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# Mark Schemes Summer 2009

IGCSE

# IGCSE Chemistry (4335)

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Summer 2009

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# IGCSE CHEMISTRY 4335-1F MARK SCHEME

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **1** | **a** | | M1 | 7 | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **1** | **b** | | M1 | B / boron | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **1** | **c** | | M1 | protons and neutrons | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **1** | **d** | | M1 | 10 | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **1** | **e** | | M1 | Po / polonium AND At / astatine | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **2** | **a** | | M1 | white / off white | | **1** |
| | | | M2 | blue | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **2** | **b** | | M1 | exothermic | | **1** |
| | | | M2 | hydration | Accept "exothermic" if neither "exothermic" nor "endothermic" for M1 | **1** |
| | | | M3 | endothermic | If M1 = endothermic, then M3 must be exothermic.<br>If M2 = dehydration, then M4 must be hydration<br>M3 and M4 can be in reverse order | **1** |
| | | | M4 | dehydration | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **3** | **a** | | M1 | nitrogen | M1 and M2 pair can be interchanged with M3 and M4 pair | **1** |
| | | | M2 | Air / atmosphere | | **1** |
| | | | M3 | hydrogen | | **1** |
| | | | M4 | water /steam / $H_2O$ / hydrocarbons / natural gas / crude oil / cracking of naphtha / methane | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **3** | **b** | | M1 | range 100 – 350 atm / value within that range | Allow equivalent pressures in other units<br>Unit needed for mark | **1** |
| | | | M2 | range 350 – 500 °C / value within that range | Allow 623 – 773 K<br>Unit needed for mark | **1** |
| | | | | | If no units in M1 and M2, award 1 mark if both within specified ranges. | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **3** | **c** | | M1<br>M2 | nitric acid<br>ammonium nitrate<br>ammonium sulphate<br>urea<br>ammonium phosphate | Any two for 1 each | **2** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **4** | **a** | **i** | M1 | halogen(s) | Reject halide(s) | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **4** | **a** | **ii** | M1 | iodine / astatine | Reject iodide and astatide | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **4** | **a** | **iii** | M1 | g | | **1** |
| | | | M2 | turns white / bleached / decolourised | Ignore references to red | **1** |
| | | | M3 | colourless | Allow misty (fumes)<br>Reject white | **1** |
| | | | M4 | turns red / pink | | **1** |
| | | | M5 | colourless | Ignore clear | **1** |
| | | | M6 | aq | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **4** | **b** | **i** | M1 | chlorine + sodium bromide → bromine + sodium chloride | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **4** | **b** | **ii** | M1 | displacement / redox / reduction / oxidation | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **4** | **c** | | M1 | bromine less reactive than chlorine /<br>chlorine more reactive than bromine /<br>bromine is a poorer/weaker oxidising agent than chlorine /<br>chlorine is a | Need reference to both elements<br>Reject bromide and chloride | **1** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | stronger/better/more powerful oxidising agent than bromine | | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **a** | **i** | M1 | evaporates | | **1** |
| | | **ii** | M1 | condenses | | **1** |
| | | **iii** | M1 | lower | | **1** |
| | | **iv** | M1 | lower | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **b** | | M1 | gasoline / petrol / petroleum spirit | | **1** |
| | | | M2 | diesel (oil) | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **c** | | M1 | octane + oxygen → carbon dioxide + water | reactants | **1** |
| | | | M2 | | products | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **d** | | M1 | carbon monoxide / CO | | **1** |
| | | | M2 | correct statement about effect on blood / haemoglobin | Ignore suffocation / asphyxiation<br>Not dependent on M1 | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **a** | **i** | M1 | Li | | **1** |
| | | | M2 | $F_2$ | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **a** | **ii** | M1 | $Li^+$ | | **1** |
| | | | M2 | $F^-$ | Accept "Fl" as symbol if Fl used in a(i) | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **b** | | M1 | 2 dots on inner circle | Reject if any other dots shown | **1** |
| | | | M2 | 2 crosses on inner circle AND 7 crosses AND 1 dot on outer circle | Reject if any other dots or crosses shown | **1** |
| | | | | | Electrons do not have to be paired | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **c** | | M1 | fluorine because of electron gain | Accept decrease in oxidation number | **1** |
| | | | M2 | lithium because of electron loss | Accept increase in oxidation number | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **7** | **a** | | M1 | $KOH + HCl \rightarrow KCl + H_2O$ | reactants | **1** |
| | | | M2 | | Products | **1** |
| | | | | | Additional incorrect balancing max 1 | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **7** | **b** | | M1 | lilac | Reject pink / purple | **1** |
| | | | M2 | yellow / orange | Reject any other colours | **1** |
| | | | M3 | Cream/off white precipitate | | **1** |
| | | | M4 | silver bromide /AgBr | | **1** |
| | | | M5 | sodium nitrate / $NaNO_3$ | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **8** | | | M1 | zinc | | **1** |
| | | | M2 | more reactive (than iron) | Accept higher in reactivity series / very reactive / more reactive than metal underneath / reacts with air or water in preference to iron<br>Reject rusts | **1** |
| | | | M3 | aluminium / duralumin / titanium | | **1** |
| | | | M4 | low density | Ignore light / strong / malleable | **1** |
| | | | M5 | copper | | **1** |
