ethanoic acid the type of reaction taking place is called oxidation not neutralisation</p> <p><b>D</b> is not correct because when ethanol reacts to form ethanoic acid the type of reaction taking place is called oxidation not thermal decomposition</p> | (1)  |

| Question Number | Answer                                                                                                                                                     | Acceptable answers                                                                                                                                                                                                                                                                                                                        | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 2(b)            | <p>ethanoic acid + magnesium → magnesium ethanoate + hydrogen</p> <ul style="list-style-type: none"> <li>LHS <b>(1)</b></li> <li>RHS <b>(1)</b></li> </ul> | <p>Correct chemical equation scores 2 marks</p> $\text{Mg} + 2\text{CH}_3\text{COOH} \rightarrow (\text{CH}_3\text{COO})_2\text{Mg} + \text{H}_2$ <p>Allow <math>\text{Mg}(\text{CH}_3\text{COO})_2</math></p> <p>Partially correct chemical equation scores 0</p> <p>If both word and chemical equation given mark the word equation</p> | (2)  |

| Question Number | Answer                      | Acceptable answers                                      | Mark |
|-----------------|-----------------------------|---------------------------------------------------------|------|
| 2(c)            | carbon, hydrogen and oxygen | <p>All 3 needed, in any order</p> <p>Ignore symbols</p> | (1)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Acceptable answers | Mark       |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|
| 2(d)            | <p>substances</p> <p>use</p> <pre> graph LR     subgraph substances         ester[ester]         vinegar[vinegar]     end     subgraph use         perfume[perfume]         fertiliser[fertiliser]         preservative[preservative]     end     ester --&gt; perfume     vinegar --&gt; preservative           </pre> <ul style="list-style-type: none"> <li>• ester linked to perfume <b>(1)</b></li> <li>• vinegar linked to preservative <b>(1)</b></li> </ul> <p>Do not award the mark if there are two or more lines starting from one of the substances</p> |                    | <b>(2)</b> |

| Question Number | Answer                                                                                                                                        | Acceptable answers                                                                                                                                                                                                     | Mark       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 2(e)            | <p>reagent<br/>sodium hydroxide / potassium hydroxide (1)</p> <p>condition<br/>boil / heat / high temperature / concentrated (alkali) (1)</p> | <p>Allow alkali<br/>Accept formulae<br/>If correct name given ignore any formula</p> <p>Allow (very) hot<br/>Allow temperature range 70-100 °C<br/>Ignore warm<br/>Ignore references to (high) pressure /catalysts</p> | <b>(2)</b> |

**(Total for Question 2 = 8 marks)**

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Acceptable answers                                                                                                                                                                                                                                                                                                                                                                                                                                           | Mark       |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>3(a)(i)</b>  | <p>A description including any two from</p> <ul style="list-style-type: none"> <li>determine mass of an empty evaporating basin <b>(1)</b></li> <li>pour (25 cm<sup>3</sup> of) water into the basin <b>(1)</b></li> <li>heat until all the water has evaporated <b>(1)</b></li> <li>determine mass of the basin and solid <b>(1)</b></li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>subtract the mass of the empty basin from the mass of basin and solid <b>(1)</b></li> </ul> | <p>Allow weigh</p> <p>Allow any suitable container</p> <p>Allow any form of heating or just allow water to evaporate</p> <p>Allow boil off/evaporate all the water</p> <p>Allow weigh</p> <p>If container NOT used allow max 2 marks for</p> <ul style="list-style-type: none"> <li>heat until all the water has evaporated / boil off/evaporate all the water <b>(1)</b></li> <li>determine mass of/weigh the solid (left afterwards) <b>(1)</b></li> </ul> | <b>(3)</b> |

