



# **General Certificate of Secondary Education**

## **Science B 4462 / Chemistry 4421**

**CHY1H      Unit 1 Chemistry**

# **Mark Scheme**

*2009 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.

## CHY1H

## Question 1

question	answers	extra information	mark
1(a)(i)	3 / three		1
1(a)(ii)	5 / five		1
1(b)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• less / no transport</li> <li>• less / no (fossil) fuel used</li> </ul>	accept less / no distance  ignore references to carbon dioxide / carbon emissions	1
1(c)(i)	carbon dioxide / CO <sub>2</sub>  (causes) global warming / climate change / greenhouse gas  <b>or</b>  (cement) particles / smoke (1)  (causes) asthma / dust / (global) dimming (1)  <b>or</b>  sulfur dioxide / SO <sub>2</sub> / nitrogen oxides / NO <sub>x</sub> (1)  (causes) acid rain (1)	for a correct emission  explanation must be correct for named emission  ignore ozone layer  accept breathing problems  do <b>not</b> accept nitrogen or water vapour for emissions  do <b>not</b> accept no named emission	1  1

Question 1 continues on the next page...

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**CHY1H****Question 1 Continued**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>1(c)(ii)</b>	absorb / trap / capture / filter / pass through water / scrub / electrostatic attraction	ignore condense / off setting / different fuel	<b>1</b>
<b>Total</b>			<b>6</b>

## CHY1H

## Question 2

question	answers	extra information	mark
2(a)(i)	calcium oxide / quicklime	allow calcium monoxide do <b>not</b> accept calcium dioxide ignore chemical formulae	1
2(a)(ii)	any <b>three</b> from: <ul style="list-style-type: none"> <li>• carbon dioxide / CO<sub>2</sub></li> <li>• (carbon dioxide) reacts (with the calcium hydroxide / slaked lime / plaster)</li> <li>• limestone / calcium carbonate / CaCO<sub>3</sub> forms</li> <li>• water is lost / evaporates</li> </ul>	it = plaster  allow reaction 3 identified do <b>not</b> allow incorrect reaction ignore mixes, unless they state the correct product  allow marble / chalk  allow moisture ignore dries	3
2(b)(i)	as the amount / volume of sand decreases the strength of the mortar increases	accept as sand decreases the mortar is stronger / harder to crack  allow as sand decreases the mortar increases  allow converse  ignore references to height of metal ball	1

Question 2 continues on the next page...

## CHY1H

## Question 2 continued

question	answers	extra information	mark
2(b)(ii)	any <b>two</b> from: <ul style="list-style-type: none"><li>• 400 / 5<sup>th</sup> result is anomalous</li><li>• the interval between the others is similar or the interval is about 6/7</li><li>• he has only one set of results</li></ul>	accept two results (36 and 37 / 400 and 500 / 4 <sup>th</sup> and 5 <sup>th</sup> ) are almost the same accept result at 400 should be 42  allow the other results fit a pattern / are on a straight line  allow he has only done it once ignore reliable	2
<b>Total</b>			<b>7</b>

## CHY1H

## Question 3

question	answers	extra information	mark
3(a)(i)	(gases from) volcanoes		1
3(a)(ii)	100	allow 99	1
3(a)(iii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• photosynthesis</li> <li>• carbon dioxide used</li> <li>• oxygen produced</li> </ul>	they = plants  allow carbon dioxide decreased  allow oxygen increased  ignore nitrogen / respiration	2
3(b)(i)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• sea floor spreading</li> <li>• periodic measurements between continents</li> <li>• evidence from rocks / fossils on different continents</li> <li>• new mountain ranges</li> </ul>	accept oceanic ridges / magnetic stripes  accept continents move a few centimetres each year  accept continents fit together  accept new islands	1
3(b)(ii)	in the mantle  any <b>two</b> from: <ul style="list-style-type: none"> <li>• convection (currents) / movement</li> <li>• radioactivity / radioactive decay / nuclear reactions</li> <li>• <u>releases</u> heat / thermal energy</li> </ul>	do <b>not</b> accept movement of the plates    accept heat from core	1  2
<b>Total</b>			<b>8</b>

**CHY1H****Question 4**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
4(a)(i)	reacts with carbon / C	accept burns / oxidises carbon	1
	carbon dioxide / CO <sub>2</sub> / gas is formed / given off	accept carbon monoxide / CO  accept correctly balanced equation for 2 marks  ignore state symbols	1
4(a)(ii)	change / improve properties	accept any specific property  accept to make alloys / special steels  ignore brittle	1
4(b)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• to conserve ores / iron</li> <li>• to prevent the use of landfills</li> <li>• to conserve energy / fuel</li> <li>• to reduce carbon / carbon dioxide emissions</li> <li>• to meet EU / International targets</li> </ul>	accept ores / iron are non-renewable / non-sustainable allow less quarrying / mining  allow reduce waste  accept fossil fuels are non-renewable  ignore costs / demand	2
<b>Total</b>			<b>5</b>

## CHY1H

## Question 5

question	answers	extra information	mark
5(a)	yes (there is the general trend) 'as the iodine value increases the melting point decreases' or 'as the hardness decreases the mp decreases' <b>or</b> <u>no</u> melting points are in random order / go up and down	accept converse statement  do <b>not</b> accept boiling point	1
	one specific use of comparative data from the table either showing the trend or an anomaly	can be gained from yes or no answer  ignore bp	1
5(b)	the iodine turns colourless		1
	this would be difficult to see (if the oil was dark coloured)	allow similar colour as iodine <b>or</b> iodine is brown	1
5(c)	(consumer may think that) the company (scientists) would be biased		1
	consumer more likely to trust independent scientists	allow independent scientists not biased	1
5(d)	add (measured amount of) hydrogen	accept hydrogenation	1
	any <b>two</b> from: <ul style="list-style-type: none"> <li>• (nickel) catalyst</li> <li>• hot / 60°C temperature</li> <li>• hardened</li> </ul>	accept add a hard / hydrogenated fat / oil <b>or</b> make an emulsion	2
<b>Total</b>			<b>9</b>

**CHY1H****Question 6**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>6(a)(i)</b>	many ethene / molecules / monomers	accept double bonds open / break	1
	join to form a long hydrocarbon / chain / large molecule	accept addition polymerisation ignore references to ethane correct equation gains <b>2</b> marks	1
<b>6(a)(ii)</b>	(can be deformed but) return to their original shape (when heated or cooled)	ignore 'it remembers its shape'	1
<b>6(a)(iii)</b>	cross links / extra bonds in PEX	it = PEX throughout accept inter-molecular bonds ignore inter-molecular forces	1
	molecules / chains in PEX are held in position	accept rigid structure	1
	molecules / chains in PEX unable to slide past each other / move		1

**Question 6 continues on the next page...**

**CHY1H****Question 6 Continued**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>6(b)</b>	any <b>four</b> from: <ul style="list-style-type: none"> <li>• less (hydrocarbon) fuels used</li> <li>• less / no electrical energy used</li> <li>• reduce carbon / carbon dioxide emissions</li> <li>• reduce / no pollution by sulfur dioxide / acid rain</li> <li>• continuous process</li> <li>• conserve copper which is running out or only low-grade ores available</li> <li>• reduce the amount of solid waste rock that needs to be disposed</li> <li>• reduce the need to dig large holes (to extract copper ores)</li> </ul>	ignore costs / sustainability / non-renewable  allow less energy  allow no electrolysis  allow less global warming    allow less / no transportation    allow less waste   allow less mining	<b>4</b>
<b>Total</b>			<b>10</b>