| | | | M6 | (good electrical) conductor | Ignore ductile / conductor of heat | **1** |
| | | | M7 | iron / steel | Reject stainless steel / cast iron | **1** |
| | | | M8 | strong | Accept hard / tough / durable<br>Ignore malleable | **1** |
| | | | | | **4,6,8 dependent on M1,3,5,7**<br>**ainless steel given in M7, M8 ca**<br>**red** | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **a** | | M1 | Fr / francium | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **b** | | M1 | NaF | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **c** | | M1 | cross in 2nd box | If crosses in more than 3 boxes, then deduct 1 mark for each wrong choice | **1** |
| | | | M2 | cross in 5th box | | **1** |
| | | | M3 | cross in last box | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **d** | | M1 | more reactive down the group / less reactive up the group | Allow easier to react instead of more reactive<br>Allow harder to react instead of less reactive<br>Allow specific example, eg xenon more reactive than argon | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **a** | | M1 | carbon and hydrogen (atoms) | Accept hydrocarbons described as compounds / molecules / substances<br>Reject hydrocarbons described as elements<br>Reject carbon and hydrogen described as molecules / compounds | **1** |
| | | | M2 | only | Dependent on M1 containing carbon and hydrogen | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **b** | | M1 | only single bonds / no double bonds (between carbon atoms) | If single bonds alternative chosen, then must contain only / solely / alone or equivalent | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **c** | | M1 | alkane(s) | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **d** | | M1 | two carbon atoms joined together by single bond | | **1** |
| | | | M2 | rest of structure correct | Must show 6 single bonds to H atoms<br>**dependent on M1** | **1** |
| | | | | | Ignore names, non-displayed and general formulae | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **e** | **i** | M1 | $C_4H_{10}$ | Allow $H_{10}C_4$ | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **10** | **e** | **ii** | M1 | isomers | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **f** | | M1 | repeat unit showing single C–C bond and four C–H bonds | Accept one or any multiples, eg four carbon atoms | **1** |
| | | | M2 | extension bonds and subscript n | Accept extension bonds as – or --<br>Balancing for n must be correct CQ on M1 | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **g** | **i** | M1 | condensation | Accept addition-elimination / polyamide<br>Reject addition | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **g** | **ii** | M1 | cross in 3rd box | If crosses in more than 2 boxes, then deduct 1 mark for each wrong choice | **1** |
| | | | M2 | cross in 4th box | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **11** | **a** | | M1 | all green / green at bottom / green spreads out / water is green | ~~re cloudy~~ | **1** |
| | | | M2 | crystals smaller/disappeared ' break up / disintegrate | Ignore dissolved | **1** |
| | | | | | **ct bubbles**<br>Ignore water level drops | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| **C** | | | | | | |
| **11** | **b** | | M1 | diffusion | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **11** | **c** | | M1 | colour spreads faster / more spread out / more is green<br>/ crystals dissolve faster / diffusion is faster | ~~ct mention of reaction~~ | **1** |
| | | | M2 | particles/ions/molecules move faster/more energy | Ignore collisions | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **11** | **d** | | M1 | (add) sodium hydroxide (solution) | Accept other Group 1 hydroxide, eg potassium hydroxide<br>Accept calcium hydroxide (solid) but not limewater | **1** |
| | | | M2 | (test gas evolved with damp) red litmus paper | Allow UI or neutral litmus instead of red litmus | **1** |
| | | | M3 | turns blue | Accept purple only if UI used<br>Accept pH > 7 or specified > 7 only if UI used<br>If definite statement that the indicator is put into solution then M3 cannot be scored | **1** |
| | | | | | M2 and M3 independent of M1 | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **12** | **a** | | M1 | gain of oxygen / increase in oxidation number / loss of electrons | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **12** | **b** | **i** | M1 | $SO_2 + H_2O \rightarrow H_2SO_3$ | Accept multiples | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **12** | **b** | **ii** | M1 | hydrogen (ion) /(hydr)oxonium (ion)/ $H^+$ / proton / $H_3O^+$ | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **12** | **b** | **iii** | M1 | named indicator<br>OR named metal carbonate or hydrogencarbonate<br>OR named metal between Mg and H in reactivity series | Reject phenolphthalein / red litmus<br>Accept limestone / marble (chips) | **1** |
| | | | M2 | correct final colour of indicator<br>OR effervescence / fizzing / bubbles | If UI, accept red/orange/yellow<br>Ignore gas given off<br>If no effervescence/fizzing/bubbles, then allow correct gas test (ie gas pops with burning splint or limewater turns milky, CQ on compound named in M1 | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **12** | **c** | | M1 | increases / gets heavier | | **1** |
| | | | M2 | copper formed/sticks to it / copper plates | Must be copper, not copper ions<br>M2 independent of M1 unless contradictory | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **12** | **d** | **i** | M1 | less reactive (than magnesium) / below magnesium in reactivity series | Reject less reactive than magnesium ions<br>Reject copper ions less reactive<br>Allow magnesium more reactive/higher in reactivity series (than copper) | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **12** | **d** | **ii** | M1 | blue | Ignore dark / pale | **1** |
| | | | M2 | colourless / pale(r) blue | Ignore clear<br>If pale blue in M1, then M2 must be colourless or paler blue | **1** |
| | | | | | Ignore bubbles<br>If precipitate mentioned, then MAX 1 | |

