



General Certificate of Secondary Education

Science B 4462 / Chemistry 4411

CHY1H Unit Chemistry 1

Mark Scheme

2011 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.

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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.

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Question 1

question	answers	extra information	mark
1(a)(i)	A	allow –11	1
1(a)(ii)	as the percentage of unsaturated fat decreases the melting point increases or vice versa	ignore boiling point / temperature ignore pattern linked to the percentage of saturated fat ignore numerical values	1
1(a)(iii)	D	allow 10	1
1(b)	any one from: <ul style="list-style-type: none"> • increase the melting point • make it 'spreadable' • make it solid (at room temperature) • increase the % of saturated fat or decrease the % of unsaturated fat 	do not accept to make it less healthy or more healthy ignore boiling point allow make it hard(er) ignore density / mass / viscous / thicker allow make it saturated ignore references to double / single bonds	1
1(c)	stop people eating unhealthy fat		1
Total			5

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Question 2

question	answers	extra information	mark
2(a)(i)	heat / high temperature / hot / vaporise	if (fractional) distillation / hydrogenation mentioned as the method = max 1 allow thermal decomposition ignore evaporation do not accept 'burns' do not accept temperature < 100	1
	catalyst or silica / alumina / porous pot or steam	ignore other named catalyst allow heat (the vapour) to a <u>very</u> high temperature / >800°C for 2 marks	1
2(a)(ii)	C_2H_3Cl	ignore attempts to balance equation	1
2(a)(iii)	single bonds between C – H, C – Cl and C – C	do not accept symbols outside the bracket	1
2(b)(i)	so that the amount of plasticiser / (sample of) PVC is the independent / only variable that affects the bending / flexibility of the samples	allow because different sizes would give different results accept because size is a control variable ignore references to reliability / precision etc	1
2(b)(ii)	to improve the <u>reliability</u> (of the investigation)	accept to calculate a mean accept to check for anomalous results or to check the range of results ignore accuracy / precision etc	1

Question 2 continues on the next page . . .

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Question 2 continued . . .

question	answers	extra information	mark
2(b)(iii)	23	correct answer with or without working = 2 marks if answer is incorrect allow $\frac{22 + 23 + 24}{3}$ or 21 for 1 mark	2
2(b)(iv)	(PVC) sample had been stretched / used / tested in first three tests	accept higher temperature allow worn or become weaker ignore (human) error ignore more flexible / softer ignore intermolecular forces	1
2(c)	does not bend (easily / much) or it is <u>not</u> flexible or it is rigid	ignore non-biodegradable / low maintenance ignore sturdy / stronger / harder	1
Total			10

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Question 3

question	answers	extra information	mark
3(a)	brass is an alloy or brass is a mixture (of metals) or brass has different sized / types of atoms / particles or in copper all the atoms / particles are the same or are the same size / type	any mention of molecules / compounds = max 1 allow ions for particles throughout it = brass accept brass does not have a regular structure or has a disrupted / irregular structure	1
		(so) in brass layers / atoms / particles cannot (easily) slide or in copper layers / atoms / particles can slide (more easily)	accept copper has a regular structure ignore moves easier
3(b)(i)	(thermal) decomposition by heating	accept endothermic (reaction) do not accept combustion / burning	1
		accept in a furnace / kiln	1
3(b)(ii)	carbon is more reactive than lead / zinc (so) lead / zinc oxide is reduced or oxygen is removed (by carbon)	they = zinc or lead	1
		accept so lead / zinc oxide reacts with carbon / carbon monoxide accept carbon displaces zinc / lead (from their oxide) allow carbon reacts with the oxygen accept word equation or balanced symbol equation	1

Question 3 continues on the next page . . .

