



**General Certificate of Secondary Education**

**Science B 4462 / Chemistry 4411**

**CHY1H Unit Chemistry 1**

**Mark Scheme**

*2011 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.

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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)	very little / low percentage of metal (in the ore)	accept <u>only</u> 0.5% metal in the ore <b>or</b> over 99% waste in the ore <b>or</b> nearly 100% waste in the ore  ignore reference to percentage of metal in the Earth's crust <b>or</b> energy used or pollution	1
1(a)(ii)	any <b>one</b> from <ul style="list-style-type: none"> <li>• iron uses less energy / fuel for extraction</li> <li>• iron has more uses</li> <li>• more demand for iron</li> <li>• iron is stronger</li> <li>• cheaper / costs less</li> <li>• easier to extract</li> </ul>	(it = iron)  ignore electrolysis / uses electricity / reactivity  ignore high abundance in the Earth's crust / high percentage of metal in ore  ignore harder	1
1(b)(i)	has <u>melting</u> point lower than 950°C	(it = aluminium) allow has a low <u>melting</u> point ignore boiling point	1
1(b)(ii)	electrode(s) made of carbon  oxygen reacts with electrode(s) / carbon	accept $C + O_2 \rightarrow CO_2$  NB oxygen reacts with the carbon electrode(s) = <b>2</b> marks	1  1

Question 1 continues on the next page

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**CHY1H**
**Question 1 contd**

question	answers	extra information	mark
1(b)(iii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• saves resources / non renewable</li> <li>• landfill problem</li> <li>• saves energy / fuel / electricity</li> <li>• less carbon dioxide / carbon emissions or reduces carbon footprint</li> <li>• less quarrying / mining</li> </ul>	accept aluminium / ore will run out or conserves aluminium  accept aluminium does not corrode  ignore global warming  ignore consequences of quarrying / mining  ignore pollution / harms environment / costs / easy to recycle	2
<b>Total</b>			<b>7</b>

## CHY1H

## Question 2

question	answers	extra information	mark
2(a)	crude oil / it is evaporated / vaporised	ignore heated	1
	vapours / gases / fractions <u>cool and condense</u>	accept named fraction(s)	1
	(different) vapours / gases / fractions (condense) at different temperatures	accept (different) vapours / gases / fractions have different boiling points max <b>2</b> marks for description of laboratory method <b>or</b> mention of cracking	1
2(b)(i)	any <b>one</b> from: <ul style="list-style-type: none"> <li>range of boiling points</li> <li>range of carbon atoms</li> </ul>		1
2(b)(ii)	greater the number (of carbon atoms) the higher the boiling point	do <b>not</b> accept molecules / particles	1
2(c)(i)	burning / combustion	allow oxidation / redox	1
2(c)(ii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>cracking / (thermal) decomposition</li> <li>heat / vaporise</li> <li>catalyst / aluminium oxide</li> </ul>	reaction with hydrogen gains max of <b>1</b> mark only  allow porous pot ignore names of other catalysts	2
<b>Total</b>			<b>8</b>

## CHY1H

## Question 3

question	answers	extra information	mark
3(a)(i)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• used by plants</li> <li>• used for photosynthesis</li> <li>• absorbed / dissolved in oceans</li> <li>• locked up in fossil fuels / limestone / sedimentary rocks</li> </ul>	allow specific plants and algae ignore oxygen released / respiration ignore oceans formed	2
3(a)(ii)	calcium carbonate / CaCO <sub>3</sub>  decomposed / thermal decomposition	do <b>not</b> allow reaction with oxygen  accept quicklime / calcium oxide produced CaCO <sub>3</sub> → CaO + CO <sub>2</sub> gains <b>2</b> marks	1  1
3(b)	increasing (CO <sub>2</sub> or global warming)  <u>more rapid</u> increase recently  carbon dioxide causes global warming	accept greenhouse gas <b>or</b> climate change / sea level rising <b>or</b> ice caps melting do <b>not</b> accept ozone layer or acid rain or global dimming	1  1  1

Question 3 continues on the next page



**CHY1H****Question 3 contd**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>3(c)(i)</b>	any <b>one</b> from: <ul style="list-style-type: none"> <li>• Wegener had no evidence / proof</li> <li>• other scientists had different ideas / views</li> <li>• did not respect Wegener as a scientist / geologist</li> </ul>	accept movement too slow to measure  accept continents / plates fixed or land bridge	<b>1</b>
<b>3(c)(ii)</b>	any <b>three</b> from: <ul style="list-style-type: none"> <li>• plates (move)</li> <li>• heat energy / radioactivity (causes)</li> <li>• convection currents</li> <li>• in mantle</li> </ul>	ignore continents	<b>3</b>
<b>Total</b>			<b>11</b>