**PAPER TOTAL 100 MARKS**

## IGCSE CHEMISTRY 4335-2H MARK SCHEME

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **1** | | | M1 | zinc | | **1** |
| | | | M2 | more reactive (than iron) | Accept higher in reactivity series / very reactive / more reactive than metal underneath / reacts with air or water in preference to iron<br>Reject rusts | **1** |
| | | | M3 | aluminium / duralumin / titanium | | **1** |
| | | | M4 | low density | Ignore light / strong / malleable | **1** |
| | | | M5 | copper | | **1** |
| | | | M6 | (good electrical) conductor | Ignore ductile / conductor of heat | **1** |
| | | | M7 | iron / steel | Reject stainless steel / cast iron | **1** |
| | | | M8 | strong | Accept hard / tough / durable<br>Ignore malleable | **1** |
| | | | | | **4,6,8 dependent on M1,3,5,7**<br>**ainless steel given in M7, M8**<br>**red** | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **2** | **a** | | M1 | Fr / francium | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **2** | **b** | | M1 | NaF | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **2** | **c** | | M1 | cross in 2nd box | If crosses in more than 3 boxes, then deduct 1 mark for each wrong choice | **1** |
| | | | M2 | cross in 5th box | | **1** |
| | | | M3 | cross in last box | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **2** | **d** | | M1 | more reactive down the group / less reactive up the group | Allow easier to react instead of more reactive<br>Allow harder to react instead of less reactive<br>Allow specific example, eg xenon more reactive than argon | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | a | | M1 | carbon and hydrogen (atoms) | Accept hydrocarbons described as compounds / molecules / substances<br>Reject hydrocarbons described as elements<br>Reject carbon and hydrogen described as molecules / compounds | 1 |
| | | | M2 | only | Dependent on M1 containing carbon and hydrogen | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | b | | M1 | only single bonds / no double bonds (between carbon atoms) | If single bonds alternative chosen, then must contain only / solely / alone or equivalent | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | c | | M1 | alkane(s) | | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | d | | M1 | two carbon atoms joined together by single bond | | 1 |
| | | | M2 | rest of structure correct | Must show 6 single bonds to H atoms<br>**dependent on M1** | 1 |
| | | | | | Ignore names, non-displayed and general formulae | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | e | i | M1 | $C_4H_{10}$ | Allow $H_{10}C_4$ | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **3** | **e** | **ii** | M1 | isomers | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| **3** | **f** | | M1 | repeat unit showing single C–C bond and four C–H bonds | Accept one or any multiples, eg four carbon atoms | **1** |
| | | | M2 | extension bonds and subscript n | Accept extension bonds as – or --<br>Balancing for n must be correct CQ on M1 | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| **3** | **g** | **i** | M1 | condensation | Accept addition-elimination / polyamide<br>Reject addition | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| **3** | **g** | **ii** | M1 | cross in 3rd box | If crosses in more than 2 boxes, then deduct 1 mark for each wrong choice | **1** |
| | | | M2 | cross in 4th box | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **4** | **a** | | M1 | all green / green at bottom / green spreads out / water is green | ~~re cloudy~~ | **1** |
| | | | M2 | crystals smaller/disappeared ' break up / disintegrate | Ignore dissolved | **1** |
| | | | | | **ct bubbles**<br>Ignore water level drops | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| **C** | | | | | | |
| **4** | **b** | | M1 | diffusion | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **4** | **c** | | M1 | colour spreads faster / more spread out / more is green<br>/ crystals dissolve faster / diffusion is faster | ~~ct mention of reaction~~ | **1** |
