

Mark Scheme (Results)

November 2009

IGCSE

IGCSE Chemistry (4335) Paper 2H

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SECTION A

| Question | | Mark | Acceptable answers | Notes | Total |
|----------|-----|------|----------------------------------|---|----------|
| 1 | a | M1 | (electron) 1/1836 / negligible | Accept value in range 1/2000 to 1/1800 and 0.0005 to 0.00056 Ignore zero | 1 |
| | | M2 | (neutron) 0 | | 1 |
| | | M3 | (proton) 1 | | 1 |
| | | M4 | (proton) +1 | | 1 |
| | b i | M1 | (number of) protons and neutrons | | 1 |
| | | M2 | 35 | | 1 |
| | ii | M1 | 18 | | 1 |
| | c i | M1 | 5 | | 1 |
| | ii | M1 | isotopes | | 1 |
| | | | | TOTAL | 9 |

| Question | | Mark | Acceptable answers | Notes | Total |
|----------|-----|------|--|---|-----------|
| 2 | a | M1 | white | | 1 |
| | | M2 | blue | | 1 |
| | b i | M1 | fractional | | 1 |
| | | M2 | distillation | | 1 |
| | ii | M1 | different boiling points / boiling point of propanone lower than that of water | | 1 |
| | iii | M1 | heat / boil | | 1 |
| | | M2 | propanone boils/collects (first) | | 1 |
| | | M3 | stop collecting liquid above 56 °C | Accept wording that indicates that water collected separately or not at all | 1 |
| | c | M1 | cross in column 1 box 4 | | 1 |
| | | M2 | cross in column 2 box 2 | | 1 |
| | | | | TOTAL | 10 |

| Question | Mark | Acceptable answers | Notes | Total |
|----------|------|--------------------|-----------------------------|----------|
| 3 | a | M1 | loses an electron/electrons | 1 |
| | | M2 | Na ⁺ | 1 |
| | b | M1 | gains <u>two</u> electrons | 1 |
| | | M2 | O ²⁻ | 1 |
| | c | M1 | sodium oxide | 1 |
| | | M2 | Na ₂ O | 1 |
| | | | | |
| | | | | |
| | | | TOTAL | 6 |

| Question | Mark | Acceptable answers | Notes | Total |
|----------|------|--------------------|--|----------|
| 4 | a | M1 | (bromine) liquid | 1 |
| | | M2 | grey / black | 1 |
| | b | i | M1 any indication of chlorine in left hand tube | 1 |
| | | ii | M1 hydrogen / H ₂ | 1 |
| | | iii | M1 brine / sodium chloride solution / NaCl(aq) | 1 |
| | | | Accept concentrated/saturated NaCl Ignore sea water | |
| | c | i | M1 chlorine + sodium bromide → M2 bromine + sodium chloride | 2 |
| | | ii | M1 displacement / redox | 1 |
| | | | Accept reduction / oxidation Ignore substitution | |
| | | iii | M1 (chlorine) more reactive (than bromine) | 1 |
| | | | | |
| | | | | |
| | | | TOTAL | 9 |

| Question | Mark | Acceptable answers | Notes | Total | |
|----------|------|--------------------|---|--|-----------|
| 5 | a | M1 | double bond / C=C / not all bonds are single | 1 | |
| | b | M1 | contains bromine / another element/atom does not contain only carbon and hydrogen | 1 | |
| | c | M1 | B and E | 1 | |
| | d | M1 | A and B / A and E / C and F | 1 | |
| | e | M1 | alkane(s) | 1 | |
| | | M2 | C_nH_{2n+2} | Accept other symbols such as x | 1 |
| | f | M1 | yellow / orange / brown | 1 | |
| | | M2 | colourless / decolorised | Ignore clear | 1 |
| | | | | If only colourless stated, assume it is final colour | |
| | g | i | M1 | F | 1 |
| | | ii | M1 | poly(ethene) / polyethene / polythene | 1 |
| | | iii | M1 | addition | 1 |
| | | | | | |
| | | | | TOTAL | 11 |

