



General Certificate of Secondary Education

Science: Single Award 3463/2H *Specification B (Co-ordinated)*

Mark Scheme

2005 examination - June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Single Award Higher Tier 3463/2H

3463/2H Q1

| question | answers | extra information | mark |
|----------|--|---|------|
| (a) | 6 | accept 5.8 – 6 | 1 |
| (b) | hydrochloric acid used up / reacted / combined / or fewer particles (of hydrochloric acid) or fewer hydrogen ions owtte | accept reactants used up accept less calcium carbonate or smaller surface area of calcium carbonate accept lower concentration / less crowded do not accept atoms / molecules ignore references to energy do not accept references to atoms or molecules | 1 |
| | fewer collisions owtte | independent mark | 1 |
| (c) | steeper curve initially | independent marks | 1 |
| | levels out at same volume | <ul style="list-style-type: none"> • must indicate levelling out • if line goes higher than 66 do not award this mark • diagonal line only = 0 marks • if steeper initially and then crosses the line and finishes correctly, then loses one | 1 |
| total | | | 5 |

3463/2H Q2

| question | answers | extra information | mark |
|----------|--|---|------|
| (a) | (very) small percentage / amount (in the Earth's crust) | any indication that there is a small amount, eg not much (left) accept rare (elements) / rarer accept not commonly found ignore cannot find easily ignore hard to extract | 1 |
| (b)(i) | oxygen / O ₂ / O | do not accept O ² | 1 |
| (ii) | any one from: <ul style="list-style-type: none"> • potassium / K • sodium / Na • calcium / Ca • magnesium / Mg | symbols must be correct write name and incorrect symbol, ignore symbol | 1 |
| (c)(i) | heating (with) or hot air blown into furnace | accept high temperatures or (very) hot | 1 |
| | carbon / carbon monoxide / coke / coking coal | do not accept coal / charcoal accept balanced equation only | 1 |
| | or: carbon reacts with O ₂ or carbon / coke burning (1) | accept balanced equation only CO / CO ₂ | |
| | CO reacts with the ore (1) | for naming the reducing agent | |
| (ii) | cost of melting ore / electricity makes aluminium expensive (owtte) or (large amount of) electricity used or because you have to use electrolysis or aluminium is higher in the reactivity series or aluminium is harder to <u>reduce</u> or unable to reduce with carbon or the cost of purifying the bauxite | do not accept harder to extract / produce more energy is not enough | 1 |
| total | | | 6 |

3463/2H Q3

| question | answers | extra information | mark |
|----------|--|--|-------------------|
| (a) | fractional distillation / fractionation | accept distillation accept refining do not accept cracking | 1 |
| (b) | <p>Quality of written communication</p> <p>any three from:</p> <ul style="list-style-type: none"> • crude oil is heated to high temperature or heated to 340°C or above • (most of the) oil is evaporated / turns into gas / vapour • heavier molecules do not boil • heavier molecules sink to the bottom or lighter molecules rise up (the tower) • oil vapours / gases go up the tower • vapours condense at different points (up the tower) • separation depends on their boiling points owtte • oil separated into fractions which have similar numbers of carbon atoms or similar chain lengths or similar boiling points • temperature gradient up the tower | <p>for technical words correctly used two from: condensat(ion) / condensate(ion) / boiling points / gas / vapour / molecules / fraction / vaporised QoWC mark can be awarded for cracking described</p> <p>accept oil is boiled</p> <p>accept converse accept particles instead of molecules</p> <p>accept particles instead of molecules</p> <p>accept heavier molecules condense first / at the bottom accept lighter molecules condense last / at the top</p> <p>vapours condense at different temperatures</p> <p>accept in terms of similar chains</p> | <p>1</p> <p>3</p> |
| total | | | 5 |