| | | | M2 | particles/ions/molecules move faster/more energy | Ignore collisions | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **4** | **d** | | M1 | (add) sodium hydroxide (solution) | Accept other Group 1 hydroxide, eg potassium hydroxide<br>Accept calcium hydroxide (solid) but not limewater | **1** |
| | | | M2 | (test gas evolved with damp) red litmus paper | Allow UI or neutral litmus instead of red litmus | **1** |
| | | | M3 | turns blue | Accept purple only if UI used<br>Accept pH > 7 or specified 7 only if UI used<br>If definite statement that the indicator is put into solution then M3 cannot be scored | **1** |
| | | | | | M2 and M3 independent of M1 | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **a** | | M1 | gain of oxygen / increase in oxidation number / loss of electrons | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **b** | **i** | M1 | $SO_2 + H_2O \rightarrow H_2SO_3$ | Accept multiples | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **b** | **ii** | M1 | hydrogen (ion) /(hydr)oxonium (ion)/ $H^+$ / proton / $H_3O^+$ | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **b** | **iii** | M1 | named indicator<br>OR named metal carbonate or hydrogencarbonate<br>OR named metal between Mg and H in reactivity series | Reject phenolphthalein / red litmus<br>Accept limestone / marble (chips) | **1** |
| | | | M2 | correct final colour of indicator<br>OR effervescence / fizzing / bubbles | If UI, accept red/orange/yellow<br>Ignore gas given off<br>If no effervescence/fizzing/bubbles, then allow correct gas test (ie gas pops with burning splint or limewater turns milky, CQ on compound named in M1 | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **c** | | M1 | increases / gets heavier | | **1** |
| | | | M2 | copper formed/sticks to it / copper plates | Must be copper, not copper ions<br>M2 independent of M1 unless contradictory | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **d** | **i** | M1 | less reactive (than magnesium) / below magnesium in reactivity series | Reject less reactive than magnesium ions<br>Reject copper ions less reactive | **1** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Allow magnesium more reactive/higher in reactivity series (than copper) | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **5** | **d** | **ii** | M1 | blue | Ignore dark / pale | **1** |
| | | | M2 | colourless / pale(r) blue | Ignore clear<br>If pale blue in M1, then M2 must be colourless or paler blue | **1** |
| | | | | | Ignore bubbles<br>If precipitate mentioned, then MAX 1 | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **a** | | M1 | $C_nH_{2n}$ | Accept $H_{2n}C_n$<br>Accept other letters such as x | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **b** | | M1 | H H<br>\ /<br>C == C<br>/ \<br>H H | Ignore bond angles<br>Ignore names and molecular formulae | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **c** | | M1 | yellow / orange | Ignore brown<br>Reject red and any other colours | **1** |
| | | | M2 | colourless / decolorised | Ignore clear | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **d** | **i** | M1 | water / steam / $H_2O$ | | **1** |
| | | | M2 | phosphoric acid | **ore dilute / concentrated** | **1** |
| | | | M3 | high temperature / 200 – 400 °C /high pressure / 60 – 70 atm | Do not apply list principle | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **d** | **ii** | M1 | oxidation / reduction / redox | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **6** | **d** | **iii** | M1 | $CH_3COOCH_2CH_3$ / $CH_3COOC_2H_5$ / more detailed formula | Ignore $H_2O$<br>Accept $CH_3CO_2CH_2CH_3$ | **1** |
| | | | M2 | ester | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 7 | a | i | M1 | air | Accept atmosphere | 1 |
| | | | M2 | water /steam / $H_2O$ / natural gas / hydrocarbons / crude oil | Accept naphtha<br>Reject sea water<br>Ignore methane | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 7 | a | ii | M1 | $N_2 + 3H_2 \rightleftharpoons 2NH_3$ | all species correct | 1 |
