

Mark Scheme (Results)

January 2015

Pearson Edexcel International GCSE in  
Chemistry (4CHO) Paper 1C

Pearson Edexcel Certificate in  
Chemistry (KCH0) Paper 1C

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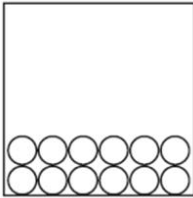
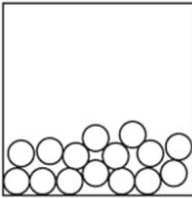
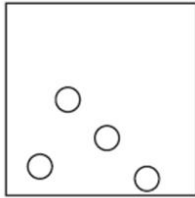
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## General Marking Guidance

- 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.

| Question number |   | Answer   | Notes | Marks         |
|-----------------|---|--|-------|---------------|
| 1               | a | <div><br/><br/></div> |       | 1             |
|                 | b | i A (an electron)  |       | 1             |
|                 |   | ii B (a neutron)   |       | 1             |
|                 |   | iii B (electrons and protons)  |       | 1             |
|                 | c | isotopes   |       | 3             |
|                 |   | atomic numbers   |       |               |
|                 |   | mass numbers   |       |               |
|                 |   |  |       | Total 7 marks |

| Question number                               | Answer  | Notes  | Marks                               |                                     |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |
|---|---|--|-------------------------------------|-------------------------------------|--|--|----------------|---------------------|------------|-------------------------|---|-------------------------------------|--|--|--|---|--|--|--|-------------------------------------|---|--|--|-------------------------------------|--|--|--|-------------------------------------|--|--|--|----------------------------|
| 2 a i   | <p>tick for P = chromatography<br/>tick for Q = fractional distillation<br/>tick for R = filtration<br/>tick for S = simple distillation</p> <table><tr><th rowspan="2">Separation</th><th colspan="4">Method of separation</th></tr><tr><th>Chromatography</th><th>Simple distillation</th><th>Filtration</th><th>Fractional distillation</th></tr><tr><td>P red ink from a mixture of coloured inks</td><td><input checked="" type="checkbox"/></td><td></td><td></td><td></td></tr><tr><td>Q ethanol from a mixture of ethanol and water</td><td></td><td></td><td></td><td><input checked="" type="checkbox"/></td></tr><tr><td>R sand from a mixture of sand and water</td><td></td><td></td><td><input checked="" type="checkbox"/></td><td></td></tr><tr><td>S water from copper(II) sulfate solution</td><td></td><td><input checked="" type="checkbox"/></td><td></td><td></td></tr></table> | Separation   | Method of separation                |                                     |  |  | Chromatography | Simple distillation | Filtration | Fractional distillation | P red ink from a mixture of coloured inks | <input checked="" type="checkbox"/> |  |  |  | Q ethanol from a mixture of ethanol and water |  |  |  | <input checked="" type="checkbox"/> | R sand from a mixture of sand and water |  |  | <input checked="" type="checkbox"/> |  | S water from copper(II) sulfate solution |  | <input checked="" type="checkbox"/> |  |  |  | <p>1<br/>1<br/>1<br/>1</p> |
| Separation                                    | Method of separation  |  |                                     |                                     |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |
|   | Chromatography  | Simple distillation  | Filtration                          | Fractional distillation             |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |
| P red ink from a mixture of coloured inks     | <input checked="" type="checkbox"/>   |  |                                     |                                     |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |
| Q ethanol from a mixture of ethanol and water |   |  |                                     | <input checked="" type="checkbox"/> |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |
| R sand from a mixture of sand and water       |   |  | <input checked="" type="checkbox"/> |                                     |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |
| S water from copper(II) sulfate solution      |   | <input checked="" type="checkbox"/>  |                                     |                                     |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |
| ii  | R   | Accept (sand from a mixture of) sand and water   | 1                                   |                                     |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |
| b   | <div><div>B</div><div>E</div><div>A</div><div>C</div><div>D</div></div>   | <p>M1 for B in first box AND D in last box</p> <p>M2 for A in box 3 AND C in box 4</p> <p>M2 dependent on M1 correct</p> | <p>1</p> <p>1</p>                   |                                     |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |
|   |   | Total 7 marks  |                                     |                                     |  |  |                |                     |            |                         |   |                                     |  |  |  |   |  |  |  |                                     |   |  |  |                                     |  |  |  |                                     |  |  |  |                            |

