



# **General Certificate of Secondary Education**

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

**CHY1H      Unit 1 Chemistry**

# **Mark Scheme**

*2008 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.

**COMPONENT NUMBER: CHY1H****COMPONENT NAME: Science B / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
1(a)(i)	calcium oxide / CaO	products can be in either order  ignore chemical names other than calcium oxide <b>or</b> carbon dioxide	1
	carbon dioxide / CO <sub>2</sub>		1
1(a)(ii)	(thermal) decomposition	accept endothermic	1
1(b)(i)	(chemical) reaction / react	accept calcium hydroxide / slaked lime produced  ignore incorrect products	1
	energy / heat <u>released</u> / exothermic	ignore gets hot / heats up  if neither mark awarded then allow 'mixing the chemicals heats up the coffee' for 1 mark	1
1(b)(ii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• foil has been broken</li> <li>• ring pull used</li> <li>• quicklime and / or water mixed / reacted</li> </ul>	} if neither mark awarded accept 'cannot / difficult to repair' for 1 mark  ignore button pushed  accept reaction not reversible accept cannot / difficult to replace quicklime / water / chemicals	2
<b>Total</b>			<b>7</b>

**COMPONENT NUMBER: CHY1H****COMPONENT NAME: Science B / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
2(a)	any <b>one</b> from: <ul style="list-style-type: none"> <li>gasoline / petrol / it contains short(er) chains / hydrocarbons <b>or</b> small(er) molecules <b>or</b> contains few(er) carbons</li> <li>gasoline / petrol / it has weak(er) / small(er) intermolecular forces</li> </ul>	accept fuel oil contains long(er) chain length / large(r) molecules <b>or</b> contains many carbons  ignore particles  accept fuel oil has strong(er) / great(er) intermolecular forces	1
2(b)	any <b>two</b> from: <ul style="list-style-type: none"> <li>gasoline / petrol / it is in high demand</li> <li>gasoline / petrol / it is in short supply</li> <li>(high) tax / duty</li> <li><u>cracking</u> costs in terms of money / energy</li> </ul>	only accept figures if used in a comparative statement  accept fuel oil is in low demand  accept fuel oil is plentiful  accept answers such as 'gasoline / petrol / its supply is less than demand for <b>2</b> marks  <b>or</b> gasoline / petrol / its percentage in crude oil is less than demand for <b>2</b> marks  accept <u>cracking</u> expensive	2
2(c)	any <b>two</b> from: <ul style="list-style-type: none"> <li>(fuel oil / it) heated / vaporised</li> <li>with catalyst</li> <li>(to give / form / produce) short(er) chains / hydrocarbons <b>or</b> small(er) molecules <b>or</b> contains few(er) carbons</li> </ul>	ignore particles  accept a named catalyst  if first two bullet points are not awarded 'cracking' gains <b>1</b> mark  if wrong process named max <b>1</b> mark	2
<b>Total</b>			<b>5</b>

**COMPONENT NUMBER: CHY1H****COMPONENT NAME: Science B / Chemistry****STATUS: Final****DATE: June 2008**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>3(a)</b>	check if safe to eat / healthy <b>or</b> permitted	accept references to allergies / medical problems	1
<b>3(b)</b>	any <b>three</b> from: <ul style="list-style-type: none"> <li>• made up of <u>two</u> colours / dots</li> <li>• contains an unknown colour / dot</li> <li>• contains a harmful <u>colour</u></li> <li>• contains E104 / quinoline yellow <b>or</b> does not contain E133 / brilliant blue</li> <li>• further analysis needed</li> </ul>	accept dye for colour	3
<b>3(c)</b>	there could be <u>other</u> additives (in the sweets)  could still contain / use / add <u>natural</u> colours	ignore No or Yes but No must be implied  accept any other type of additives but <b>not</b> colourings  accept non-artificial for natural <b>or</b> named natural colours	1  1
<b>Total</b>			<b>6</b>

**COMPONENT NUMBER: CHY1H****COMPONENT NAME: Science B / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
4(a)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• light(er) / less dense</li> <li>• resistant to acids / alkalis / chemical</li> </ul>	ignore stronger accept resistant to corrosion	1
4(b)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• magnesium is <u>more</u> reactive than titanium</li> <li>• titanium is <u>more</u> reactive than carbon</li> <li>• magnesium is <u>more</u> reactive than carbon</li> <li>• magnesium is <u>most</u> reactive</li> <li>• carbon is <u>least</u> reactive</li> </ul>	it must be clear list principle applies allow reverse argument ignore reference to temperature magnesium is above titanium in the reactivity series	2

**Question 4 continued on the next page...**



**COMPONENT NUMBER: CHY1H****COMPONENT NAME: Science B / Chemistry****STATUS: Final****DATE: June 2008****Question 4 continued...**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
4(c)	any <b>three</b> from: <ul style="list-style-type: none"> <li>• takes a long time to process</li> <li>• low abundance (of ore)</li> <li>• small amount produced</li> <li>• batch process used <b>or</b> blast furnace is continuous</li> <li>• more stages used to manufacture titanium</li> <li>• more energy used (per tonne of titanium)</li> <li>• magnesium / chlorine is expensive</li> <li>• labour intensive</li> </ul>	it = titanium  ignore references to cost / easier / usefulness alone <b>or</b> references to incorrect processes           allow $\geq 3$ / many / several  allow high energy requirement ignore references to temperature	3
<b>Total</b>			<b>6</b>