| | | | M2 | | balancing<br>Accept multiples<br>Accept $\rightarrow$ instead of $\rightleftharpoons$<br>**dependent on M1**<br>Ignore state symbols | 1 |
| | | | | | If all species correct but either or both of + and $\rightleftharpoons$ missing than award M1 but not M2 | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 7 | b | | M1<br>M2<br>M3 | increased decreased<br>increased | Allow other words with similar meanings | 3 |
| | | | M4<br>M5 | decreased decreased | Allow other words with similar meanings | 2 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 7 | c | i | M1 | cooled / temperature decreased | **~~re compressed~~** | 1 |
| | | | M2 | liquefied / condensed / becomes a liquid | Reject liquidised<br>**re references to melting an**<br>**ts / fractional distillation** | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **7** | **c** | **ii** | M1 | recycled / recirculated / put back into reactor | **re used again** | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **7** | **d** | **i** | M1 | ammonium sulphate | | **1** |
| | | | M2 | $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$ | formula of ammonium sulphate | **1** |
| | | | M3 | | everything correct<br>Ignore state symbols<br>M3 dep on M2 | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **7** | **d** | **ii** | M1 | neutralisation / proton transfer / acid-base | Accept exothermic | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **8** | **a** | | M1 | exothermic | | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **8** | **b** | | M1 | shared electron(s) (between atoms) | Reject between molecules | **1** |
| | | | M2 | two/pair (of electrons) / attracted to nuclei (of atoms) | **dependent on M1** | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **8** | **c** | | M1 | weak forces between molecules / intermolecular forces | Accept correctly intermolecular forces (ie Waals' forces / temporarily dipole-dipole attractions / forces / dispersion forces<br>Reject bonds between atoms / bonds breaking | **1** |
| | | | M2 | little energy needed to overcome | M2 dependent on M1 | **1** |
| | | | | | If neither M1 nor M2 scored, allow 1 mark for boiling point lower than room temperature/lower than 30 °C | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **8** | **d** | | M1 | dot-and-cross pair between O and both H atoms | Allow any combinations of dots and crosses | **1** |
| | | | M2 | four other electrons around O<br>AND no more electrons around H | Ignore inner shell of oxygen<br>Element symbols not needed, but if wrong then no marks<br>**-bonding electrons do not h**<br>**aired**<br>M2 dependent on M1 | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **8** | **e** | | M1 | (bonds broken) 1368 / (2 × 436) | | **1** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | + 496 | | |
| | | | M2 | (bonds formed) 1852 / 4 × 463 | | **1** |
| | | | M3 | –484 (kJ/mol or kJ) | Correct final answer scores 3 marks<br>484 or +484 scores 2 marks<br>Ignore units<br>M3 CQ on (M1 – M2) | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **8** | **f** | | M1 | reactants/(2)$H_2$ + $O_2$ shown above $2H_2O$ | ~~**e symbols not needed**~~<br>Ignore curves, vertical lines, Δ*H* data | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **8** | **g** | | M1 | decreases / slower | | **1** |
| | | | M2 | decreases / closer | ~~**ept more tightly packed**~~ | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **8** | **h** | | M1 | $CuSO_4(s) + 5H_2O(l) \rightarrow CuSO_4.5H_2O(s)$ | $CuSO_4$ AND $CuSO_4.5H_2O$ both correct | **1** |
| | | | M2 | | $H_2O$ AND consequentially correct balancing<br>Accept $\rightleftharpoons$ in place of $\rightarrow$ | **1** |
| | | | M3 | | All state symbols correct, dependent on correct formulae (including $CuSO_4.2H_2O$ etc) | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **a** | | M1 | atoms of same element/with same atomic number /with same number of protons | Do not award M1 if no mention of atoms<br>**ore same number of electron**<br>Reject different number of electrons<br>**ect compounds / molecules** | **1** |