| Question number | Answer   | Notes   | Marks |
|-----------------|--|---|-------|
| 3 a             | burns with a pop/squeak<br>OR<br>use burning/lit splint/flame to see if pop/squeak                         | Must be reference to test and result<br>Reference to splint/match with no indication of flame is not enough<br>Ignore flame extinguished<br>Reject reference to glowing splint<br><br>Squeaky pop test on its own is not enough | 1     |
| b i             | anhydrous/white copper sulfate<br><br>turns blue<br>OR<br>anhydrous/blue cobalt chloride<br><br>turns pink | Ignore colourless<br>Accept correct formula<br>Incorrect formula (eg CuSO) counts as near miss<br><br>Accept correct formula<br>Incorrect formula (eg CoCl) counts as near miss<br><br>M2 DEP on M1 or near miss                | 2     |
| ii              | measure boiling point / freezing point   | Accept boil it / freeze it<br>Ignore heat   | 2     |
|                 | 100 (°C) / 0 (°C)  | Value must match property<br>Ignore units   |       |
|                 |  | Answers such as boils/distils at 100 °C<br>/ freezes at 0 °C score M2 only  |       |

| Question number | Answer  | Notes  | Marks |
|-----------------|---|--|-------|
| 3 b iii         | <p>cross by<br/>carbon dioxide from the air reacts to cause the cloudiness<br/>cross by<br/>the cloudiness is caused by the formation of a white precipitate</p> <p><input type="checkbox"/> carbon dioxide forms when the hydrogen burns</p> <p><input checked="" type="checkbox"/> carbon dioxide from the air reacts to cause the cloudiness</p> <p><input type="checkbox"/> the cloudiness is caused by the formation of calcium hydroxide</p> <p><input checked="" type="checkbox"/> the cloudiness is caused by the formation of a white precipitate</p> <p><input type="checkbox"/> the reaction in the limewater is an example of oxidation</p> | <p>If 3 boxes crossed then max 1<br/>If 4 or more boxes crossed then 0</p> | 2     |
| Total 7 marks   |   |  |       |

| Question number | Answer  | Notes   | Marks |
|-----------------|---|---|-------|
| 4 a i           | reactants labelled wrong way round / OWTTE  | Accept manganese(IV) oxide is the solid OR hydrogen peroxide is the liquid<br>Ignore just manganese(IV) oxide/hydrogen peroxide is wrongly labelled | 1     |
|                 | ii bung / cork  | Accept stopper<br>Ignore plug   | 1     |
|                 | iii to prevent oxygen/gas from escaping<br>OR<br>(without a bung), oxygen/gas would escape/could not be collected | Do not penalise wrong gas, such as hydrogen   | 1     |
| b               | use a (gas) syringe   | Accept collect in gas jar by displacement of air in place of syringe  | 1     |
| c               | 2                      2                      (1)   | Accept multiples and fractions  | 1     |



| Question number | Answer   | Notes  | Marks                |
|-----------------|--|--|----------------------|
| 4 d             | (a substance that) increases rate of reaction / speeds up reaction / decreases time of reaction is (chemically) unchanged (at the end)<br>OR<br>mass does not change | Ignore change/decrease in rate<br>Ignore references to element / compound<br>Accept is not used up / does not change<br>Accept reference to lowering activation energy<br>Ignore reference to alternative route<br>Ignore references to yield<br>Ignore reference to not reacting or taking part in reaction<br>Ignore refs to being physically unchanged<br>Ignore references to starting reaction<br>Reject reference to providing/increasing energy for M2<br>Reject reference to incorrect statement such as removes impurities for M2 | 1<br><br>1           |
| e               | (approximately) vertical line between hydrogen peroxide and top of curve<br>AND<br>labelled activation energy / $E_a$  | ignore arrowheads on vertical line   | 1                    |
|                 | curve starting from hydrogen peroxide line and ending at water + oxygen line<br>AND<br>peak below peak of original curve   | Accept near misses, such to and from words<br>Accept curve leaving or joining original curve<br>Do not penalise more than one peak   | 1                    |
|                 |  |  | <b>Total 9 marks</b> |

