



General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1H Unit 1 Chemistry

Mark Scheme

2008 examination – January 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.

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MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

- 2.1** In a list of acceptable answers where more than one mark is available ‘any **two** from’ is used, with the number of marks emboldened. Each of the following lines is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that ‘right + wrong = wrong’.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

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Question 1

question	answers	extra information	mark
(a)(i)	old animals / fossils / rocks match (when the continents are put together) or (continents) fit together	ignore 'they are the same shape'	1
(a)(ii)	any two from: <ul style="list-style-type: none"> • continents / plates cannot move (thousands of kilometres) • modern / new animals are different • a land bridge (could explain the matching fossils / rocks) 	accept the continents / plates are attached to the Earth or continents / plates cannot drift / float ignore 'no evidence' 'no proof' 'no reputation'	2
(b)	crust mantle year	allow lithosphere	1 1 1
total			6

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Question 2

question	answers	extra information	mark
(a)(i)	oxygen / O / O ₂	do not accept oxide	1
(a)(ii)	sodium and carbon and oxygen all correct numbers linked to correct elements i.e. 2 (sodium), a / 1 (carbon), 3 (oxygen)	do not allow symbols alone do not allow oxide accept statement ‘the number and type of atoms’ for 1 mark only ignore types of particles	1 1
(b)(i)	calcium carbonate → calcium oxide + carbon dioxide	allow CaCO ₃ either way round allow CaO + CO ₂ do not allow quick lime maximum 1 mark for unbalanced symbol equation	1 1
(b)(ii)	thermal decomposition	accept endothermic do not accept reversible / equilibrium	1
(c)	any one from: <ul style="list-style-type: none">• lowers energy / temperature needed or conserves energy• decreases the amount of fuel needed• no / less glass going to landfill	do not accept no energy ignore cheaper / easier ignore conserves raw materials or more quarries needed	1
total			7

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Question 3

question	answers	extra information	mark
(a)(i)	(a carbon carbon) double (covalent) bond	accept C = C accept alkene	1
(a)(ii)	turns colourless / decolourises	ignore clear	1
(b)	salt / it at 1.6 g or portion is about 25 % of the safe daily amount or 2 portions is ½ daily amount or 4 portions is daily amount	accept 20–30% or fifth / quarter / third accept high / lot / too much salt or guideline daily amount for 1 mark ignore consequences of too much salt	2
(c)	use of solvent / solution / water / any named solvent		1
	separates / carries colour(s) / dye(s)	allow any idea of movement eg runs / moves	1
	match against Rf value / known chromatogram / similar pattern or comparison to permitted additive / colour	removal of coloured additive from salmon does not gain any marks ignore reasons for separation maximum 2 if technique clearly doesn't work	1
total			7

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Question 4

question	answers	extra information	mark
(a)	any three from: <ul style="list-style-type: none"> • resources / aluminium / ores are conserved • less / no mining or less associated environmental problems eg quarrying / eyesore / dust / traffic / noise / loss of land / habitat • less / no waste (rock) / landfill • no purification / separation (of aluminium oxide) • (aluminium extraction / production) has high energy / electricity / heat / temperature requirements • less carbon dioxide produced 	accept converse argument ignore just pollution do not accept ‘wastes 50% of the ore’ accept no carbon dioxide produced ignore references to cost	3
(b)	statement linked reason	ignore density eg (pure) Al / it is weak / soft (1) as layers / rows can slide (over each other) (1) or alloy / other metals / they makes it stronger / harder (1) stops layers / rows sliding over each other (1) accept disrupts the structure owtte if no other mark awarded accept to form an alloy or to change properties for 1 mark	1 1
total		5	

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Question 5

question	answers	extra information	mark
(a)(i)	acid rain	accept consequences of acid rain allow asthma / bronchitis ignore toxic gas	1
(a)(ii)	global dimming	accept dimming alone	1
(b)(i)	<p>sustainable:</p> <p>maximum two from:</p> <ul style="list-style-type: none"> • crops (that produce oil) can be grown in most places owtte • renewable • use less fossil fuels / diesel • use (refined) waste oils <p>low pollution:</p> <p>maximum two from:</p> <ul style="list-style-type: none"> • most emissions are lower or any two named emissions from CO / SO₂ / PM₁₀ are lower • much / lot less SO₂ emissions (than the others) owtte • accept spillages / waste is biodegradable • less new CO₂ or (more) carbon neutral 	ignore references to CO ₂ here	3

continued...

CHY1H**Question 5 continued...**

question	answers	extra information	mark
(b)(ii)	plants / photosynthesis use carbon (dioxide) from the air	allow 1 mark for biodiesel is (more) carbon neutral	1
	it / biodiesel releases carbon (dioxide) from plants / crops / photosynthesis		1
	(fossil) diesel releases 'locked up' / new carbon (dioxide) / doesn't absorb CO ₂ / absorbed it millions of years ago		1
total			8

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Question 6

question	answers	extra information	mark
(a)	any two from: <ul style="list-style-type: none"> naphtha has a different / low(er) boiling point condenses at a different temperature / height / place in the column / when it reaches it's boiling point different size of molecules 	accept different volatility	2
(b)(i)	$C_{10}H_{22} \rightarrow C_6H_{14} + 2C_2H_4$	allow multiples	1
(b)(ii)	(hydrocarbon) heated / vapours (passed over a) catalyst / alumina / porous pot	ignore other catalysts	1 1
(b)(iii)	it / ethene is unsaturated or decane and hexane / they are saturated ethene has a double (carbon carbon) bond or decane and hexane have only single (carbon carbon) bonds	accept decane and hexane are alkanes / C_nH_{2n+2} or ethene is an alkene / C_nH_{2n} or different homologous series / general formula accept ethene has a reactive double (carbon carbon) bond for 2 marks	1 1
(c)	<u>all</u> bonds drawn correctly <pre> H H C = C H H </pre>		1

continued...

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Question 6 continued...

question	answers	extra information	mark
(d)	<p>economic argument against recycling</p> <p>any one from:</p> <ul style="list-style-type: none"> poly(ethene) / plastic must be collected / transported / sorted / washed this uses (fossil) fuels which are expensive 		1
	<p>environmental argument against recycling</p> <p>any one from:</p> <ul style="list-style-type: none"> uses (fossil) fuels that are non-renewable / form CO₂ / CO / SO₂ / NO_x / particulates washing uses / pollutes water 	ignore pollution / harmful gases / etc	1
	<p>counter arguments</p> <p>any two from:</p> <ul style="list-style-type: none"> collect / transport alongside other waste use biofuels (instead of fossil) landfill is running out landfill destroys habitats incinerators are expensive to build saves raw materials / crude oil saves energy needed to make new plastic incinerators may produce harmful substances incinerator ash goes to landfill poly(ethene) is non-biodegradable poly(ethene) can be made into other useful items more jobs / employment for people 		2
total			12