| | | | M2 | different mass numbers / different numbers of neutrons | same mass number / atomic mass as contradiction of M2 | **1** |
| | | | | | Accept amount / quantity in place of number | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **b** | **i** | M1<br>M2<br>M3 | 29 34<br>29 65 | M1 is for BOTH 29 values<br>M2 is for 34<br>M3 is for 65 | **1**<br>**1**<br>**1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **b** | **ii** | M1 | $\frac{(63 \times 69) + (65 \times 31)}{100}$<br>OR<br>$(63 \times 0.69) + (65 \times 0.31)$<br>OR<br>43.47 + 20.15 | | **1** |
| | | | M2 | 63.6 | CQ from their table values<br>Ignore units<br>Correct final answer to 1 dp scores 2 marks<br>Correct final answer to wrong number of dp scores 1 mark (63.62) | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **c** | | M1 | carbon / C | | **1** |
| | | | M2 | 12 | **ore position of 12** | **1** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Ignore (relative) atomic mass | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **d** | | M1 | same number of (outer) electrons / isoelectronic / same electronic configuration | Ignore reference to same number of protons<br>**not award mark if no reference**<br>**nber/amount/quantity etc** | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **e** | | M1<br>M2 | variable valency/oxidation state<br>~~form~~ coloured (compounds/solutions)<br>~~form~~ complexes / complex ions<br>~~act as~~ catalysts | Accept more than one combining power / differently charged ions / $Cu^{+}$ and $Cu^{2+}$<br>Any two for 1 mark each | **2** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **f** | **i** | M1 | (from) green | Ignore dark / pale | **1** |
| | | | M2 | (to) black | Reject any other colour<br>A single correct colour with no indication of whether it is the starting or final colour does not score either M1 or M2 | **1** |
| | | | M3 | $CuCO_3(s) \rightarrow CuO(s) + CO_2(g)$ | reactants AND products AND correct balancing<br>Accept multiples | **1** |
| | | | M4 | | all state symbols correct<br>**dependent on correct formula** | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **f** | **ii** | M1 | $CuO + 2HCl \rightarrow CuCl_2 + H_2O$ | reactants | **1** |
| | | | M2 | | products | **1** |
| | | | M3 | | balancing<br>**dependent on M1 and M2** | **1** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | **ore state symbols** | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **9** | **g** | | M1 | $Cu_2O$ | **ore names** | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **a** | | M1 | filter / centrifuge and decant | Accept allow (precipitate) to settle and pour off water | **1** |
| | | | M2 | wash / rinse | | **1** |
| | | | M3 | warm / heat / leave to dry/to evaporate/in warm place | Accept mention of drying with filter paper / Bunsen burner / hairdryer / oven | **1** |
| | | | | | M2 and M3 dependent on attempt at M1 | |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **b** | **i** | M1 | 5.55 ÷ 111 | | **1** |
| | | | M2 | 0.05 | **ore units**<br>Correct answer scores both marks | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **b** | **ii** | M1 | 0.05 / answer to (b)(i) | **ore units** | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **b** | **iii** | M1 | 136 | **ore units** | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **b** | **iv** | M1 | 0.05 × 136 / answer to (b)(ii) x answer to b(iii) | | **1** |
| | | | M2 | 6.8 | Correct answer CQ on (b)(ii) and b(iii) scores both marks<br>If (b)(ii) incorrect, accept 6.8 if evidence of using mass ratios<br>Ignore units | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **c** | **i** | M1 | 0.04(00) ÷ 0.5 | | **1** |
| | | | M2 | 0.08 $dm^3$ | M2 dep on correct method for M1 (eg 0.4÷0.5 = 0.8 $dm^3$ scores M2 but not M1)<br>Answer of 0.08 $dm^3$ scores M1 and M2 | **1** |
| | | | M3 | 80 ($cm^3$) | Unit not needed<br>M3 CQ on M2<br>Correct final answer scores 3 marks | **1** |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| **10** | **c** | **ii** | M1 | (0.02 × 24000 =) 480 ($cm^3$) | | **1** |

