

Mark Scheme (Results)

Summer 2012

GCSE Chemistry
5CH1H/01

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GCSE Chemistry 5CH1H/01 Mark Scheme – Summer 2012

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---------------|--------------------|------------|
| 1(a) | B gold | | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|-----------------------------|--------------------|------------|
| 1(b) | { loss of / remove } oxygen | gain of electrons | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--|--|------------|
| 1(c) | <p>An explanation linking</p> <p>either</p> <ul style="list-style-type: none"> aluminium high(er) in reactivity / aluminium more reactive than carbon / aluminium compounds are very stable (1) <p>or</p> <ul style="list-style-type: none"> iron lower in reactivity / iron less reactive than carbon / iron compounds less stable (1) <p>plus one of</p> <ul style="list-style-type: none"> (for aluminium) electrolysis is powerful means of reduction / needs powerful means of extraction / needs more energy (1) (for iron) can be reduced with {carbon / carbon monoxide} / use of carbon is cheaper / use of electricity is expensive / ORA (1) | <p>stronger means of reduction</p> <p>can be reacted with {carbon / carbon monoxide} and oxygen removed</p> | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|--|------------|
| 1 (d) | <p>An explanation linking the following points</p> <ul style="list-style-type: none"> (magnesium and aluminium) {atoms / ions / particles} are different sizes (1) this prevents the layers (of atoms / ions / particles) sliding over each other (1) | <p>magnesium atoms are larger than aluminium atoms OR aluminium atoms are larger than magnesium atoms</p> <p>sheets / rows</p> <p>penalise molecules only once</p> | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--|--------------------|------------|
| 1 (e) | <p>4 (Al) + 3 (O₂) → (2Al₂O₃)</p> <p>4 (1)</p> <p>3 (1)</p> | | (2) |

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|-----------------|--|--|------------|
| 2(a) | <p>An explanation linking two of the following points</p> <ul style="list-style-type: none"> nobody was there / OWTTE (1) there are no (written) records / measurements (1) {different / conflicting} sources of information (1) | <p>{limited / unreliable} evidence e.g. data based on atmospheres on other planets</p> <p>(gases in) ice core and rock data not old enough</p> | (2) |

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|-----------------|--|---------------------------|------------|
| 2(b) | lowered the amount of {water vapour / carbon dioxide} / oceans absorbed carbon dioxide | reject all removed | (1) |

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|-----------------|---|---|------------|
| 2(c) | <p>An explanation linking two of the following points</p> <ul style="list-style-type: none"> photosynthesis (in plants) (1) {decreased / absorbed} carbon dioxide (1) {increased / released} oxygen (1) | if respiration confused with photosynthesis max 1 | (2) |

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|-----------------|---------------|--------------------|------------|
| 2(d) | A 0.04 | | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--|---|------------|
| 2(e) | <p>Any one from the following points</p> <ul style="list-style-type: none"> deforestation (1) volcanic activity (1) respiration (1) increase in temperature (1) | <p>more animals</p> <p>ignore references to biofuels</p> | (1) |

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|-----------------|---------------------------------|--------------------|------------|
| 3(a)(i) | B LPG, petrol and diesel | | (1) |