| Question number      | Answer   | Notes   | Marks |
|----------------------|--|---|-------|
| 5 a                  | i 4  |   | 1     |
|                      | ii B (hydrated)  |   | 1     |
| b                    | i aluminium hydroxide AND sodium sulfate   | Accept in either order<br>Ignore formulae / oxidation numbers                             | 1     |
|                      | ii smothers/blankets the fuel/fire<br>/ sinks onto to fuel/fire  | Accept high density / higher density than<br>air/oxygen<br>Ignore heavier than air/oxygen | 1     |
|                      | (therefore) prevents oxygen/air from reaching<br>the fuel/fire   | Accept does not support combustion<br>Ignore carbon dioxide does not burn                 | 1     |
| c                    | i $\text{Al}(\text{OH})_3$ has (s) / is solid /is insoluble / its ions<br>not free / its ions not released<br>$\text{H}_2\text{SO}_4$ has (aq) / is a solution<br>AND $(\text{H}^+)$ ions are released |   | 1     |
|                      | ii B (5.5)   |   | 1     |
| <b>Total 8 marks</b> |  |   |       |

| Question number      | Answer   | Notes   | Marks       |
|----------------------|--|---|-------------|
| 6 a                  | C (diffusion)  |   | 1           |
| b                    | ammonia (moves more quickly)<br>AND<br>it travels further /white solid is close(r) to the HCl end / further from the NH <sub>3</sub> end | Ignore reference to solution<br>Ignore reverse argument for HCl<br>Ignore references to reacting more quickly                             | 1           |
| c                    | i sodium hydroxide / NaOH<br>ammonia / NH <sub>3</sub><br>blue   | Accept other suitable alkalis<br>Reject ammonium<br>Reject all other colours<br>M3 DEP on M2 or near miss                                 | 1<br>1<br>1 |
|                      | ii to remove carbonate (ions)/sulfite (ions)   | Accept to prevent other ions interfering / to prevent other precipitates from forming<br>Ignore to make sure other reactions do not occur | 1           |
|                      | iii silver nitrate / AgNO <sub>3</sub><br>silver chloride / AgCl   | If both name and formula given, both must be correct  | 1<br>1      |
| <b>Total 8 marks</b> |  |   |             |

| Question number | Answer   | Notes   | Marks |
|-----------------|--|---|-------|
| 7 a             | <p>fractional distillation/fractionating column/tower</p> <p>(crude oil) heated/vaporised / boiled cooler at top/hotter at bottom/idea of temperature gradient</p> <p>fractions condense /separate at different heights/levels</p> <p>fractions have different boiling points/ranges</p> | <p>Reference to fractional / fractionating needed</p> <p>Ignore references to fracking</p><br><p>Accept components / hydrocarbons / compounds / gases</p> <p>Accept separate at different temperatures</p> <p>Ignore references to melting point</p> <p>Any four for 1 mark each</p> <p>If any reference to cracking, MAX 2</p> <p>M1 - M4 can be scored from suitably labelled diagram</p> | 4     |

| Question number | Answer   | Notes   | Marks |
|-----------------|--|---|-------|
| 7 b i           | $C_nH_{2n+2}$  | Do not penalise inappropriate spaces or failure to show 2 and n as subscripts   | 1     |
| ii              | <p>same/similar chemical properties/reactions/behaviour/characteristics</p> <p>gradation / gradual change / trend / increase / decrease of physical properties</p> <p>same functional group (neighbouring) members differ by <math>CH_2</math></p> | <p>Ignore specific examples such as react with oxygen</p> <p>Ignore similar (type of) reactivity</p> <p>Do not penalise reference to trends</p> <p>Accept reference to specific property, eg boiling point</p> <p>Reject same / similar physical properties</p> <p>Ignore variable physical properties</p> <p>Ignore reference to specific group</p> <p>Any two for 1 each</p> <p>Accept two answers on one answer line</p> <p>Ignore any reference to properties not specified as physical or chemical</p> | 2     |
| c               | (1) 5 3 4  | Accept multiples and fractions  | 1     |
| d i             | carbon monoxide / CO   |   | 1     |
| ii              | reduces capacity of blood to carry oxygen / OWTTE  | <p>Accept correct explanation involving haemoglobin</p> <p>Ignore references to carbon monoxide reacting with blood / red blood cells</p>   | 1     |
| iii             | nitrogen/ $N_2$ AND oxygen/ $O_2$  | <p>Accept in either order</p> <p>Ignore N and O</p>   | 1     |

| Question number | Answer   | Notes   | Marks             |
|-----------------|--|---|-------------------|
| 7 e             | <pre>       H H H H H                 H - C - C - C - C - C - H                       H H H H H         H H H H                 H - C - C - C - C - H                       H       H   H                 H - C - H                       H </pre> | <p>Penalise missing H atoms once only provided all bonds are correctly shown</p> <p>Penalise missing bonds in both structures</p> | <p>1</p> <p>1</p> |