**PAPER TOTAL 120 MARKS**

| Question | | | Mark | **Acceptable answers** | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 1 | a | | M1 | thermometer | | 1 |
| | | | M2 | condenser | | 1 |
| | | | M3 | round bottom flask | | 1 |
| | | | M4 | Bunsen (burner) | | 1 |
| | | | M5 | tripod | | 1 |

| Question | | | Mark | **Acceptable answers** | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 1 | b | | M1 | thermometer / A | | 1 |

| Question | | | Mark | **Acceptable answers** | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 1 | c | | M1 | cross in first box | | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 2 | a | | M1 | base line in ink/not in pencil | | 1 |
| | | | M2 | will interfere with results/run / smudge / will produce different colours / will move up paper/dissolve/mixed up with samples | Dependent on M1 | 1 |
| | | | M3 | water level too high / water too high / base line/spots under water /too much water / paper too low | | 1 |
| | | | M4 | ink will mix with water / dissolve in water / wash off paper/smudge/diffuse into water | Dependent on M3 | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 2 | b | i | M1 | 3 | | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 2 | b | ii | M1 | red AND green (in either order) | Do not award mark if yellow or blue are included | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 2 | b | iii | M1 | blue | | 1 |
| | | | M2 | did not move/ did not spread/ stayed on base line / not affected by water | Dependent on M1<br>Ignore does not separate | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 2 | c | i | M1 | 2.1 – 2.4 cm / 21 – 24 mm | | 1 |
| | | | M2 | 5.6 to 5.7cm/56 to 57mm | | 1 |
| | | | M3 | unit correct ONCE | | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 2 | c | ii | M1 | red dist / solvent dist / $R_f$<br>2.1 / 5.6 / 0.375<br>2.2 / 5.6 / 0.39285714<br>2.3 / 5.6 / 0.41071428<br>2.4 / 5.6 / 0.42857142<br>2.1 / 5.7 / 0.36842105<br>2.2 / 5.7 / 0.38596491<br>2.3 / 5.7 / 0.40350877<br>2.4 / 5.7 / 0.42105263<br>1 or more sig figs | CQ on values in (c)(i)<br>Ignore units | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | a | | M1<br><br>M2 | volume of acid<br><br>concentration of acid<br><br><u>starting</u> temperature (of acid)<br><br>particle size/surface area/form of magnesium hydroxide<br><br>stir same speed / stir in same way / stir for same time | ignore "amount of acid"– but if no other mark awarded give 1 mark for "amount of acid"<br><br>not just "keep temp the same" – ignore, neutral<br><br>reject mass of $Mg(OH)_2$<br><br>reject record maximum temperature after same length of time. | 2 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | b | | M1 | insulate / use polystyrene cup/ wrap in (named) insulation /lid<br>eg cotton wool / bubble wrap / mineral wool<br>accept digital thermometer/ thermometer that has smaller divisions (may be specified) | ignore methods of measuring volume / finding mass / stirring | 1 |
| | | | M2 | Reduces (accept "prevents") heat loss / poor conductor (of heat)<br><br>(Temperature) more accurate (allow "precise") / read to more decimal places | Reject keeps temperature constant<br><br>M2 dependent on M1 | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | c | | M1 | 21.5 21 ½ | | 1 |
| | | | M2 | 55(.0) | | 1 |
| | | | M3 | 33.5 331/2 | CQ on M1 and M2 | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | d | | M1<br>M2 | 7.5 | Award 2 marks for 7.5<br>Award 1 mark for 7.53<br>LOOK IN THE TABLE | 2 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | e | | M1 | too much (accept excess) magnesium hydroxide used magnesium hydroxide bigger surface area /smaller bits<br>starting temperature of acid too high<br>acid too concentrated | Reject volume of acid too big.<br>Ignore non directional changes, reject wrong directional changes. | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | f | | M1 | 2.5 (g) | | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | g | i | M1<br>M2 | all points plotted correctly | Tolerance of half small square<br>Deduct 1 mark for each error | 2 |