SECTION A TOTAL: 45 MARKS

SECTION B

| Question | | | Mark | Acceptable answers | Notes | Total |
|----------|---|----|------|--|--|-----------|
| 6 | a | i | M1 | red | Reject orange-red and brick red | 1 |
| | | ii | M1 | Li ⁺ | | 1 |
| | b | | M1 | yellow | | 1 |
| | | | M2 | OH ⁻ | | 1 |
| | c | i | M1 | melts / becomes a ball | M2 Accept other words indicating movement such as darts / whizzes / skids / skates / shoots | 1 |
| | | | M2 | moves (on surface) | | 1 |
| | | | M3 | fizzes / bubbles / effervescence | | 1 |
| | | | M4 | disappears / dissolves / becomes smaller | | 1 |
| | | | M5 | white trail | Reject white precipitate | 1 |
| | | | | | Any two for 1 each Ignore flames/fires | |
| | | ii | M1 | $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$ | M1 all formulae correct | 1 |
| | | | M2 | | M2 balancing | 1 |
| | d | i | M1 | flame / explosion | Accept any more extreme observation from ci, eg moves more quickly, faster bubbling, but not just reacts faster/more violently | 1 |
| | | ii | M1 | 10 - 14 / value within this range | Reject range outside this, eg 9 - 12 | 1 |
| | | | | | | |
| | | | | | TOTAL | 10 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|----------|---|-----|----------------|--|--|-------------|
| 7 | a | i | M1 | reagents wrong way round / in wrong places / calcium carbonate is solid and hydrochloric acid is liquid or solution | Accept any wording that clearly suggests that calcium carbonate should be in the conical flask and hydrochloric acid in the funnel Do not penalise wrong terms for funnel, eg pipette/burette | 1 |
| | | ii | M1 | carbon dioxide denser/heavier than air | | 1 |
| | | | M2 | over water / in gas syringe / by downward delivery / <u>upward</u> displacement of air / have gas jar other way round | | 1 |
| | | iii | M1 M2 M3 | $\text{CaCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{CaCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$ | M1 correct formulae M2 balancing M3 state symbols | 1 1 1 |
| | b | | M1 | bright/brilliant/dazzling/white flame/light | M1 Accept burn instead of flame/light | 1 |
| | | | M2 | white solid | Do not accept glow/spark/flash M2 Accept other words in place of solid, eg smoke/ash/residue/deposit/compound but not fumes/precipitate Accept in either order | 1 |

| Question | | | Mark | Acceptable answers | Notes | Total |
|----------|---|----|------|--|---|-----------|
| 7 | c | i | M1 | strong (electrostatic) attractions/ionic bonds | M1 Accept attractions/bonds hard to overcome/need much energy to overcome If atoms instead of ions, M1 can still score | 1 |
| | | | M2 | between ions | | 1 |
| | | | | | No marks if mention of molecules / covalent / sharing electrons / intermolecular | |
| | | ii | M1 | ions have greater/double charge(s) | M1 Accept correct comparison of either cation or anion, eg Mg^{2+} and Na^{+} or O^{2-} and Cl^{-} | 1 |
| | | | M2 | stronger (electrostatic) attractions/(ionic) bonds / attractions/bonds harder to overcome/need more energy to overcome | | 1 |
| | | | | | No marks if mention of molecules / covalent / sharing electrons / intermolecular | |
| | | | | | | |
| | | | | | TOTAL | 12 |

| Question | Mark | Acceptable answers | Notes | Total | |
|----------|------|--|--|--|---|
| 8 | a | M1 (J) coke / coal | Ignore carbon / iron ore / iron oxide | 1 | |
| | | M2 (K) limestone | Ignore chalk / marble / calcium carbonate Reject lime | 1 | |
| | | M3 (L) air | Ignore oxygen | 1 | |
| | b | i | M1 produces heat/energy / exothermic / raises the temperature | 1 | |
| | | ii | M1 reducing agent / removes oxygen from iron oxide / converts iron oxide to iron | Do not penalise reference to correct name or formula of any oxide of iron, eg iron(II) oxide, Fe ₃ O ₄ | 1 |
| | | iii | M1 | M1 reactants | 1 |
| | | | M2 | M2 products | 1 |
| | | | | Max 1 if unbalanced | |
| | c | M1 calcium silicate / slag | | 1 | |
| | | M2 less dense / lighter | | 1 | |
| | d | M1 strong / hard / durable / malleable / ductile | | 1 | |
| | | M2 catalyst / speeds up the reaction | | 1 | |
| | e | i | M1 (hydrated) iron (III) oxide | Not any other oxide, and not just iron oxide | 1 |
| | | ii | M1 zinc more reactive (than iron) / higher in reactivity series / better reducing agent / better at losing electrons / transfers electron(s) to iron | Ignore very reactive | 1 |
| | | M2 reacts/corrodes/oxidises instead of/before iron | Ignore rusts | 1 | |
| | | | | | |
| | | | TOTAL | 14 | |

