



**General Certificate of Secondary Education**

**Additional Science 4463 /  
Chemistry 4421**

**CHY2F      Unit Chemistry 2**

**Mark Scheme**

*2010 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.

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.

**CHY2F****Question 1**

question	answers	extra information	mark
<b>1</b>	the atoms are in layers		1
	the atoms can slide over each other		1
<b>Total</b>			<b>2</b>

**Question 2**

question	answers	extra information	mark
<b>2(a)</b>	fertilisers		1
<b>2(b)</b>	air		1
<b>2(c)(i)</b>	water <b>and</b> carbon monoxide on correct side of equation	accept H <sub>2</sub> O for water and CO for carbon monoxide	1
<b>2(c)(ii)</b>	speeds up the reaction (owtte)	accept lowers the activation energy	1
<b>2(d)</b>	reversible reaction		1
<b>2(e)(i)</b>	10		1
<b>2(e)(ii)</b>	sulfuric	accept H <sub>2</sub> SO <sub>4</sub>	1
	water	accept H <sub>2</sub> O / hydrogen oxide	1
<b>Total</b>			<b>8</b>

## CHY2F

## Question 3

question	answers	extra information	mark
3(a)(i)	protons		1
3(a)(ii)	neutrons		1
3(b)	<p>heavier than</p> <p>H-2 atoms are heavier than H-1 atoms</p> <p><b>or</b></p> <p>the hydrogen atoms are heavier / more particles in the nucleus of the <u>hydrogen</u> atoms / one more particle in each <u>hydrogen</u> atom / a neutron in each <u>hydrogen</u> atom etc</p> <p><b>or</b></p> <p>molecule A has more particles / neutrons</p> <p><b>or</b></p> <p>molecule A has a larger nuclear mass / atomic mass</p> <p>A has two more neutrons than B</p>	<p>can be awarded even if they do not circle heavier than</p> <p>must be linked to heavier than</p> <p>a correct explanation of the increase in mass by ref. to the particles in the <u>hydrogen</u> atoms</p> <p>ignore reference to particles in the oxygen atoms</p> <p>do <b>not</b> accept incorrect numbers of particles</p> <p>accept molecule A has more protons and neutrons</p> <p>molecule A has higher mass numbers</p> <p>hydrogen has a greater mass number in A</p> <p>all the numbers in the molecule A add up to 6 and in molecule B add up to 4</p> <p>molecule A has</p> $\begin{array}{c} 2 \\ \text{H} \\ 1 \end{array}$ <p>and B</p> $\begin{array}{c} 1 \\ \text{H} \\ 1 \end{array}$	<p>1</p> <p>1</p>
<b>Total</b>			<b>4</b>

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**CHY2F****Question 4**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>4(a)</b>	the diameter of the tube is very small		1
<b>4(b)(i)</b>	three		1
<b>4(b)(ii)</b>	covalent		1
<b>4(b)(iii)</b>	bonds		1
<b>Total</b>			<b>4</b>

**CHY2F****Question 5**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
5(a)(i)	48		1
5(a)(ii)	3		1
5(b)	heat / energy		1
	given out / transfers to surroundings	the mark for given out / transfers to cannot be awarded without heat / energy  allow given off	1
5(c)	it has a low boiling point		1
	it is made of small molecules		1
<b>Total</b>			<b>6</b>

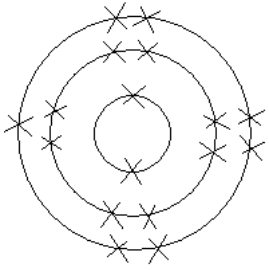


**CHY2F****Question 6**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>6(a)(i)</b>	mix (owtte)	accept to allow more collisions / helps particles to collide (owtte)  idea of more efficient heat transfer  do <b>not</b> allow heat is a catalyst	1
<b>6(a)(ii)</b>	higher <b>and</b> more		1
	powder <b>and</b> big		1
	concentrated <b>and</b> more		1
<b>6(b)</b>	electrons		1
<b>6(c)</b>	H <sup>+</sup>		1
<b>Total</b>			<b>6</b>

