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General Certificate of Secondary Education

Chemistry 4421

CHY3F Unit Chemistry 3

Mark Scheme

2010 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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Marking Guidance for Examiners

GCSE Science Papers

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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Question 1

question	answers	extra information	mark
1(a)(i)	H^+		1
1(a)(ii)	OH^-		1
1(a)(iii)	lower than		1
1(b)	with HCl: UI goes red / pink has a pH 0 ,1 ,2 **or** 3 **or** with ethanoic acid: UI goes orange / yellow (1) has a pH 4 / or above (but less than 7) (1)	 allow a comparison eg redder than ethanoic acid allow a comparison eg has pH less than ethanoic acid. do **not** accept an incorrect pH. allow a comparison with HCl allow a comparison with HCl	 1 1
1(c)	completely		1
1(d)(i)	conical flask		1
1(d)(ii)	titration		1
1(d)(iii)	repeat **or** take average	allow compare with another students results	1
Total			**9**

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Question 2

question	answers	extra information	mark
2(a)	evaporate condenses		1 1
2(b)	high amounts of / too much (dissolved) solids in the water **or** not sterilised	allow contains (dissolved) salt / sewage / micro-organisms / toxins / oil etc	1
Total			**3**

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Question 3

question	answers	extra information	mark
3(a)(i)	**A**		1
3(a)(ii)	**F**		1
3(a)(iii)	**E**		1
3(a)(iv)	**C**		1
3(a)(v)	**A or B**		1
3(b)(i)	Rb K Na	allow rubidium, potassium, sodium do **not** accept RB or NA	1
3(b)(ii)	decrease **or** become lower / smaller / less	allow from 180° C to 27° C	1
3(c)	They are harder than Group 1 metals. They have higher melting points than Group 1 metals. They often form coloured compounds but Group 1 compounds are usually white.		1 1 1
Total			**10**

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Question 4

question	answers	extra information	mark
4(a)(i)	sodium hydroxide green solid		1 1 1
4(a)(ii)	barium chloride white sulfate ions, SO_4^{2-}		1 1 1
4(b)	some indication of contact between (colourless) flame and the chemical	ignore colour of flame	1
4(c)	any **one** from: • accurate • precise • sensitive • reliable • rapid • only small amount needed	ignore reference to cost / safer	1
Total			**8**

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Question 5

question	answers	extra information	mark
5(a)	contact with rocks		1
	(ions) dissolve / soluble / react	allow water is a solvent ignore 'picks up' / 'gets into' / absorbed	1
5(b)	more calcium / Ca^{2+} and / or magnesium / Mg^{2+} (ions in Crete water)	accept 'a lot' of calcium / magnesium allow incorrectly charged Ca and Mg ions accept correct comparison using numbers from the table do **not** accept mention of other ions	1
5(c)	**two** from: • scum / calcium stearate / magnesium stearate • (scum) more soap used • scale / limescale / calcium carbonate / magnesium carbonate • (scale) less efficient heating systems / kettles / appliances • use of a water softener eg sodium carbonate / ion-exchange	if an effect and clarification are given, the clarification must be correct to gain both marks accept does not lather (easily) ignore costs more unqualified ignore fur ignore costs more unqualified ignore blocks pipes unqualified accept salt in dishwashers	2

Question 5 continues on the next page

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Question 5 continued

question	answers	extra information	mark
5(d)	any **one** from: • sodium carbonate / washing soda • ion-exchange • distillation	ignore filter / filtration allow soap accept de-ionised ignore boiling / heating / evaporation	1
Total			**6**

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Question 6

question	answers	extra information	mark
6(a)(i)	straight line through the 'points' and extended to C_8H_{18}	do **not** accept multiple lines	1
6(a)(ii)	5500	range 5400 *to* 5600 accept ecf from their graph	1
6(a)(iii)	it is a straight line graph	allow directly proportional accept constant difference between (energy) values accept C_5H_{12} close to values on the graph **or** C_5H_{12} comes in middle of the graph ignore 'fits the pattern' unqualified ignore 'line of best fit' ignore 'positive correlation'	1
6(a)(iv)	expected ranges for working are: (5400 to 5600) – (2800 to 2900) = (2500 to 2800) **or** their value from (a)(ii) – a value from 2800 to 2900 **or** (5400 to 5600) / their (a)(ii) divided by 2 **or** a value from 2800 to 2900 × 2 no / not quite / almost / yes	accept correct numerical answer as evidence of working this mark is only awarded on evidence from their correct working	1 1

6(b)(i)	incorrect / no **or** partially correct bio-ethanol produces least energy **or** bio-ethanol produces 29 kJ	ignore references to hydrogen mark independently	1 1
6(b)(ii)	any **two** from: • hydrogen produces only H_2O • coal produces SO_2 • coal produces smoke • both renewable and non-renewable fuels produce CO_2 • (both) the non-renewable fuels produce CO_2 • (both) renewable fuels produce no smoke • (both) renewable fuels produce no SO_2	ignore incorrect / correct accept hydrogen does not produce harmful gases / CO_2 / SO_2 allow coal causes acid rain / respiratory problems allow coal causes global dimming accept bio-ethanol and natural gas / coal produce CO_2 / global warming accept coal and natural gas produce CO_2 / global warming accept hydrogen and bio-ethanol do not produce smoke / global dimming accept hydrogen and bio-ethanol do not produce SO_2 / acid rain	2
Total			**9**