| Question number       | Answer  | Notes  | Marks                      |
|-----------------------|---|--|----------------------------|
| 7 f i                 | <p>setting out correct division of each % by <math>A_r</math><br/>OR<br/>4.4, 11.1 and 1.1</p> <p>division by smallest /ratio of 4 : 10 : 1<br/><math>C_4H_{10}S_{(1)}</math></p> | <p>Award 0/3 if division by any atomic numbers / wrong way up / multiplication used / wrong atomic mass (eg 16 for C)<br/>Do not penalise roundings and minor misreads of % values, eg 11 for H and 36.5 for S<br/>If molecular mass used for H, no M1, but can award M2 and M3<br/>but no CQ in ii<br/>Using 2 for H gives <math>C_4H_5S</math><br/>Working required for this answer<br/>M2 subsumes M1<br/>Accept elements in any order<br/>Award 3 for correct final answer with no working<br/>No ECF from M2<br/>Accept use of 90 from ii,<br/>i.e. <math>90 \times 0.533 = 48</math> etc scores M1<br/>ratio scores M2, answer scores M3</p> | <p>1</p> <p>1</p> <p>1</p> |
| ii                    | $C_4H_{10}S_{(1)}$  | <p>Accept elements in any order<br/>No other answer acceptable</p>   | 1                          |
| <b>Total 17 marks</b> |   |  |                            |

| Question number | Answer  | Notes  | Marks |
|-----------------|---|--|-------|
| 8 a             | hydrogen / H <sub>2</sub>   | Ignore H   | 1     |
| b               | <u>only</u> single bonds (between carbon atoms)<br>/single bond(s) between carbon atoms   | ignore between C and H<br>Accept no double bond(s) / no multiple bond(s)<br>Ignore answers that refer to numbers of hydrogens  | 1     |
| c i             | $  \begin{array}{c}  \text{H} \quad \text{H} \\    \quad   \\  \text{Br}-\text{C}-\text{C}-\text{Br} \\    \quad   \\  \text{H} \quad \text{H}  \end{array}  $  | Accept Br atoms in any position provided one on each carbon  | 1     |
| ii              | C (the product of the reaction is colourless)   |  | 1     |
| d               | $  \begin{array}{cccc}  \text{H} & \text{CH}_3 & \text{H} & \text{H} \\    &   &   &   \\  \cdots & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & \cdots \\    &   &   &   \\  \text{H} & \text{H} & \text{H} & \text{CH}_3  \end{array}  $ | M1 for 4 × C AND 6 × H and 2 × CH <sub>3</sub><br>M2 for extension bonds and two CH <sub>3</sub> groups on alternate carbon atoms (can be both above or both below carbon chain)<br>M2 DEP on M1<br>Do not penalise bonds to H of CH <sub>3</sub><br>Ignore brackets and subscripted n<br>If any double bond shown, then 0/2 | 2     |
| e               | $  \begin{array}{c}  \text{F} \quad \quad \text{F} \\  \diagdown \quad \diagup \\  \text{C} = \text{C} \\  \diagup \quad \diagdown \\  \text{F} \quad \quad \text{F}  \end{array}  $  | Reject any extension bonds<br>Ignore bond angles<br>Do not penalise more than one correct structure  | 1     |



| Question number       | Answer                                      | Notes   | Marks |
|-----------------------|---|---|-------|
| 8 f i                 | (polymer) breaks down / decomposes / decays | Do not penalise compound / object / molecule / substance in place of polymer<br>Reject element in place of polymer<br>Ignore rots / degrades / digests / disintegrate<br>If reference to <u>not</u> breaking down etc, only M2 can be awarded<br>Ignore naturally / enzymes | 1     |
|                       | by bacteria / microbes / microorganisms     |   | 1     |
| ii                    | inert / unreactive / OWTTE                  | Ignore do not react with named chemical<br>Ignore references to bond strengths / bond breaking  | 1     |
| <b>Total 10 marks</b> |   |   |       |