**COMPONENT NUMBER: CHY1H****COMPONENT NAME: Science B / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
5(a)(i)	soya	allow bean	1
	high(est) in polyunsaturated fat <b>and</b> low(est) in saturated fat	independent mark	1
5(a)(ii)	same / balanced amount of each fat	accept it contains the lowest total amount of these fats <b>or</b> it is <u>low</u> in saturated fat  allow <u>only</u> 14% for this mark	1
5(b)(i)	turns colourless	accept colour disappears  ignore fading	1
5(b)(ii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>unsaturated fat content / healthiness about the same / similar to maize</li> <li>less unsaturated / less healthy than soya</li> <li>more unsaturated / more healthy than olive / palm</li> </ul>	accept about the same number of double carbon bonds as maize accept 'a <u>bit</u> less' for similar  accept fewer / less double bonds than soya ignore 'more saturated'  accept more double bonds than olive / palm ignore 'less saturated'  if no other mark awarded accept sunflower oil has (about) the same result as maize oil for <b>1</b> mark  ignore comments about saturated fats	2
<b>Total</b>			<b>6</b>

**COMPONENT NUMBER: CHY1H****COMPONENT NAME: Science B / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
6(a)	<p>any <b>two</b> environmental problems with linked explanations</p> <ul style="list-style-type: none"> <li>global warming (1) caused by (formation of) carbon dioxide / greenhouse gas (1)</li> <li>acid rain (1)  caused by ( formation of) sulfur dioxide (1)</li> <li>global dimming (1) caused by ( formation of) particles / particulates / fires / smoke / carbon / pm 10 (1)</li> <li>scarring of landscape (1) caused by mining / quarrying of coal (1)</li> </ul>	<p>accept effects of global warming ignore greenhouse effect</p> <p>accept effects of acid rain ignore respiratory problems</p> <p>accept sulfur oxide ignore sulfuric acid</p> <p>ignore respiratory problems</p> <p>ignore ozone layer</p>	max 4
6(b)	<p>any <b>three</b> from:</p> <ul style="list-style-type: none"> <li>replant the trees / renewable / sustainable</li> <li>carbon dioxide is used by the trees / photosynthesis</li> <li>it's a (continuous carbon) cycle</li> <li>no '<u>new</u>' carbon (dioxide) is produced <b>or</b> no locked up carbon (dioxide) is released</li> </ul>	<p>ignore reusable</p> <p>accept trees absorb carbon dioxide as they grow do <b>not</b> allow respiration</p> <p>accept 'carbon dioxide goes back into the air'</p> <p>accept trees use CO<sub>2</sub> which is released when trees are burnt</p> <p>accept no carbon (dioxide) from fossil fuels is produced</p>	3
<b>Total</b>			<b>7</b>

**COMPONENT NUMBER: CHY1H****COMPONENT NAME: Science B / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
7(a)	<p>any <b>two</b> from:</p> <p><b>carbon dioxide has <u>decreased</u> due to:</b></p> <ul style="list-style-type: none"> <li>plants / micro organisms / bacteria / vegetation / trees</li> <li>photosynthesis</li> <li>'locked up' in (sedimentary) rocks / carbonates / fossil <u>fuels</u></li> <li>dissolved in oceans</li> </ul> <p><b>oxygen has <u>increased</u> due to:</b></p> <ul style="list-style-type: none"> <li>plants / bacteria / micro organisms / vegetation / trees</li> <li>photosynthesis</li> </ul> <p><b>nitrogen <u>increased</u> due to:</b></p> <ul style="list-style-type: none"> <li>ammonia reacted with oxygen</li> <li>bacteria / micro organisms</li> </ul>	<p>asks for cause therefore no marks for just describing the change</p> <p>must link reason to a correct change in a gas</p> <p>accept idea of 'used' to indicate a decrease</p> <p>ignore respiration</p> <p>ignore volcanoes</p> <p>accept idea of 'given out / produced'</p> <p>ignore respiration</p> <p>accept idea of 'given out / produced'</p> <p>ignore (increase in) use of fossil fuels / deforestation</p>	2
7(b)	<p>(because methane's) boiling point is greater than the average / surface temperature <b>or</b> Titan's (average / surface) temperature is below methane's boiling point</p> <p>any methane that evaporates will condense</p>	<p>ignore references to nitrogen <b>or</b> water</p> <p>accept boils for evaporates</p> <p>accept cooling and produce rain for condensing</p>	1 1

**Question 7 continued on next page...**

**COMPONENT NUMBER: CHY1H****COMPONENT NAME: Science B / Chemistry****STATUS: Final****DATE: June 2008****Question 7 continued...**

question	answers	extra information	mark
7(c)(i)	$  \begin{array}{c}  \text{H} \qquad \qquad \text{H} \\    \qquad \qquad \quad   \\  \text{C} = \text{C} - \text{C} - \text{H} \\    \qquad   \qquad   \\  \text{H} \qquad \text{H} \qquad \text{H}  \end{array}  $	bonds must be displayed correctly ignore bond angles	1
7(c)(ii)	poly(propene) / polypropene / polypropylene  any <b>two</b> from: <ul style="list-style-type: none"> <li>• double bonds open up / break / become single</li> <li>• propene molecules / monomers / they join / undergo <u>addition</u> polymerisation</li> <li>• form chains / long molecules</li> </ul>	do <b>not</b> allow polypropene  } correct chemical equation gains <b>2</b> marks  ignore large  using monomer incorrectly max <b>2</b> marks	1  2
<b>Total</b>			<b>8</b>