| Question | Mark | Acceptable answers | Notes | Total | |
|----------|------|--------------------|--|---|-----------|
| 9 | a | i | M1 M2 $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2$ | M1 correct formulae M2 balancing | 1 1 |
| | | ii | M1 iron loses electrons and chlorine gains electrons | Accept correct statement and definition for either iron or chlorine for 1 mark, eg iron loses electrons and is oxidised, or chlorine gains electrons and is reduced | 1 |
| | | | M2 oxidation is loss and reduction is gain of electrons | | 1 |
| | b | | M1 green precipitate/solid/suspension | Ignore grey / dirty / bubbles | 1 |
| | | | M2 brown/rust precipitate/solid/suspension | Accept orange / foxy red Ignore red | 1 |
| | | | | Award 1 mark for two correct colours with no mention of precipitate | |
| | c | i | M1 (pale) blue | Reject green / dark / deep Ignore bright | 1 |
| | | ii | M1 solution forms / precipitate dissolves | Accept disappears Ignore liquid | 1 |
| | | | M2 colour darkens / goes dark/deep blue | Accept royal blue | 1 |
| | | iii | M1 complex | | 1 |
| | | iv | M1 silver nitrate / AgNO_3 (solution) | | 1 |
| | | | M2 (dilute) nitric acid / HNO_3 | | 1 |
| | | | M3 white precipitate/solid/suspension | Do not award M3 if no mention of silver nitrate | 1 |
| | | | | | |
| | | | | TOTAL | 13 |

| Question | | Mark | Acceptable answers | | Notes | Total |
|----------|---|------|--------------------|--|--|--|
| 10 | a | M1 | colourless | | If only one colour given, assume it is the final colour If both colours correct but wrong way round, award 1 mark | 1 |
| | | M2 | pink / red | | | 1 |
| | b | i | M1 | $0.200 \times 21.05 \div 1000$ | Correct final answer scores 2 marks Ignore units Award 1 for 4.21 Accept answers to 2 or more sf | 1 |
| | | M2 | 0.00421 | | | 1 |
| | | ii | M1 | $0.00421 \div 0.025$ | CQ on bi Correct final answer scores 2 marks Ignore units Accept answers to 2 or more sf | 1 |
| | | | M2 | 0.168(4) | | 1 |
| | c | i | M1 | 85 | Ignore units | 1 |
| | | ii | M1 | 0.00421×85 | CQ on bi and ci | 1 |
| | | | M2 | 0.35785 (g) | Accept answers to 2 or more sf Penalise incorrect units | 1 |
| | d | | M1 | heat/boil/evaporate the solution | | 1 |
| | | | M2 | to crystallisation/saturation point / to remove some water | | If clear statement that all the water is evaporated by heating, then M2 and M3 cannot be awarded |
| | | | M3 | cool and filter / leave solution to evaporate/dry | | |
| | | | | OR | | |
| | | | M1 | leave in warm place/on window ledge | | |
| | | | M2 | for stated time | | |
| | | | M3 | to allow water to evaporate / filter | | |
| | | | | | | |
| | | | | | TOTAL | 12 |

| Question | Mark | Acceptable answers | Notes | Total | |
|----------|------|--------------------|--|--|-----------|
| 1 1 | a | i | M1 vapour/hydrocarbons/molecules/fractions / compounds / substances rise(s) / collect at different heights | 1 | |
| | | | M2 condense/turn back to liquid (at different heights/temperatures) | 1 | |
| | | ii | M1 heavier / bigger / greater M_r | 1 | |
| | | | M2 (fuel oil molecules) boil/condense at higher temperature | 1 | |
| | | iii | M1 formula of type C_xH_y where $x = 5$ to 12 and $y = 2x$ or $2x + 2$ | 1 | |
| | | iv | M1 bitumen | 1 | |
| | b | i | M1 $C_{14}H_{30}$ | 1 | |
| | | ii | M1 carbon-to-carbon/C-C / C-H bonds break | Do not accept C=C bonds break | 1 |
| | | | M2 C=C bonds form | If neither mark scored as shown, award 1 mark for single bonds break and double bonds form | 1 |
| | c | i | M1 phosphoric acid / H_3PO_4 | 1 | |
| | | ii | M1 | M1 Reactants | 1 |
| | | | M2 | M2 Product | 1 |
| | | | | Max 1 if unbalanced | |
| | d | i | M1 redox / oxidation / reduction | 1 | |
| | | ii | M1 ethanoic acid / ethanal | 1 | |
| | | | | | |
| | | | | TOTAL | 14 |

SECTION B TOTAL: 75 MARKS

PAPER TOTAL: 120 MARKS

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