



## **General Certificate of Secondary Education**

# **Chemistry 4421**

**CHY3F                  Unit Chemistry 3**

# **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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**CHY3F****Question 1**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>1(a)(i)</b>	Sb		<b>1</b>
<b>1(a)(ii)</b>	Se		<b>1</b>
<b>1(a)(iii)</b>	Sn		<b>1</b>
<b>1(a)(iv)</b>	Si		<b>1</b>
<b>1(b)(i)</b>	elements		<b>1</b>
<b>1(b)(ii)</b>	potassium (K)		<b>1</b>
<b>1(b)(iii)</b>	0		<b>1</b>
<b>Total</b>			<b>7</b>

**CHY3F****Question 2**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>2(a)</b>	goes up		1
<b>2(b)(i)</b>	B		1
<b>2(b)(ii)</b>	A		1
<b>2(b)(iii)</b>	a catalyst		1
	activation energy		1
<b>2(c)(i)</b>	eg (ensures) complete reaction <b>or</b> even heating	allow spread heat / energy  allow mixes properly or mix them together or to get correct temperature  ignore dissolves	1
<b>2(c)(ii)</b>	lid (on beaker) <b>or</b> insulate (beaker) / use a plastic cup	accept cover beaker	1
<b>Total</b>			<b>7</b>

**CHY3F****Question 3**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>3(a)(i)</b>	sodium hydroxide solution		1
	blue		1
<b>3(a)(ii)</b>	barium chloride		1
	white		1
<b>3(b)</b>	fully ionised in water		1
<b>3(c)(i)</b>	H <sup>+</sup> ions		1
<b>3(c)(ii)</b>	lower than		1
<b>3(d)(i)</b>	(indicator) changed colour / goes colourless	ignore clear / discoloured	1
<b>3(d)(ii)</b>	13.9		1
	or (titration) 2		
<b>3(d)(iii)</b>	13.2	ecf from 3(d)(ii)	1
<b>Total</b>			<b>10</b>

**CHY3F****Question 4**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>4(a)(i)</b>	orange		1
<b>4(a)(ii)</b>	colourless		1
<b>4(a)(iii)</b>	a carbon carbon double bond		1
<b>4(b)(i)</b>	C		1
<b>4(b)(ii)</b>	B		1
<b>4(b)(iii)</b>	only produces water <b>or</b> does not produce carbon dioxide	do <b>not</b> accept CO <sup>2</sup>	1
<b>Total</b>			<b>6</b>



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## Question 5

question	answers	extra information	mark
5(a)(i)	Mountain View: (65+35 =)100		1
	Valley Croft: (16+14 =) 30		1
	<b>OR</b>		
	Mountain View Ca (65) is about 4 times Valley Croft (Ca 16) (1)		
	Mountain View Mg (35) is about twice Valley Croft (Mg 14) (1)		
		ignore other ions unless used in another calculation or calculations. In this case the list principle applies	
		if no other mark awarded either:	
		Ca 65 compared with Ca 16 <b>and</b> Mg 35 compared with Mg 14 gains <b>1</b> mark	
		<b>or</b>	
		difference in Ca (65 – 16) = 49 <b>and</b> Mg (35 – 14) = 21 gains <b>1</b> mark	
5(a)(ii)	shake / stir / swirl (water with soap)	allow mix ignore add / use soap / titrate	1
	(about) <u>3</u> × the scum / precipitate / solid (compared with Valley Croft)	accept (about) 3 × volume / drops / amount / quantity of soap solution for (permanent) lather (compared with Valley Croft)	1
	fair test: eg same volume / amount of <u>water</u> <b>or</b> shake for same amount of time <b>or</b> use same type / concentration of soap	ignore scale / time  allow same temperature do <b>not</b> accept same volume of soap  ignore repeat the experiment	1

Question 5 continues on the next page . . .

## CHY3F

## Question 5 continued . . .

question	answers	extra information	mark
5(b)	strong(er) teeth / bones  or  good for heart	allow contains calcium (ions / compounds)  ignore magnesium or charge on the calcium ion do <b>not</b> accept any other ions	1
5(c)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• produces scale / limescale / calcium carbonate / magnesium carbonate</li> <li>• produces scum</li> <li>• more soap needed</li> <li>• costs more to soften water</li> <li>• (scale) lowers efficiency of appliances</li> </ul>	ignore health effects  allow fur for scale  allow doesn't lather easily ignore detergent  allow costs if qualified  ignore just damage to pipes	1
5(d)(i)	water / everything is made of / contains chemicals or water contains named ion from the label	accept company (probably) means water contains no added substances ignore water has not been treated	1
5(d)(ii)	Valley Croft scientists may be biased / vested interest	accept Food Standards Agency / independent scientists (more likely to be) unbiased  allow Valley Croft scientists may falsify results ignore accuracy / reliability / fairness / validity	1
<b>Total</b>			<b>9</b>

## CHY3F

## Question 6

question	answers	extra information	mark
6(a)(i)	(copper) stops barnacles / seaweed (sticking)	it = copper accept lead doesn't stop barnacles / seaweed (sticking) ignore all other properties	1
6(a)(ii)	(Muntz Metal) is less expensive / cheaper / cheapest	it = Muntz Metal must be a comparison accept copper is more expensive ignore other properties	1
6(b)(i)	atomic absorption spec(troscopy) / spectrometry <b>or</b> mass spec(trometry) / spectroscopy	accept spectroscopy / spectrometry alone allow AAS / MS do <b>not</b> allow NMR spectroscopy <b>or</b> IR spectrometry <b>or</b> chromatography	1
6(b)(ii)	sensitive <b>or</b> detect (very) small amounts <b>or</b> only small sample needed	it = instrumental method allow (more) precise ignore accurate  allow converse for chemical method ignore metal contains small amount / low concentration of iron	1
6(c)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• unreactive / not very reactive</li> <li>• strong / hard</li> <li>• malleable / easy to shape</li> </ul>	transition elements (= they)  allow does not corrode  ignore reference to rust  ignore tough / durable / hard wearing  ignore ductile / density / melting point	2
<b>Total</b>			<b>6</b>

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