



# **General Certificate of Secondary Education**

## **Additional Science 4463 / Chemistry 4421**

**CHY2F                  Unit Chemistry 2**

### **Mark Scheme**

*2010 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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## Marking Guidance for Examiners

### GCSE Science Papers

#### 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. Boldening

- 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 boldened. 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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**CHY2F****Question 1**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>1(a)</b>	white to blue	accept colourless to blue	<b>1</b>
<b>1(b)</b>	reversible		<b>1</b>
<b>Total</b>			<b>2</b>

**CHY2F****Question 2**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
2(a)(i)	nucleus		1
2(a)(ii)	neutron		1
2(a)(iii)	electron		1
2(b)(i)	6		1
2(b)(ii)	12		1
2(c)	14 C 6		1
2(d)(i)	CH <sub>4</sub>		1
2(d)(ii)	compound		1
2(d)(iii)	covalent		1
<b>Total</b>			<b>9</b>

**CHY2F****Question 3**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>3(a)</b>	the glow stick is brighter (owtte)	accept glow stick is less bright <b>at low temperatures</b> (owtte)  ignore references to rate / particles	1
<b>3(b)</b>	gave out light for less time	accept use of figures from table for comparison  allow reference to speed / rate eg quicker / faster reaction	1
<b>3(c)</b>	the particles will collide more often		1
	the particles will move faster		1
	the particles will have more energy		1
<b>3(d)</b>	any <b>one</b> from: <ul style="list-style-type: none"> <li>• repeat</li> <li>• measure brightness eg use light meter</li> <li>• more temperatures <b>or</b> wider range</li> <li>• improve precision</li> </ul>	allow more glow sticks	1
<b>Total</b>			<b>6</b>

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**CHY2F****Question 4**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
4(a)	carbon		1
4(b)	all		1
4(c)	covalent		1
4(d)	four		1
4(e)	hard		1
<b>Total</b>			<b>5</b>

## CHY2F

## Question 5

question	answers	extra information	mark
5(a)(i)	precipitation		1
5(a)(ii)	filtration		1
5(a)(iii)	lead nitrate		1
	sodium iodide		1
5(b)	<p>any <b>four</b> from:</p> <ul style="list-style-type: none"> <li>• magnesium (atom) reacts with <b>two iodine (atoms)</b></li> <li>• magnesium (atom) loses</li> <li>• <b>2</b> electrons</li> <li>• iodine (atom) gains</li> <li>• <b>1</b> electron <b>or</b> an electron</li> <li>• iodide ion formed</li> <li>• iodide has negative charge / is a negative ion / particle</li> <li>• magnesium ion formed</li> <li>• magnesium has positive charge</li> <li>• oppositely charged ions attract</li> <li>• a giant structure / lattice is formed</li> </ul>	<p>sharing / covalent / metallic = max <b>3</b></p> <p>allow iodine ion allow iodine ignore I<sup>2-</sup></p> <p>if reference to ions being formed is made unqualified, allow <b>1</b> mark</p>	4
<b>Total</b>			<b>8</b>

## CHY2F

## Question 6

question	answers	extra information	mark
6(a)(i)	(nitrogen) + hydrogen → ammonia	accept H <sub>2</sub> and NH <sub>3</sub> ignore incorrect symbols ignore balancing	1
6(a)(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• catalyst</li> <li>• to speed up the reaction</li> <li>• lower activation energy</li> </ul>	ignore causes reaction ignore heat / reference to particles	1
6(a)(iii)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• cooled</li> <li>• ammonia condenses / turns into liquid</li> <li>• nitrogen and hydrogen do not condense / turn into liquid</li> </ul> <p><b>or</b></p> nitrogen and hydrogen stay as gases	it = ammonia  ignore references to boiling point  if no marks awarded accept pass through / separated in condenser <b>or</b> unreacted nitrogen and hydrogen / gases recycled for <b>1</b> mark	2

Question 6 continues on the next page

## CHY2F

## Question 6 continued

question	answers	extra information	mark
6(b)	80	<p>correct answer with or without working gains <b>2</b> marks</p> <p>ignore units</p> <p>if answer incorrect, evidence of correct <i>working</i> gains <b>1</b> mark</p> <p>eg</p> $14 + (4 \times 1) + 14 + (3 \times 16) (= 70)$ <p><b>or</b></p> $2N + 4H + 30$	2
6(c)	<p>fertiliser is <b>C</b></p> <p>evidence of correct working</p>	<p>examples of minimum correct working:</p> <p>39/101</p> <p><b>or</b></p> <p>14/101</p> <p><b>or</b></p> <p>38.61/100</p> <p><b>or</b></p> <p>13.86/100</p>	<p>1</p> <p>1</p>
<b>Total</b>			<b>8</b>

**CHY2F****Question 7**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
7(a)(i)	(different) properties	allow ideas of different property / behaviour / element	1
7(a)(ii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• they had high status</li> </ul> <b>or</b> <p>they were lecturers / doctors / professors / famous scientists</p> <ul style="list-style-type: none"> <li>• other scientists repeated experiments</li> </ul> <ul style="list-style-type: none"> <li>• they had proof</li> </ul> <b>or</b> <p>lots of / strong / conclusive / enough / clear evidence</p>	they = Crawford + Cruikshank  allow experiment could be repeated allow other scientists showed they had different properties  ignore evidence unqualified	1
7(a)(iii)	other scientists obtained similar results / proved it  <b>or</b> experiments were repeated		1

**Question 7 continues on the next page**

## CHY2F

## Question 7 continued

question	answers	extra information	mark
7(b)(i)	any <b>one</b> from: <ul style="list-style-type: none"> <li>mass of solid / strontium (chloride) / barium (chloride)</li> <li>volume of water</li> <li>type of container</li> </ul>	allow amount / volume  allow amount / mass  allow initial / starting temperature (of water)  ignore room temperature / time / concentration  ignore reference to hydrochloric acid	1
7(b)(ii)	2 <b>and</b> takes in heat / energy  <b>or</b>  2 <b>and</b> temperature goes down (owtte)		1
7(b)(iii)	temperature increased for one experiment and decreased for the other (owtte)  <b>or</b>  one was exothermic and one was endothermic (owtte)	accept experiment 1 was exothermic	1
7(c)	any <b>one</b> from <ul style="list-style-type: none"> <li>positive / + (charge)</li> <li>opposite (charges) attract</li> </ul>	do <b>not</b> accept incorrect further qualification eg electrons / atoms / electrodes	1
<b>Total</b>			<b>7</b>