



General Certificate of Secondary Education

Chemistry 4421

CHY3F Unit Chemistry 3

Mark Scheme

2012 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 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	Neptune, Mars, Moon	1
2	Neptune, 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.

CHY3F**Question 1**

question	answers	extra information	mark
1(a)	transition elements		1
1(b)	These metals do not react with air		1
	These metals do not react with water		1
Total			3

CHY3F**Question 2**

question	answers	extra information	mark
2(a)	evaporates Sun condenses		3
2(b)(i)	filtration		1
2(b)(ii)	chlorine		1
2(c)	any one from: <ul style="list-style-type: none">• so that it is <u>safe</u> to drink• to prevent (spread of) disease• to sterilise it / disinfect	allow bacteria can be harmful	1
Total			6

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Question 3

question	answers	extra information	mark
3(a)(i)	4		1
3(a)(ii)	(Make) 3		1
	biggest <u>temperature rise</u>		1
3(b)(i)	1008 (kJ)	correct answer with or without working gains 2 marks if incorrect answer given allow evidence of 240×4.2 for 1 mark	2
3(b)(ii)	crisps have a high energy content	allow crisps have lots of calories / kilojoules / fat / one ninth of daily energy intake	1
	so if you take in more energy than you need the excess is stored as fat or crisps contain salt (1) too much salt can cause high blood pressure or heart problems or kidney problems (1)	accept consequences: obesity; heart disease; high blood pressure; diabetes; arthritis	1
Total			7

CHY3F

Question 4

question	answers	extra information	mark
4(a)(i)	hydrogen ions		1
4(a)(ii)	partially ionised		1
4(b)(i)	burette		1
4(b)(ii)	indicator		1
4(b)(iii)	colour change or turns pink		1
4(c)	20.4(0)	correct answer with or without working gains 2 marks if answer incorrect allow 20.80 or $\frac{20.30 + 20.50 + 20.40}{3}$ for 1 mark	2
4(d)	50 (g)	correct answer with or without working gains 2 marks if answer incorrect allow evidence of 1.25×40 for 1 mark	2
Total			9

CHY3F**Question 5**

question	answers	extra information	mark
5(a)(i)	milky		1
	carbonate ions		1
5(a)(ii)	red		1
5(b)(i)	smaller		1
5(b)(ii)	The answer obtained is closer to the true value		1
Total			5

CHY3F

Question 6

question	answers	extra information	mark
6(a)	because the water contains magnesium ions or magnesium compounds / magnesium sulphate	allow magnesium or calcium throughout allow because the water contains magnesium / Mg^{2+} / Mg / Mg^+ / $MgSO_4$	1
	sodium carbonate / carbonate <u>ions</u> reacts with the magnesium <u>ions</u> / magnesium sulfate	do not accept other ions allow sodium <u>ions</u> exchange / displace / magnesium <u>ions</u>	1
	to form solid / insoluble / precipitate of magnesium carbonate	allow solid contains magnesium (ions) ignore scale / scum	1
6(b)(i)	any one from: <ul style="list-style-type: none"> anomalous does not fit the pattern / straight line 	ignore error	1
6(b)(ii)	water boils (at 100 °C)	ignore evaporate	1
6(b)(iii)	68 (°C)		1
6(b)(iv)	solubility goes up then down (after 68 °C or ecf from 1(b)(iii))	'it' = solubility allow solubility changes direction allow solubility goes down / decreases after 68°C (or ecf from 1(b)(iii))	1
	solubility usually increases as the temperature increases		1
Total			8

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Question 7

question	answers	extra information	mark
7(a)	any two from: <ul style="list-style-type: none"> • <u>react</u> with water or <u>very reactive</u> • (react with water) releasing gas / hydrogen / fizzing • (react with water) to form an alkaline / hydroxide solution • form ions with a <u>1+</u> charge 	allow lose one electron from the outer shell ignore other references to electronic structure ignore physical properties	2
7(b)	any three from: <ul style="list-style-type: none"> • some boxes contain two elements • groups / columns contain elements with different properties • Newlands not a well-known / respected scientist • new idea (not readily accepted by other scientists) 	allow specific examples: Co, Ni or Ce, La or Di, Mo or Ru, Ru or Ba, V or Pt, Ir allow groups / columns contain both metals and non-metals ignore examples ignore references to sugar factory allow musical scales thought to be silly by some scientists	3

Question 7 continues on the next page . . .

CHY3F**Question 7 cont'd..**

question	answers	extra information	mark
7(c)	<p>one for improvement and one for explanation from:</p> <ul style="list-style-type: none"> • left gaps (for undiscovered elements) (1) • so that elements were in their correct group (1) <p>or</p> <ul style="list-style-type: none"> • did not always follow order of relative atomic weights / masses (1) • so that elements were in their correct group (1) 	<p>allow so the elements fitted the pattern of properties</p> <p>ignore references to atomic number / electronic structure</p> <p>allow so the elements fitted the pattern of properties</p>	2
Total			7

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