| | | | M3 | straight line through first 4 points | not freehand | 1 |
| | | | M4 | straight line through last three points | ignore portion between 2g and 2.5g | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 3 | g | ii | M1 | goes up | temp increase (directly) proportional to mass gets M1 and M3<br>"they are proportional" is not sufficient for either M1 or M3 | 1 |
| | | | M2 | goes down | ignore references to where temperature increase ends/decrease starts | 1 |
| | | | M3 | increase is (directly) proportional (can be expressed either way round) / decrease more slowly than increase | accept "goes up quickly and down slowly" or similar.<br>"goes down slowly" without reference to increasing quickly is not sufficient. | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 4 | a | i | M1<br><br>M2 | *y*-axis labelled (mass or g) and mass scale correct (4 cm rep 0.1 g)units not required<br><br>*x*-axis labelled (volume or $cm^3$) and volume scale correct (1 cm rep 1 $cm^3$)units not required | units on axis do not replace mass / volume labels<br><br>scales on each axis must consist of two or more numbers (one of which can be zero). | 2 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 4 | a | ii | M1 | A correct volume reading from either part of line (2.5 or 8.5/8.6) | units not required, but penalise wrong units once in M1 and M2 | 1 |
| | | | M2 | Correct units ($cm^3$) | Independent of M1 | 1 |
| | | | M3 | some CORRECT indication on graph for any one reading | correct construction with wrong value read off still scores M3 | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 4 | a | iii | M1 | more readings between 4 and 6 $cm^3$ /around 5 / repeat between 4 and 6/around 5<br>smaller intervals between specified volumes as above<br>accept list of suitable values.<br>Accept answers based on more values around suitable mass of precipitate | Not just more readings or repeat not just "add 0.1$cm^3$ at a time" – must give indication of volume limits. | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 4 | b | | M1 | weigh filter paper | can be implied (such as "use a filter paper of known mass" or after M4 "subtract the mass of the filter paper") | 1 |
| | | | M2 | filter | | 1 |
| | | | M3 | wash and dry | ignore how it is dried – an attempt at drying after washing is what is required | 1 |
| | | | M4 | reweigh filter paper (with ppt) | M4 can only be awarded if the precipitate has been obtained by filtering | 1 |
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | M1 | filter / centrifuge and decant | | |
| | | | M2 | wash and dry | ignore how it is dried – an attempt at drying after washing is what is required | |
| | | | M3 | remove from filter paper / remove from centrifugation tube | this cannot be implied – it must be clear the precipitate is removed from the paper | |
| | | | M4 | weigh (ppt) | M4 can only be awarded if the precipitate has been obtained, by filtering or centrifuging and decanting | |
| | | | | | | |

| Question | | | Mark | **Acceptable answers** | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 4 | c | i | M1 | zinc has the same results / metal could be zinc | | 1 |

| Question | | | Mark | **Acceptable answers** | Notes | Total |
|---|---|---|---|---|---|---|
| | | | | | | |
| 4 | c | ii | M1 | add ammonia (solution) to excess / | | 1 |
| | | | M2 | White / precipitate (does not dissolve/remains) | M2 dependent on M1 | 1 |

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