| Question Number | Answer                                                                                                       | Acceptable answers                                                                                            | Mark       |
|-----------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------|
| <b>3(a)(ii)</b> | $\frac{0.6 \times 1000}{25} (= 24 \text{ g dm}^{-3})$ <p>OR</p> $\frac{0.6}{0.025} (= 24 \text{ g dm}^{-3})$ | <p>Correct answer with no working <b>(1)</b></p> <p>Correct working with {no/incorrect} answer <b>(1)</b></p> | <b>(1)</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                       | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 3(a)(iii)       | <p><b>B</b> magnesium, <math>\text{Mg}^{2+}</math></p> <p><b>The only correct answer is B</b></p> <p><b>A</b> is not correct because potassium ions do not cause hardness in water</p> <p><b>C</b> is not correct because sodium ions do not cause hardness in water</p> <p><b>D</b> is not correct because ammonium ions do not cause hardness in water</p> | (1)  |

| Question Number | Answer                                                                                                                                                                                           | Acceptable answers                                                                                                                                          | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 3(b)            | <p>An explanation linking</p> <ul style="list-style-type: none"> <li>(water sample) C <b>(1)</b></li> <li>because there was no lather produced / all soap has been used up <b>(1)</b></li> </ul> | <p>Allow least lather/smallest height of lather</p> <p>Allow height of lather = 0</p> <p>Ignore references to scum</p> <p>Second mark dep on first mark</p> | (2)  |

| Question Number | Answer                                | Acceptable answers                    | Mark |
|-----------------|---------------------------------------|---------------------------------------|------|
| 3(c)            | scum / precipitate / cloudy (mixture) | Ignore reference to no bubbles/lather | (1)  |

| Question Number | Answer                                                                                                                                                                                                       | Acceptable answers                                                                                                                     | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------|
| 3(d)            | <p>(calcium hydrogen carbonate (aq))</p> <p>→ calcium carbonate (<b>s</b>) + carbon dioxide (<b>g</b>) + water (<b>l</b>)</p> <p>All 3 correct scores <b>(2)</b></p> <p>1 or 2 correct scores <b>(1)</b></p> | <p>Allow upper case letters</p> <p>Do not allow solid / so(l) for s</p> <p>Do not allow gas for g</p> <p>Do not allow liquid for l</p> | (2)  |

**(Total for Question 3 = 10 marks)**

| Question Number | Answer                                             | Acceptable answers | Mark |
|-----------------|----------------------------------------------------|--------------------|------|
| 4(a)(i)         | ions are in fixed positions/cannot move/not mobile |                    | (1)  |

| Question Number | Answer                                                                                                         | Acceptable answers                                                                                                                                                                                                                                                                        | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4(a)(ii)        | An explanation linking <ul style="list-style-type: none"> <li>electron(s) (1)</li> <li>gain(ed) (1)</li> </ul> | accept reduction (1)<br><br>second mark dep on first mark if state incorrect number of electrons gained by each sodium ion allow 1 mark<br><br>$\text{Na}^+ + \text{e}^{(-)} \rightarrow \text{Na}$ scores 2 marks<br>$\text{Na}^+ + 2\text{e}^{(-)} \rightarrow \text{Na}$ scores 1 mark | (2)  |

| Question Number | Answer                                                                                                                            | Acceptable answers                                                                                                                                                                                                 | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4(b)(i)         | An explanation linking <ul style="list-style-type: none"> <li>chlorine (gas) (1) AND</li> <li>(is) toxic/poisonous (1)</li> </ul> | Allow <ul style="list-style-type: none"> <li>hydrogen (gas) (1) AND</li> <li>(is) flammable (1)</li> </ul> Allow explosive<br><br>For both pairs:<br>Ignore dangerous/harmful<br><br>Second mark dep on first mark | (2)  |

| Question Number | Answer                                                                                                                 | Acceptable answers                     | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------|
| 4(b)(ii)        | An explanation linking <ul style="list-style-type: none"> <li>electron(s) (1)</li> <li>(have been) lost (1)</li> </ul> | Second mark is dependent on first mark | (2)  |

| Question Number | Answer                    | Acceptable answers                                                                                                                  | Mark |
|-----------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------|
| 4(c)(i)         | copper sulfate (solution) | Allow sulphate<br>Allow copper nitrate /copper chloride<br><br>Allow $\text{CuSO}_4$ / $\text{Cu}(\text{NO}_3)_2$ / $\text{CuCl}_2$ | (1)  |