## CHY1H

## Question 4

question	answers	extra information	mark
4(a)(i)	removal of oxygen	accept definition in terms of electrons <b>or</b> oxidation numbers ignore oxides	1
4(a)(ii)	2 (Cl <sub>2</sub> )	allow correct multiples	1
4(a)(iii)	no atoms are lost / made (during a chemical reaction) <b>or</b> the atoms are rearranged (during a chemical reaction)	accept because of (the law of) conservation of mass / matter	1
4(b)(i)	sodium is more reactive (than titanium)	accept sodium is very reactive <b>or</b> titanium is less reactive do <b>not</b> accept sodium is more reactive than argon	1
4(b)(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• sodium / titanium would react with oxygen / air</li> <li>• sodium / titanium does not react with argon</li> </ul>	accept air / oxygen is reactive  accept argon is unreactive / inert / a noble gas / in group 0	1
4(c)(i)	all atoms are the same / it only contains one type of atom	accept all ions are the same do <b>not</b> accept only got one atom do <b>not</b> accept all atoms are the same size ignore particles	1
4(c)(ii)	two <u>different</u> / <u>types</u> atoms / elements / ions  bonded / joined together	accept more than one type of atom / ion / element do <b>not</b> accept different size  accept definite proportions do <b>not</b> accept mixture	1  1
<b>Total</b>			<b>8</b>

**CHY1H****Question 5**

Question	Advantages	Disadvantages	
<u>Reused</u>	<ul style="list-style-type: none"> <li>• saves raw materials / crude oil</li> <li>• saves energy / fuel / transport</li> <li>• fewer bags needed / made</li> <li>• reduces carbon / CO<sub>2</sub> emissions</li> <li>• reduces use of landfill</li> <li>• saves cost of a new bag</li> <li>• no waste</li> </ul>	<ul style="list-style-type: none"> <li>• unable to reuse many times</li> <li>• bags easily split</li> </ul>	1
<u>Recycled</u>	<ul style="list-style-type: none"> <li>• saves raw materials / crude oil</li> <li>• saves energy / use of fuel</li> <li>• reduces carbon / CO<sub>2</sub> emissions</li> <li>• reduces use of landfill</li> <li>• can be used for new products</li> </ul>	<ul style="list-style-type: none"> <li>• has to be collected / transported / washed / separated / melted</li> </ul> <p>ignore uses energy</p>	1
<u>Burned</u>	<ul style="list-style-type: none"> <li>• heat / energy released can be used (for heating / generating electricity)</li> <li>• reduces use of landfill</li> </ul>	<ul style="list-style-type: none"> <li>• has to be collected / transported</li> <li>• wastes the resource / plastic</li> <li>• releases harmful gases / toxic gases / CO<sub>2</sub></li> </ul>	1
<u>Dumped</u>	<ul style="list-style-type: none"> <li>• collected / transported with household waste</li> <li>• (slowly) biodegrades <b>or</b> produces methane which can be used as a fuel</li> <li>• (not biodegradable so) does not release CO<sub>2</sub> / green house gas into the air</li> </ul>	<ul style="list-style-type: none"> <li>• wastes the resource</li> <li>• plastic uses landfill</li> <li>• produces methane which is a greenhouse gas / could cause explosions</li> <li>• not biodegradable / take years to decompose</li> </ul>	1
ignore cost / litter / waste / global warming / habitats unless mentioned above			
<b>Total</b>			<b>4</b>

## CHY1H

## Question 6

question	answers	extra information	mark
6(a)	carbon / diesel / it reacts / burns in oxygen / air		1
	limited supply (of oxygen / air)	accept incomplete combustion  $2C + O_2 \rightarrow 2CO$ <b>or</b> $C + CO_2 \rightarrow 2CO$ gains <b>2</b> marks	1
6(b)	any <b>four</b> from:	accept converse statements for fossil diesel. ignore cost / ease of manufacture / usage issues	4
	for biodiesel: <ul style="list-style-type: none"> <li>• less global dimming (because fewer carbon particles)</li> <li>• less acid rain (because less sulfur dioxide)</li> <li>• renewable resource / sustainable</li> <li>• use <u>waste</u> vegetable oils / fats</li> <li>• vegetables / plants absorbed carbon dioxide / carbon neutral</li> <li>• uses land which could be used to produce food</li> <li>• third world countries can produce bio diesel</li> <li>• biodegrades easily</li> <li>• more NO<sub>x</sub> released</li> </ul> justified conclusion	if neither point awarded, fewer carbon particles and less sulfur dioxide = <b>1</b> mark  accept fossil fuel / diesel supplies are limited  accept fossil fuel / diesel releases locked up carbon / is not carbon neutral	
<b>Total</b>			<b>7</b>