| Question number      | Answer   | Notes   | Marks                  |
|----------------------|--|---|------------------------|
| 9 a                  | C (lithium reacts with water to form an alkali)  |   | 1                      |
| b                    | A (have the same number of outer shell electrons)  |   | 1                      |
| c                    | (similar)<br>bubbles / fizzing / effervescence<br>OR<br>moves / darts / floats<br>OR<br>gets smaller / disappears<br>potassium shows a flame / sparks / explodes<br>OR<br>potassium melts / forms ball | Accept gas given off<br>/evolved/formed/produced<br>Accept hydrogen <u>gas</u><br>Ignore identity of gas<br><br>Accept dissolves<br>Accept reverse arguments for lithium              | 1<br><br><br><br><br>1 |
| d                    | K <sub>2</sub> O<br><br>KCl  | Accept K <sub>2</sub> O <sub>2</sub> and KO <sub>2</sub><br>Reject KO<br><br>If formula shown as <u>product</u> of an equation, ignore reactants and balancing<br>Ignore coefficients | 1<br><br>1             |
| e                    | s      l      aq      g  |   | 1                      |
| f                    | 85 AND 87 calculated (even if not identified)<br>(85 × 0.72) + (87 × 0.28) = 85.6  | Accept 37+48 and 37+50<br>Correct final answer = 2 marks<br>85.5 or 85.56 = 1 mark<br>No ECF from incorrect mass numbers<br>Ignore units  | 1<br>1                 |
| <b>Total 9 marks</b> |  |   |                        |

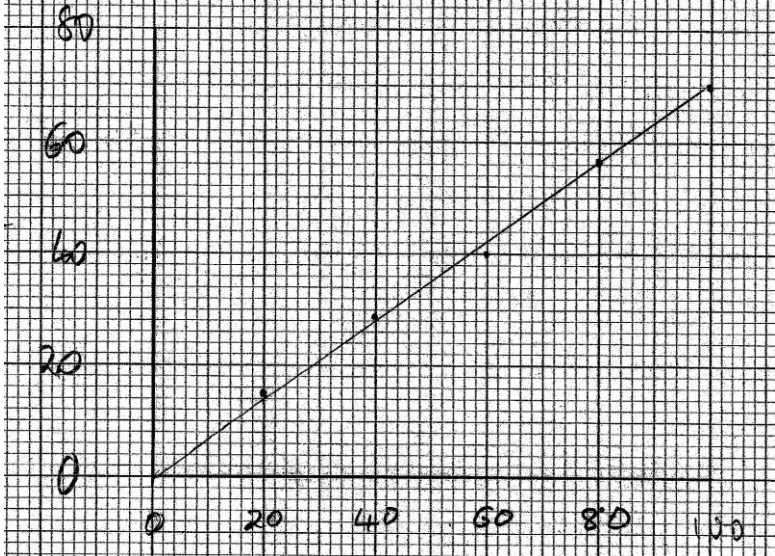
| Question number | Answer  | Notes   | Marks             |
|-----------------|---|---|-------------------|
| 10 a            | <p>mix / add / react (the two) solutions / salts together</p> <p>stir</p> <p>filter</p> <p>wash (with water)</p> <p>suitable method of drying</p> <p>identifying two suitable pieces of apparatus</p> | <p>Ignore references to volumes</p> <p>Accept swirl</p> <p>Accept description of filtration</p> <p>eg warm / heat / place in oven / leave on window ledge / leave to dry / dry with filter paper or kitchen towel</p> <p>Not just dry</p> <p>Any four above for 1 mark each</p> <p>If M3 not scored then M4 and M5 cannot be awarded</p> <p>If description of evaporation of solution, then M4 and M5 cannot be awarded</p> <p>Any two of</p> <ul style="list-style-type: none"> <li>• beaker / flask / test tube (for mixing)</li> <li>• (glass) rod (for stirring)</li> <li>• (filter) funnel/paper (for separation)</li> </ul> <p>Reference to filter paper or filter funnel scores M3 and counts as one of M6</p> <p>If any other substance added, then MAX 4</p> | <p>4</p> <p>1</p> |

| Question number | Answer   | Notes  | Marks                |
|-----------------|--|--|----------------------|
| 10 b i          | B (the products are both elements)   |  | 1                    |
| ii              | electrons on wrong side / should be on right<br>/should be $- 2e^-$<br>2Br should be Br <sub>2</sub> | Accept + in front of electrons (should be —)<br><br>Accept product is shown as a bromine atom<br>/ should be shown as a bromine molecule<br>Equation correctly rewritten scores both marks | 1<br><br>1           |
| iii             | ions stop moving / ions not free to move<br>OR<br>electrons stop moving (through wires)              | Ignore liquid becomes solid / no free ions<br><br>Accept electric current in place of electrons<br>Reject implication that electrons stop flowing through liquid                           | 1                    |
|                 |  |  | <b>Total 9 marks</b> |