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Question 3 continued . . .

question	answers	extra information	mark
3(b)(iii)	(zinc separates / escapes because) zinc boils / <u>turns</u> to a gas (at the temperature of the furnace)	ignore density ignore evaporates	1
	or the boiling point of zinc is below the temperature of the furnace		
	lead separates because it melts but does not boil	ignore density accept lead is molten for lead melts	1
	or the temperature of the furnace is above the melting point of lead but below its boiling point	if no other mark awarded allow 1 mark for they (zinc and lead) have different <u>boiling</u> points or zinc's boiling point is lower than lead's or vice versa	
Total			8

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Question 4

question	answers	extra information	mark
4(a)	any two from: <ul style="list-style-type: none"> improve the colour / appearance additives are permitted / not banned / listed on the label link between additives and hyperactivity not proved maintain the low cost of the drink or natural colours would make the drink cost more 	ignore reference to taste / shelf-life / sales etc allow cheaper if qualified	2
4(b)	have a control group / placebo or test children before any drink given give a drink to at least 3 groups or give a drink at least 3 times give each additive to different group / children / at different times observe / monitor / compare behaviour of group / children		1 1 1 1
4(c)(i)	so that there would be trust / respect / no bias		1
4(c)(ii)	compare the <u>colours</u> / <u>spots</u> from the orange drink with those of the (three) additives there should be no matching colours / spots	accept diagram of chromatogram(s) with spots for E102, 104, 110 and sample	1 1
Total			9

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Question 5

question	answers	extra information	mark
5(a)	complete diagram with 2 carbon atoms and 5 hydrogen atoms each C–C and each C–H linked by a single line (bond)		1
5(b)(i)	the greater the number of (carbon) atoms (in an alkane molecule) the greater its boiling point or vice versa	allow as the (carbon) chain gets longer the boiling point increases ignore melting points do not accept reference to greater number of molecules	1
5(b)(ii)	any two from: <ul style="list-style-type: none"> • low boiling point / volatile • low viscosity • high flammability • small molecules • burn completely 	they = hydrocarbons from the graph it = C ₃₀ H ₆₂ accept they are gases or liquids accept easier to burn / ignite accept short chains ignore number of carbon atoms ignore speed of burning	2
5(c)(i)	16 (CO ₂) + 18 (H ₂ O)		1
5(c)(ii)	(carbon dioxide in the Earth's early) atmosphere	accept from volcanoes (millions of years ago) or from <u>dead</u> plants / animals allow dead sea creatures ignore shells	1

Question 5 continues on the next page . . .

CHY1H**Question 5 continued . . .**

question	answers	extra information	mark
5(c)(iii)	increase in burning / use of fossil fuels		1
	locked up carbon (carbon dioxide) is released	allow carbon / carbon dioxide from millions of years ago is released accept extra carbon dioxide is not 'absorbed' (by the carbon cycle)	1
Total			8

Question 6

question	answers	extra information	mark
6	<p>any four from:</p> <p>Arguments for biodiesel</p> <p>max three from:</p> <ul style="list-style-type: none"> sustainable / renewable (carbon neutral) absorbs CO₂ when growing / during photosynthesis burning biodiesel produces low amounts particulates / carbon monoxide can use waste vegetable oils / fats (from food industry) or can use waste plant material can be used to conserve crude oil (instead of / mixed with petroleum diesel) produced by a low energy / temperature process biodegrades (easily) <p>Arguments against biodiesel</p> <p>max three from:</p> <ul style="list-style-type: none"> creates food shortages deforestation to plant more crops leads to loss of habitat / biodiversity or deforestation leads to a reduction in absorption of CO₂ burning biodiesel produces high amounts of nitrogen oxides crops takes time to grow vast areas of land needed to grow crops <p>conclusion supported by the argument presented, which must give added value to the points for and against given above</p>	<p>to gain 4 marks both pros and cons should be given</p> <p>allow burning biodiesel produces little / low amount of global dimming</p> <p>ignore sulfur dioxide</p> <p>accept produced by a low tech process</p> <p>ignore engine effects</p> <p>accept price of food increases</p> <p>allow burning trees increases CO₂ allow deforestation increases global warming</p> <p>allow increases acid rain</p> <p>allow crops can fail</p>	<p>4</p> <p>1</p>
Total			5

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