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|-----------------|---|---|------------|
| 3(a)(ii) | <p>An explanation linking two of the following points</p> <ul style="list-style-type: none"> • use of {fractions / large molecules / long chain hydrocarbons} of {less demand / less useful / lower value} / ORA (1) • to meet demand / small molecules needed (1) | <p>reject useless use up excess kerosene / fuel oil and bitumen</p> <p>to make more petrol / LPG / alkenes</p> | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|--------------------|------------|
| 3(b) | B the boiling point of the hydrocarbon increases | | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--|--------------------|------------|
| 3(c)(i) | B C ₂ H ₄ | | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|--|------------|
| 3(c)(ii) | $n \begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C}=\text{C} \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array} \longrightarrow \left[\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right]_n \quad (2)$ <p>ignore n missing on polymer structure</p> <p>LHS (1) RHS (1)</p> <p>Allow:</p> $n \begin{array}{c} \text{H} & & \text{X} \\ & \diagdown & / \\ & \text{C}=\text{C} \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array} \longrightarrow \left[\begin{array}{cc} \text{H} & \text{X} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right]_n \quad (1)$ <p>(where X could be CH₃ or similar)</p> | <p>$n \text{C}_2\text{H}_4 \rightarrow (\text{C}_2\text{H}_4)_n$ (2)</p> <p>Note: Displayed formulae alkene with C=C polymer – single bonds between atoms with continuation bonds</p> <p>Allow any number of C₂H₄ on LHS drawn out with corresponding structure of polymer on RHS</p> | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--|--|------------|
| 3(d)(i) | <p>An explanation linking the following points</p> <ul style="list-style-type: none"> greenhouse gas / traps heat in atmosphere (1) may lead to increasing global temperature / global warming (1) | <p>traps infra-red radiation / increases greenhouse effect</p> <p>reject reference to UV</p> <p>melting {ice caps / glaciers} / climate change / sea-level rising / loss of habitats</p> <p>reject reference to ozone layer</p> | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--|---|------------|
| 3(d)(ii) | <p>An explanation linking two of the following points</p> <ul style="list-style-type: none"> sulfur dioxide formed (during combustion of fuel) (1) sulfur dioxide {dissolves in rain / forms acid (rain)} (1) an effect of acid rain e.g. harms {fish / plants / statues / buildings} / lowers pH of lakes (1) | <p>SO₂</p> <p>possible harm to human respiration</p> | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--|--------------------|------------|
| 4(a) | C sedimentary / metamorphic / sedimentary | | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--|---|------------|
| 4(b)(i) | <p>A description linking one of the following pairs</p> <p>Either</p> <ul style="list-style-type: none"> • {find mass of / weigh} solid before heating (1) • (heat in a suitable container) and {find mass / weigh} again (when cool) (1) <p>Or</p> <ul style="list-style-type: none"> • {bubble / pass} the gas produced through limewater(1) • limewater turns {cloudy / milky} (1) | <p>Any other description that proves a change is taking place</p> <p>(Measure) change in mass 1 mark only</p> <p>Ignore carbon dioxide puts out lighted splint</p> | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|---|------------|
| 4(b)(ii) | <p>A description including two of the following points</p> <ul style="list-style-type: none"> • fizzing / hissing (1) • steam (1) • swells (1) • solid crumbles (to a powder) (1) • becomes hot (1) | <p>Ignore bubbling / solution</p> <p>Ignore boiling</p> <p>list principle applies</p> | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|------------------|--|--|------------|
| 4(b)(iii) | $\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$ <p>left hand side (1) right hand side (1)</p> | <p>allow multiples</p> <p>incorrect balancing scores 1 max</p> | (2) |

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|-----------------|-----------|--------------------|------------|
| 4(b)(iv) | limewater | lime water | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|--|------------|
| 4(c) | <p>An explanation linking two of the following points</p> <ul style="list-style-type: none"> • (calcium carbonate) reacts with {acidic gases / sulphur dioxide} (1) • (because) calcium carbonate is a base (1) • to form a salt / calcium sulfate (1) • neutralisation (reaction) (1) | <p>Ignore calcium carbonate is an alkali</p> <p>neutralises acidic gases = 2 marks</p> <p>two marks can be scored with suitable balanced equation : e.g. $\text{CaCO}_3 + \text{SO}_2 + \frac{1}{2} \text{O}_2 \rightarrow \text{CaSO}_4 + \text{CO}_2$</p> | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|-------------------------|---|------------|
| 5(a)(i) | toxic / poisonous (gas) | Ignore other words such as harmful / dangerous / smelly / corrosive | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|--|--|------------|
| 5(a)(ii) | A description including the following points <ul style="list-style-type: none"> • (damp blue) litmus (paper) (1) • (turns red then) white / bleaches (1) | Allow use of any suitable named indicator with correct result eg <ul style="list-style-type: none"> • (damp) universal indicator paper (1) • (turns red then) white (1) OR <ul style="list-style-type: none"> • (damp) starch iodide paper (1) • (turns) dark blue / black (1) | (2) |

| Question Number | Answer | Acceptable answers | Mark |
|------------------|--|--|------------|
| 5(a)(iii) | making {poly(chloroethene / PVC / solvents / medicines / agrochemicals / disinfectants} bleach / sterilising water / killing bacteria | ignore water purification / "swimming pools" micro-organisms | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|---|------------|
| 5(a)(iv) | $2\text{NaCl} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 + \text{Cl}_2$ correct products (1) balancing of correct formulae (1) | $\text{NaCl} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \frac{1}{2} \text{H}_2 + \frac{1}{2} \text{Cl}_2$ | (2) |

