Version : 07/03/2012

General Certificate of Secondary Education

Science A 4405 / Chemistry 4402

CH1FP Unit Chemistry 1

Mark Scheme

2012 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 students' 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 students' 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 students' 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 students 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)

Student	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)

Student	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student 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.

Quality of Written Communication and levels marking

In Question 5(b) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: Basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: Clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: Detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

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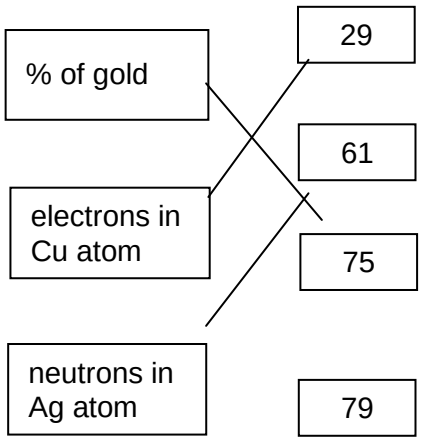
Question 1

question	answers	extra information	mark
1(a)	+1/+ electron	do **not** accept 1 without the + allow phonetic spelling	1 1
1(b)(i)	elements		1
1(b)(ii)	non-metal		1
1(c)	soft an alloy		1 1
1(d)		**one** mark for each correct link extra lines lose the mark	3
Total			9

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Question 2

question	answers	extra information	mark
2(a)	reduction		1
2(b)	carbon is less reactive than aluminium		1
2(c)		they = aluminium ions ignore particle names	
	aluminium (ions) / they are positively charged	accept aluminium (ions) / they are cations allow aluminium (ions) / they have an opposite charge	1
	so they are attracted **or** they move towards the negative electrode **OR** aluminium (ions) / they need to gain electrons (1) which come from the negative electrode (1)	if no other marks awarded allow 'opposites attract' for **1** mark	1
2(d)	aluminium has a low density		1
	aluminium is resistant to corrosion		1
2(e)	**advantage** less carbon dioxide is produced		1
	disadvantage used aluminium cans have to be collected and transported		1
Total			**8**

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Question 3

question	answers	extra information	mark
3(a)(i)	hydrocarbons		1
3(a)(ii)	ethane has the smallest molecules heptadecane has the highest boiling point		1 1
3(a)(iii)	evaporating condense		1 1
3(b)(i)	**W** **Y**		1 1
3(b)(ii)	floats	if no answer written on line, allow correct answer indicated in the box	1
3(b)(iii)	open the tap stop the flow of liquid when the water has run out	allow let the water out ignore remove water allow until oil is left behind ignore filter	1 1
Total			**10**

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Question 4

question	answers	extra information	mark
4(a)(i)	fermentation		1
4(a)(ii)	cloudy there is carbon dioxide / CO_2	accept milky / white accept calcium carbonate forms allow a (white) solid / precipitate forms	1 1
4(b)(i)	 (the amount of ethanol used) increases (from 1970) to 1989 then it decreases from 1989 (to 2000)	if no year(s) or incorrect year(s) indicated then max **1** correct year(s) only needs to be indicated once to gain full marks accept values in range 1987-1992	 1 1
4(b)(ii)	any **one** from: • Brazil had more oilfields • cost of crude oil had decreased • cost of ethanol / sugar (cane) had increased • demand for ethanol / sugar (cane) had increased • availability of ethanol / sugar (cane) had decreased • climate change affects growing sugar (cane)	 accept availability of land to grow sugar (cane) had decreased	1
Total			**6**

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Question 5

question	answers	extra information	mark
5(a)	• one / 1 (molecule of) methane (reacts with) two / 2 (molecules of) oxygen		1
	• two / 2 (molecules of) water / steam / hydrogen oxide and one / 1 (molecule of) carbon dioxide (are produced)		1
		if no other marks awarded all four names correct **or** correct number **and** name for two molecules **or** 4 correct numbers gains **1** mark allow all four names correct **and** correct number of atoms in each substance for **2** marks	