| Question Number | Answer                                                                                                                                                                                                          | Acceptable answers                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Mark       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4(c)(ii)        | <p>A description including two from</p> <ul style="list-style-type: none"> <li>cathode becomes larger <b>(1)</b></li> <li>anode becomes smaller <b>(1)</b></li> <li>solid drops to bottom <b>(1)</b></li> </ul> | <p>Allow copper coating (forms) on cathode<br/> Allow orange/brown solid coats cathode<br/> Ignore copper added to cathode<br/> Ignore cathode gains mass<br/> Ignore cathode gains copper<br/> Ignore copper moves/attracted to the cathode<br/> Ignore copper transferred to the cathode</p> <p>Ignore anode loses copper<br/> Ignore anode loses mass</p> <p>sludge formed<br/> Reject (impure) copper drops to bottom</p> <p>Ignore references to bubbles/fizzing/gas produced</p> | <b>(2)</b> |

**(Total for Question 4 = 10 marks)**

| Question Number | Answer                                                                                                                                                 | Acceptable answers                                                                                                                                                                                                    | Mark       |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 5(a)(i)         | <p>An explanation linking</p> <ul style="list-style-type: none"> <li>filter <b>(1)</b></li> <li>to remove solid / zinc carbonate <b>(1)</b></li> </ul> | <p>Allow to collect the {filtrate/zinc chloride solution} in a suitable container eg conical flask</p> <p>Allow what is left is zinc chloride (solution)</p> <p>Allow solid/zinc carbonate left on (filter) paper</p> | <b>(2)</b> |

| Question Number | Answer                                                                                                                                                                                                                                            | Acceptable answers                                                                                                                                              | Mark       |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 5(a)(ii)        | <p><math>\text{ZnCO}_3 + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2\text{O} + \text{CO}_2</math></p> <ul style="list-style-type: none"> <li><math>\text{CO}_2</math> <b>(1)</b></li> <li><math>2(\text{HCl})</math> <b>(1)</b></li> </ul> | <p>Allow multiples of complete equation eg</p> <p><math>2\text{ZnCO}_3 + 4\text{HCl} \rightarrow 2\text{ZnCl}_2 + 2\text{H}_2\text{O} + 2\text{CO}_2</math></p> | <b>(2)</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                    | Acceptable answers                                                                            | Mark       |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------|
| 5(b)            | <ul style="list-style-type: none"> <li>any acid-base indicator <b>(1)</b></li> <li>colour change for named indicator <b>(1)</b></li> </ul> <p>Examples:<br/> litmus – red to blue/ purple<br/> methyl orange – pink to orange / yellow<br/> phenolphthalein – colourless to pink/ red</p> | <p>do not allow universal indicator / pH paper</p> <p>second mark dependent on first mark</p> | <b>(2)</b> |

| Question Number |              | Indicative Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Mark       |
|-----------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>QWC</b>      | <b>*5(c)</b> | <p>A description including some of the following points</p> <p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• promotes plant growth (allow faster growth)</li> <li>• provides nitrogen/nutrients</li> <li>• contains a high percentage of nitrogen</li> <li>• increases crop yields / more food for people</li> <li>• easy to spread on soil (as a solid) or easy to spray onto crops (as a solution)</li> <li>• easily absorbed by plants (as it is soluble)</li> <li>• known amount of fertiliser provided</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• (can wash out from fields and) go into lakes/ rivers</li> <li>• increases plant/algae growth in lakes/ rivers</li> <li>• (which) blocks sunlight</li> <li>• as plants {die/decay} oxygen is used up</li> <li>• reduces oxygen available for other organisms/wildlife may die</li> <li>• eutrophication</li> <li>• too much in water supply can damage health of babies</li> <li>• some people may not wish to buy/eat produce grown using artificial fertilisers /some may prefer produce grown without artificial fertilisers)</li> <li>• cost of artificial fertilisers used has to be added to selling price of crops</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. one advantage or one disadvantage</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. two advantages, two disadvantages or one advantage and one disadvantage</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. at least four points including at least one advantage <b>and</b> at least one disadvantage</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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 6(a)            | <p><b>C</b> iron(II), Fe<sup>2+</sup></p> <p><b>The only correct answer is C</b></p> <p><b>A</b> is not correct because if a green precipitate is formed when sodium hydroxide is added to a solution it shows the solution contains iron(II) ions not sodium ions</p> <p><b>B</b> is not correct because because if a green precipitate is formed when sodium hydroxide is added to a solution it shows the solution contains iron(II) ions not potassium ions</p> <p><b>D</b> is not correct because because if a green precipitate is formed when sodium hydroxide is added to a solution it shows the solution contains iron(II) ions not iron(III) ions</p> | (1)  |

