



## **General Certificate of Secondary Education**

# **Additional Science 4463 / Chemistry 4421**

**CHY2F      Unit 2 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: CHY2F****COMPONENT NAME: Additional Science / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
1(a)(i)	(phosphoric) acid	allow phosphoric acid	1
1(a)(ii)	hydrogen		1
1(b)(i)	faster / quicker / speeds it up (owtte)	allow answers based on activation energy ignore helps it to react	1
1(b)(ii)	most of the starting materials end up as useful products		1
1(b)(iii)	H <sub>2</sub> O	allow HOH or OH <sub>2</sub>	1
<b>Total</b>			<b>5</b>

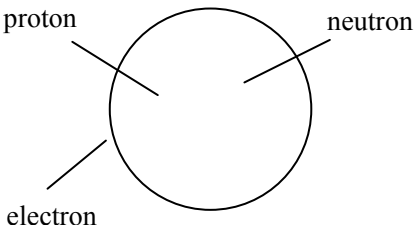
question	answers	extra information	mark
2(a)	any <b>two</b> from: <ul style="list-style-type: none"> <li>increases</li> <li>until reaches maximum / levels off</li> <li>quickly at first</li> <li>then more slowly / rate decreases</li> </ul>	owtte allow 'goes up' owtte owtte allow reaction finished ignore rate increases	2
2(b)	use a more concentrated acid use zinc powder	list principle applies	2
<b>Total</b>			<b>4</b>

**COMPONENT NUMBER: CHY2F****COMPONENT NAME: Additional Science / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
3	high	allow covalent	1
	giant		1
	four		1
	covalent		1
<b>Total</b>			<b>4</b>

question	answers	extra information	mark
4(a)	the bag gets cold because heat energy is taken in from the surroundings		1
4(b)	endothermic		1
4(c)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• mix / spread (the ammonium nitrate and water)</li> <li>• dissolve <u>faster</u></li> <li>• get cold <u>faster</u> <b>or</b> so the <u>whole</u> bag gets cold</li> <li>• particles collide <u>more</u> <b>or</b> <u>more</u> collisions</li> </ul>	} allow increase rate <b>or</b> quicker reaction	2
<b>Total</b>			<b>4</b>

**COMPONENT NUMBER: CHY2F****COMPONENT NAME: Additional Science / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
5(a)(i)	proton  neutron electron	all three correct <b>2</b> marks one correct <b>1</b> mark	2
5(a)(ii)	14		1
5(b)	A		1
5(c)(i)	ammonia can break up to form nitrogen and hydrogen  ammonia is made from nitrogen and hydrogen	list principle applies	2
5(c)(ii)	air		1
5(d)	ammonium nitrate		1
<b>Total</b>			<b>8</b>

**COMPONENT NUMBER: CHY2F****COMPONENT NAME: Additional Science / Chemistry****STATUS: Final****DATE: June 2008**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
6(a)(i)	small <b>or</b> few atoms thick <b>or</b> size in the range 1–100 nanometres	owtte	1
6(a)(ii)	sensible idea of passing through smaller gaps owtte	eg can pass through skin / pores / cells <b>or</b> more easily <u>absorbed</u>	1
6(b)	any <b>two</b> from: <ul style="list-style-type: none"> <li>• good at absorbing UV light / radiation</li> <li>• spread more easily</li> <li>• cover better</li> <li>• save money / use less</li> <li>• transparent</li> <li>• less chance of getting skin cancer <b>or</b> stops skin cancer</li> </ul>	ignore more effective alone	2
6(c)	toxic to (cells / specific cells)	allow harm / damage / kill <b>or</b> cause cancer	1
<b>Total</b>			<b>5</b>

**COMPONENT NUMBER: CHY2F****COMPONENT NAME: Additional Science / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
7(a)	157	correct answer with <b>or</b> without working  $(2 \times 19 + 119)$ for <b>1</b> mark only  allow $(119 + 19 =)$ 138 for <b>1</b> mark only  ignore units	2
7(b)	24.2	accept answers in the range 24 to 24.2038.....  ignore incorrect rounding after correct answer  25 only without working gains <b>1</b> mark <b>or</b>  $38/157 \times 100$ gains <b>1</b> mark <b>or</b>  $(19/157 \times 100 =)$ <u>12 to 12.1</u> gains <b>1</b> mark  allow error carried forward from part(a)  $38/(a) \times 100$ gains <b>2</b> marks if calculated correctly  $(19/138 \times 100 =)$ <u>13.8</u> gains <b>1</b> mark	2
7(c)	0.29	accept answers in the range 0.28 to 0.3  allow error carried forward from part (b)  $(b)/100 \times 1.2$ correctly calculated  ignore units	1

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

**COMPONENT NUMBER: CHY2F****COMPONENT NAME: Additional Science / Chemistry****STATUS: Final****DATE: June 2008****Question 7 continued...**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
7(d)	an <u>electron</u>	allow electrons	1
		allow electron shared / lost for <b>1</b> mark	
		apply list principle for additional particles	
	is gained owtte	must be linked to electron	1
		accept can hold / take in if in correct context	
		eg it can hold another electron (in its outer shell) = <b>2</b> marks	
		it can take an electron (from another atom) = <b>2</b> marks	
		ignore reference to fluoride ions	
		incorrect number of electrons gained does <b>not</b> gain the second mark	
<b>Total</b>			<b>7</b>

**COMPONENT NUMBER: CHY2F****COMPONENT NAME: Additional Science / Chemistry****STATUS: Final****DATE: June 2008**

question	answers	extra information	mark
8(a)	(propanone) has a low(er) boiling point  or (propanone) evaporates fast(er) owtte	or water has a high(er) boiling point or water evaporates slow(er)  allow propane / solution / it  allow evaporates at lower temperature or boils quicker  ignore density / reactivity / melting point	1
8(b)(i)	0.29	ignore + or –  ignore units	1
8(b)(ii)	any <b>two</b> sensible suggestions eg: <ul style="list-style-type: none"> <li>• weighing error</li> <li>• (copper) lost during washing owtte</li> <li>• (copper) lost during electrolysis / reaction owtte</li> <li>• electrodes not completely dry</li> <li>• impurities in the electrode</li> <li>• copper falling off when removing electrode / copper from cell</li> </ul>	accept human error or inaccurate measurements  allow different washing of electrodes      ignore timing errors ignore 'fair test' ignore sludge ignore gases produced	2

**Question 8 continued on next page...**

**COMPONENT NUMBER: CHY2F****COMPONENT NAME: Additional Science / Chemistry****STATUS: Final****DATE: June 2008****Question 8 continued...**

question	answers	extra information	mark
8(c)	any <b>four</b> from: <ul style="list-style-type: none"> <li>• impure copper is anode / positive (electrode)</li> <li>• pure copper is cathode / negative (electrode)</li> <li>• copper sulfate solution <b>or</b> any soluble copper salt in solution</li> <li>• copper loses electrons <b>or</b> copper is oxidised</li> <li>• copper forms positive ions / particles</li> <li>• copper gains electrons <b>or</b> copper reduced at <u>negative electrode</u></li> <li>• copper attracts to / collects at <u>negative electrode</u></li> <li>• sludge / impurities collect at the bottom of the cell</li> <li>• impurities not attracted to electrode</li> </ul>	} as alternative to these two points $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^- = 2 \text{ marks}$  <b>or</b> $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$ at <u>negative electrode</u>  allow sludge left behind <b>or</b> sludge left in solution <b>or</b> impurities separated from copper  ignore get rid of impurities	4
<b>Total</b>			<b>8</b>