| Question Number | | Indicative Content | Mark |
|-----------------|--------------|---|------------|
| QWC | *5(b) | <p>A comparison including some of the following points</p> <p>Comparing volumes of hydrogen and oxygen</p> <ul style="list-style-type: none"> • (in each experiment) volume of hydrogen is twice volume of oxygen • because water molecules contain twice as many hydrogen atoms as oxygen atoms / is H₂O • overall $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ <p>Relating volumes of gases to current and time</p> <ul style="list-style-type: none"> • (from experiments 1 and 2) time doubles • (from experiments 1 and 2) volumes of gases double • Volumes of gases are directly proportional to the time for electrolysis / passage of current • (from experiments 1 and 3) as current x 1.5 • (from experiments 1 and 3) volumes of gases x 1.5 • volumes of gases are directly proportional to the current | (6) |
| Level | 0 | No rewardable content | |
| 1 | 1 - 2 | <ul style="list-style-type: none"> • a limited description of one trend e.g. increased time gives an increased gas volume • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy | |
| 2 | 3 - 4 | <ul style="list-style-type: none"> • a simple description e.g. if the time is doubled, the volume of gas is doubled and if the current is increased the volume of gas increases • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy | |
| 3 | 5 - 6 | <ul style="list-style-type: none"> • a detailed description e.g. volume of hydrogen is twice volume of oxygen and as time doubles, volume of gas doubles or as current x 1.5, volume of gas x 1.5 • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors | |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|---|------------|
| 6(a) | <p>A description linking one from each of the following pairs:</p> <p>Non-renewable</p> <ul style="list-style-type: none"> • e.g. fossil fuels (1) • when used, not replaced (in a reasonable time) / finite supply (1) <p>Renewable fuels</p> <ul style="list-style-type: none"> • produced {from plants / electrolysis (to produce hydrogen)} (1) • (therefore) when used, able to be (quickly) replaced (1) | <p>ignore can't be used again</p> <p>ignore won't run out / infinite supply / can be used again</p> | (2) |

| Question Number | Indicative Content | Mark |
|-----------------|--|---|
| QWC | <p>*6(b)</p> <p>An evaluation including some of the following points</p> <p>Advantages of bioethanol</p> <ul style="list-style-type: none"> • is renewable / petrol is finite / takes a long time to form crude oil • crops to make bioethanol regrown quickly/takes a long time to form crude oil • use reduces demand on fossil fuels • carbon dioxide is removed from air when growing crops (which are used in ethanol production) • may be sulfur impurities in petrol, none in ethanol / ethanol is less polluting than petrol (does not produce sulphur dioxide) • ethanol burns more completely, petrol does not <p>Disadvantages of bioethanol</p> <ul style="list-style-type: none"> • less readily available than petrol / fewer filling stations than for petrol (in UK but not in some countries) • lots of crops needed to generate sufficient fuel to replace petrol • less farmland available for growing food crops • currently few cars are built to run on bioethanol/bioethanol fuel (in cars) runs out faster / over shorter distances / less energy efficient | (6) |
| Level | 0 | No rewardable content |
| 1 | 1 - 2 | <ul style="list-style-type: none"> • a limited description e.g. using ethanol conserves oil deposits • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy |
| 2 | 3 - 4 | <ul style="list-style-type: none"> • a simple description e.g. growing plants gives continuous supply of bioethanol but petrol comes from crude oil which is finite • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy |
| 3 | 5 - 6 | <ul style="list-style-type: none"> • a detailed description e.g. growing plants remove carbon dioxide from the air but lots of crops are needed to make sufficient bioethanol to replace petrol therefore less land to grow food crops • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|--|------------|
| 6(c)(i) | $2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O}$ (3) or left hand side – $\text{H}_2 + \text{O}_2$ (1) right hand side – H_2O (1) balancing – $2 (\text{H}_2) \dots 2 (\text{H}_2\text{O})$ (1) | $\text{H}_2 + \frac{1}{2} \text{O}_2 \rightarrow \text{H}_2\text{O}$ (3) | (3) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|--------------------|------------|
| 6(c)(ii) | Any one from the following points <ul style="list-style-type: none"> • requires {electricity / energy} for electrolysis (1) • must be stored in {heavy / strong / pressurised} cylinders (1) • gas can escape easily (1) • fewer fuel stations (1) | | (1) |

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