| Question Number | Answer                                                                                                      | Acceptable answers                                                                                                                                                                                                      | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 6(b)            | aluminium (ions) could also give a white precipitate /excess (sodium hydroxide solution) has not been added | <p>Allow both (aluminium and calcium ions) give a white precipitate</p> <p>Allow (white) precipitate may disappear in excess (sodium hydroxide)</p> <p>Allow only a few drops (of sodium hydroxide) have been added</p> | (1)  |

| Question Number | Answer                                                                            | Acceptable answers                                                | Mark |
|-----------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------|------|
| 6(c)            | <ul style="list-style-type: none"> <li>copper (1)</li> <li>sulfate (1)</li> </ul> | <p>Allow Cu</p> <p>Allow sulphate</p> <p>Allow SO<sub>4</sub></p> | (2)  |

| Question Number | Answer                                                                                                                                                                                                                                       | Acceptable answers                                                               | Mark       |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------|
| 6(d)            | $\text{NaOH} + \text{NH}_4\text{Cl} \rightarrow \text{NaCl} + \text{NH}_3 + \text{H}_2\text{O}$ <ul style="list-style-type: none"> <li>• correct formulae on LHS<br/><b>(1)</b></li> <li>• correct formulae on RHS<br/><b>(1)</b></li> </ul> | <p>If all formulae correct but equation is incorrectly balanced award 1 mark</p> | <b>(2)</b> |

| Question Number |   | Indicative Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mark |
|-----------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 6 (e)<br>QWC    | * | <p>A description to include some of the following points</p> <p>Flame test</p> <ul style="list-style-type: none"> <li>• carry out a flame test</li> <li>• clean wire</li> <li>• in (concentrated) hydrochloric acid</li> <li>• put solid / sample on wire</li> <li>• hold wire in flame</li> <li>• lilac flame indicates potassium ions / potassium chloride or potassium iodide</li> <li>• yellow flame indicates sodium ions / sodium iodide</li> </ul> <p>Test for anion</p> <ul style="list-style-type: none"> <li>• add solid to water / dissolve solid</li> <li>• add dilute nitric acid</li> <li>• add silver nitrate solution</li> <li>• if white precipitate forms</li> <li>• then chloride ion / potassium chloride present</li> <li>• if yellow precipitate forms</li> <li>• then iodide ion / sodium iodide or potassium iodide present</li> </ul> | (6)  |

| Level | 0     | No rewardable content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1     | 1 - 2 | <ul style="list-style-type: none"> <li>• A limited description of one test e.g. carry out a flame test, potassium gives lilac colour</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>                                                                                                                                                                                                                    |
| 2     | 3 - 4 | <ul style="list-style-type: none"> <li>• A simple description of a test for the cations or the anions <b>or</b> a limited description of both e.g. add silver nitrate, nitric acid and chloride gives white ppt</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>                                                                                                          |
| 3     | 5 - 6 | <ul style="list-style-type: none"> <li>• A detailed description containing tests for both cations <b>and</b> anions e.g. do flame test with solid on wire and put into flame and lilac colour means potassium ion present, yellow means sodium and test using silver nitrate solution to find the other ion including at least two correct results</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)**