Question 5(b) continues on the next page

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Question 5(b) cont'd……

5(b)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2, and apply a 'best-fit' approach to the marking.	6

0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**
No relevant content.	There is a simple description of a positive **and / or** a negative impact caused by the plan to quarry limestone and / or make cement.	There is a clear description of both a positive **and** a negative impact caused by the plan to quarry limestone and / or make cement.	There is a detailed description of both positive impacts **and** negative impacts caused by the plan to quarry limestone and / or make cement.

examples of the chemistry points made in the response

Positive impacts:

- Limestone / cement is used for building
- Limestone needed for industrial processes
- Company landscapes / provides recreation facilities in the quarry after use
- Provides employment
- Improves local economy
- Improved transport links

Negative impacts:

- Destruction of habitats
- Fewer plants / trees to absorb carbon dioxide
- Example of visual pollution
- Example of noise pollution
- Example of atmospheric pollution
- More traffic

Total			**8**

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Question 6

question	answers	extra information	mark
6(a)(i)	C_7H_{16}	mark answer line first answer may be given in the table	1
6(a)(ii)	C_nH_{2n+2}		1
6(b)(i)	carbon monoxide	do **not** accept carbon oxide do **not** accept water ignore CO	1
6(b)(ii)	because of partial / incomplete combustion (in reaction 2) **or** complete combustion (in reaction 1)	allow because there is less / insufficient oxygen (in reaction 2) **or** sufficient oxygen (in reaction 1) allow different amounts of oxygen used (in the reactions) **or** $19O_2$ (in reaction 1) **and** $13O_2$ (in reaction 2) ignore air	1
6(c)(i)	15 (%)	ignore units	1
6(c)(ii)	water (vapour)/steam	allow H_2O / OH_2 / hydrogen oxide	1

Question 6 continues on the next page…….

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Question 6 cont'd…..

question	answers	extra information	mark
6(c)(iii)	sulfur in petrol / crude oil (reacts with oxygen)	it = sulfur dioxide	1
6(c)(iv)	because nitrogen **and** oxygen (are in the air and) react	allow nitrogen **and** oxygen burn accept nitrogen + oxygen → nitrogen oxide **or** symbol equation ignore air	1
	at high temperature (inside a petrol engine)	allow heat / hot (engine)	1
6(d)	because carbon dioxide / it causes global warming **or** because carbon dioxide / it has an impact on oceans	allow because carbon dioxide / it causes greenhouse effect / climate change	1
	because this carbon dioxide / carbon / it was 'locked up' (in fossil fuels) **or** because the percentage/amount of carbon dioxide / it in the atmosphere is increasing		1
Total			**11**

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Question 7

question	answers	extra information	mark
7(a)(i)	6-8	accept any value in the range 6-8	1
7(a)(ii)	any **three** from: • there are many earthquakes predicted by scientists each year • expense / inconvenience / panic caused by government / people taking action • most / some earthquakes do little or no damage • scientists do not know what is happening below the crust • scientists cannot (accurately) predict where the earthquake will occur • scientists cannot (accurately) predict when the earthquake will occur • scientists cannot (accurately) predict the strength of the earthquake	allow scientists / predictions have been wrong ignore lack of evidence allow earthquakes are random If none of the last 3 points have been awarded then 'scientists cannot accurately predict earthquakes' gains **1** mark	3

Question 7 continues on the next page…….

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Question 7 cont'd….

question	answers	extra information	mark
7(b)(i)		allow crust / plate for continent	
	continents were once joined together **or** continents breaking up / separating / fitted like a jigsaw	accept there was a supercontinent / Pangaea	1
	so the continents are moving	accept continents not in fixed positions allow continents move apart for **2** marks if no other mark awarded allow continents drift apart for **1** mark	1
7(b)(ii)		allow credit for both marking points if given in 3(b)(i)	
	convection currents (in the mantle)	accept movement / flow (in the mantle)	1
	caused by heat **or**		
	caused by radioactive processes	ignore chemical reactions	1
Total			**8**

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