3463/2H Q4

| question | answers | extra information | mark |
|----------|--|--|------|
| (a)(i) | (actual value 2403°C) | accept values between 2100 and 2450 | 1 |
| (ii) | (actual value is 5.9 g/cm ³) | accept values between 3.5 and 6.5 | 1 |
| (b)(i) | <p>any two sensible ideas such as:</p> <ul style="list-style-type: none"> • (why) put in order of mass • he left gaps or table not complete • no evidence for undiscovered elements or they believed all the elements had been discovered • he changed the order of some elements or there were exceptions to the rule(s) • he put metals and non-metals together • he did not explain his ideas clearly (owtte) | <p>accept other equally valid orders, eg alphabetical</p> <p>accept predictions could not be backed by evidence accept why change previous ideas</p> <p>accept they didn't like his groupings / groups</p> <p>do not accept modern explanations, eg proton number etc</p> | 2 |
| (ii) | (the properties of gallium) fitted the predictions (owtte) or predictions were correct or (properties) would make it fit in the gap or (properties) would make it fit in group 3 | <p>do not accept gallium fitted his theory</p> <p>accept finding gallium proved there were new elements to be discovered</p> | 1 |
| total | | | 5 |

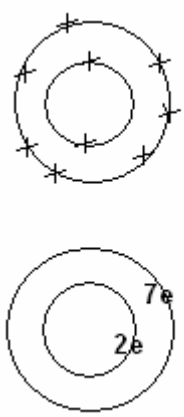
3463/2H Q5

| question | answers | extra information | mark |
|----------|--|---|--------|
| (a)(i) | heat (the limestone) | accept decompose limestone accept heat with coke | 1 |
| | add water / slake | dependent on 1 st mark unless they say add water to the calcium oxide | 1 |
| (ii) | magnesium hydroxide + hydrochloric acid → magnesium chloride + water / H ₂ O | 1 mark for each side of the equation (if a symbol equation is given then give 1 mark for correct formulae (all) and 1 mark for balancing) | 1 1 |
| (b) | hydrogen ions (from acid) or protons / H ⁺ | | 1 |
| | react with hydroxide ions (from alkali) / OH ⁻ | | 1 |
| | to produce water | H ⁺ + OH ⁻ → H ₂ O gains all 3 marks ignore state symbols molecules of hydrogen <u>ions</u> and molecules of hydroxide <u>ions</u> produce water = 2 marks if they fail to get any of the above marks they can get 1 mark for neutralisation / product neutral | 1 |
| total | | | 7 |

3463/2H Q6

| question | answers | extra information | mark |
|----------|--|--|------------|
| (a) | $C_6H_{12}O_6$ | any order accept $C_6H_7O(OH)_5$ accept 'the same' | 1 |
| (b) | sweeter / use in smaller quantities | accept uses more energy to be metabolised | 1 |
| (c) | enzyme | accept (biological) catalyst accept protein accept carbohydrase do not accept description alone | 1 |
| (d) | enzyme is trapped in / bonded to / attached / linked / combined / held / adsorbed a gel / solid / (alginate) beads / surface / resin | ignore 'reacted with' do not accept absorbed | 1 1 |
| (e) | to prevent being lost or to allow the same enzyme to be used for a long period of time | accept do not denature accept it is not washed away accept does not need to be replaced <u>as often</u> accept they can be reused do not accept recycled | 1 |
| total | | | 6 |

3463/2H Q7

| question | answers | extra information | mark |
|----------|---|--|------|
| (a)(i) | all points plotted to $\pm \frac{1}{2}$ square | | 1 |
| | sensible line of best fit extended | could be curve must not join dots, ie zig zag if they draw 2 lines then lose second mark, but can still gain marks in (a)(ii) | 1 |
| (ii) | as read from their graph $\pm \frac{1}{2}$ square | | 1 |
| (iii) | iodine and astatine I/I ₂ At/At ₂ | must give both | 1 |
| (b)(i) |  <p>or</p> | ignore symbol ignore nucleus / lack of nucleus accept dots / crosses etc / e / e ⁻ not 2.7 alone | 1 |
| (ii) | same number of electrons in outer shell or seven electrons in outer shell (owtte) | accept missing one electron in outer shell / energy level / orbit accept trying to gain one electron accept they all form 1 ⁻ ions do not accept orbital / rings | 1 |
| (c)(i) | 8 electrons in outer shell or full outer shell / energy level | | 1 |
| | does not need to lose / gain / share electrons or don't need to form bonds | accept don't bond ionically or covalently they do not react is not enough | 1 |
| (ii) | fluorine atom is smaller / fewer shells (owtte) or outer shell closer to nucleus | accept answers argued in terms of iodine | 1 |
| | more strongly attracted (to nucleus) or less shielding | accept holds electrons tighter (to the nucleus) | 1 |
| | gains electron(s) <u>more</u> easily | accept easier to gain electrons | 1 |
| total | | | 11 |