| Question number | Answer  | Notes  | Marks       |
|-----------------|---|--|-------------|
| 11 a            | i pipette                                       |  | 1           |
|                 | ii pink   | Ignore purple  | 1           |
|                 | colourless                                      | Accept red<br>Ignore clear<br>Ignore white<br>Award 1 mark for both colours correct in wrong order   | 1           |
| b               | (after) 23.15<br>(before) 1.40<br>(added) 21.75 | CQ on before and after readings<br>Award 1 mark for both readings correct but in wrong order<br>All values must be to 2 dp<br>Penalise answers to other than 2 dp once only  | 1<br>1<br>1 |
| c               | i ticks in columns 3 and 4                      |  | 1           |
|                 | ii $\frac{21.10 + 21.20}{2}$<br><br>21.15       | CQ on any combination of ticked results<br>If no results ticked, award M1 if only columns 3 and 4 averaged<br>If only 1 result ticked, then no marks can be awarded in (c)<br>CQ on results averaged - see separate table<br>Answer should be to 2 dp, except that trailing zero not needed<br>Correct final answer without working scores 2 | 1<br><br>1  |

| Question number | Answer  | Notes   | Marks                 |
|-----------------|---|---|-----------------------|
| 11 d i          | $0.300 \times \frac{200}{1000}$<br>0.06(00) (mol) | Correct final answer scores 2 marks<br>60 scores 1 mark in di<br>No marks for answers such as 0.6 / 6 / 600     | 1<br>1                |
| clip<br>ii      | di ÷ 2 / 0.03(00) (mol)                           |   | 1                     |
| clip<br>iii     | $M_r = 98$<br>2.94 (g)                            | Award 1 mark for 98 anywhere in iii<br>ECF from incorrect $M_r$<br>Moles CQ on ii<br>Must be 2 or more sig figs | 1<br>1                |
|                 |   |   | <b>Total 14 marks</b> |

| Question number | Answer   | Notes  | Marks  |
|-----------------|--|--|--------|
| 12 a            | mass / amount  | Accept weight  | 1      |
|                 | surface area / size / volume   | Ignore number of marble chips<br>Ignore length / width / height / thickness / shape / type<br>Ignore temperature / purity / density      | 1      |
| b               | gas/carbon dioxide escapes / OWTTE   | Ignore references to solid dissolving<br>Ignore references to acid spray / vapour<br>Do not penalise incorrectly named gas (eg hydrogen) | 1      |
| c               | prevents loss of acid (spray)/liquid   | Ignore references to evaporation / water vapour / spilling of liquid<br>Reject references to stopping gases/marble chips escaping        | 1      |
| d i             | 210 (s)<br>some indication of mark on curve<br>OR<br>vertical line from 50% / horizontal line from 210 s | Mark M1 and M2 independently   | 1      |
|                 | ii B (the loss of mass was greater than 1.0g)  |  | 1      |
| e               | $1 \div 210$<br>evaluation of M1 / 0.00476   | Accept any time value in range 200 - 210<br>Accept answer in range 0.004- 0.005<br>Accept any number of sig fig                          | 1<br>1 |

| Question number | Answer   | Notes  | Marks             |
|-----------------|--|--|-------------------|
| 12 f            |  <p>all five points plotted to nearest gridline</p> <p>straight line of best fit</p> | <p>Deduct 1 mark for each error up to max 2</p> <p>Line need not be extrapolated to origin</p> <p>If line not extrapolated, it should go to the origin if extrapolated</p> <p>Must be drawn with a ruler</p> <p>CQ on candidate's plotted points</p> | <p>2</p> <p>1</p> |



| Question number | Answer                                      | Notes   | Marks                 |
|-----------------|---|---|-----------------------|
| 12 g            | more particles (in a given volume)          | Accept ions<br>Reject atoms / molecules<br>Accept quantitative answer such as twice as many particles when concentration doubles  | 1                     |
|                 | more collisions (between particles) / OWTTE |   | 1                     |
|                 | per unit time / OWTTE                       | more frequent collisions scores M2 and M3<br>Ignore greater chance/likelihood of collisions<br>Accept reverse argument if clear that decreasing concentration is being considered<br>MAX 1 if any reference to particles moving faster / having more energy | 1                     |
|                 |   |   | <b>Total 15 marks</b> |