## CHY2F

## Question 7

question	answers	extra information	mark
7(a)		accept dots / crosses / e must be drawn on diagram electrons do not need to be paired ignore brackets or + or –charges ignore 2,8,7	1
7(b)	(one) electron  lost / given away / transferred from sodium / transferred to chlorine owtte	recognition that electrons are involved  must be linked to electrons accept loses electron(s) for <b>2</b> marks NB loses 2 or more electrons gains <b>1</b> mark reference to sharing / covalent max <b>1</b> mark ignore charges on ions formed	1  1
7(c)(i)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• ions / atoms / they are / it is negatively charged / anions</li> <li>• opposite (charges) attract</li> </ul>	accept they are negative  accept they are <u>attracted</u> or it is oppositely charged  ignore opposite forces attract	1
7(c)(ii)	hydrogen	accept H <sub>2</sub>  ignore H or H <sup>+</sup>	1

Question 7 continues on next page

**CHY2F****Question 7 continued**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
7(d)(i)	poisons released into environment (owtte)	accept any sensible idea of harm / harmful / poisons / poisonous / pollution / damaging  do <b>not</b> accept answers such as global warming / ozone layer etc.  ignore safety unless qualified	1
7(d)(ii)	any <b>one</b> sensible idea eg <ul style="list-style-type: none"> <li>• loss of work / unemployment <b>or</b> company goes out of business</li> <li>• any adverse effect on local economy (owtte)</li> <li>• any adverse effect on paper production / cost of paper / cost of water (treatment)</li> <li>• chlorine (compounds) have been used (for many years) without causing harm owtte</li> <li>• only a tiny amount of chlorine is released so it would not cause harm</li> </ul>	eg shops / house prices etc.  allow less expensive to use chlorine or converse  ignore uses of chlorine to treat drinking water unless qualified	1
7(d)(iii)	ideas related to bias	accept more reliable or valid or fair  ignore more accurate / fair test	1
<b>Total</b>			<b>8</b>

**CHY2F****Question 8**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>8(a)</b>	gas / g	accept low density / low boiling point <b>or</b> weak intermolecular forces <b>or</b> small molecules <b>or</b> simple molecules <b>or</b> simple molecular (structure)  accept volatile <b>or</b> easy to evaporate  ignore very light  ignore incorrect name of gas	1
<b>8(b)</b>	filter / filtration	accept filter paper  accept decant / centrifuge  ignore filter funnel / sieving / drained off / funnelling  ignore names of compounds  ignore evaporation / heating if after filtration  do <b>not</b> accept crystallisation	1
<b>8(c)</b>	evaporation / crystallisation	accept heating / boiling  accept 'leave for a few days' owtte  allow cool  do <b>not</b> allow freeze  ignore filtration	1

**Question 8 continues on next page**

**CHY2F****Question 8 continued**

question	answers	extra information	mark
<b>8(d)</b>	candidates can gain marks from any two of the three linked pairs		
	hydrogen chloride escaped / released (into atmosphere) <b>or</b> (hydrogen chloride) damaged vegetation / harmful	to get both of these <b>2</b> marks hydrogen chloride must be mentioned ignore HCl formed / produced / made	1
	used to make chlorine / bleach		1
	unpleasant smell (of calcium sulfide) <b>or</b> waste of calcium (sulfide)	ignore calcium sulphide alone allow calcium / calcium sulfate for calcium sulphide	1
	converted to sulfur <b>or</b> used to make sulfuric acid	to get both of these 2 marks calcium (sulfide) must be mentioned ignore sale of calcium sulfide	1
	unreacted coal (1)	must be linked to first coal point	
	recycled / burnt / used / sold (1)		
<b>Total</b>			<b>7</b>