



General Certificate of Secondary Education

Chemistry 4421

CHY3F Unit Chemistry 3

Mark Scheme

2009 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.

COMPONENT NUMBER: CHY3F**COMPONENT NAME: Chemistry****STATUS: Final****DATE: January 2009**

question	answers	extra information	mark
1(a)	any three from: <ul style="list-style-type: none"> • heat / sun / energy • (water) evaporates • (water) vapour rises • vapour cools • condenses • droplets of water form or clouds form • rain / snow / hail / sleet / "precipitation" 		3
1(b)(i)	dissolve		1
1(b)(ii)	calcium		1
1(b)(iii)	sodium carbonate		1
1(b)(iv)	precipitates		1
1(c)	any two from: <ul style="list-style-type: none"> • (lime)scale • acts as insulator / covers element / prevents heat passing through • requires more energy 	accept precipitate ignore scum ignore references to time	2

Question 1 continued on next page...

COMPONENT NUMBER: CHY3F

COMPONENT NAME: Chemistry

STATUS: Final

DATE: January 2009

Question 1 continued...

question	answers	extra information	mark
1(d)(i)	flask	accept clear misspellings	1
1(d)(ii)	condenser	accept clear misspellings	1
Total			11

COMPONENT NUMBER: CHY3F**COMPONENT NAME: Chemistry****STATUS: Final****DATE: January 2009**

question	answers	extra information	mark
2(a)	(UI) paper is dry or no water present when (UI) paper used owtte	accept citric acid is a solid accept 'it is not a liquid / solution'	1
2(b)	water / H ₂ O / hydrogen oxide		1
2(c)	eg H (atom) loses an electron to form H ⁺ or <u>only</u> a proton left		1
2(d)	is partially ionised in water		1
2(e)(i)	eg same concentration / quantity of Mg	accept: volume of acid / ribbon for both / same time accept: volume of gas measured under the same conditions	1
2(e)(ii)	C A D B		1
2(f)(i)	OH ⁻		1
2(f)(ii)	acidic		1
Total			8

COMPONENT NUMBER: CHY3F**COMPONENT NAME: Chemistry****STATUS: Final****DATE: January 2009**

question	answers	extra information	mark
3(a)(i)	contains a carbon carbon double bond		1
3(a)(ii)	orange		1
3(a)(iii)	decolourised		1
3(b)(i)	<p>correct named instrumental method</p> <p>eg</p> <p>atomic absorption spectroscopy / spectrometry</p> <p>or</p> <p>mass spectrometry / spectroscopy</p> <p>or</p> <p>infrared (spectrometry) / IR</p> <p>or</p> <p>ultraviolet / spectroscopy / UV</p> <p>or</p> <p>nuclear magnetic spectroscopy / nmr</p> <p>or</p> <p>gas-liquid chromatography / GLC</p>	<p>accept atomic / absorption spectroscopy</p> <p>accept aas</p> <p>accept mass spec</p>	1

Question 3 continued on the next page...

COMPONENT NUMBER: CHY3F**COMPONENT NAME: Chemistry****STATUS: Final****DATE: January 2009****Question 3 continued...**

question	answers	extra information	mark
3(b)(ii)	any one from: <ul style="list-style-type: none">• fast / quick or comment about speed• small amount• sensitive / accurate / precise• ease of automation• reliable / efficient• can be left to run / continuous analysis	ignore lost ignore human error accept operators do not need <u>chemical</u> skills ignore safe / easier to use	1
Total			5

COMPONENT NUMBER: CHY3F**COMPONENT NAME: Chemistry****STATUS: Final****DATE: January 2009**

question	answers	extra information	mark
4(a)(i)	elements		1
4(a)(ii)	atomic weight		1
4(a)(iii)	atomic (proton) number		1
4(b)(i)	transition metals		1
4(b)(ii)	has a higher melting point is harder		1 1
Total			6

COMPONENT NUMBER: CHY3F**COMPONENT NAME: Chemistry****STATUS: Final****DATE: January 2009**

question	answers	extra information	mark
5(a)(i)	hydrochloric acid / HCl	accept any (named) acid	1
	carbon dioxide / CO ₂	accept bubbles / fizz / gas or limewater gets milky ignore 'add limewater' do not accept other named gases 2 nd mark dependant on first mark accept for this answer only heat gives CO ₂ / limewater milky = 1 mark	1
5(a)(ii)	(white) precipitate / solid	ignore names of substances even if incorrect accept <u>white</u> deposit / substance do not accept any coloured precipitate	1
5(a)(iii)	eg flame colour of (Na) and flame colour of (K) interfere / mask / mix with each other	accept 'can't see the colours' or 'difficult to determine the colour' or 'both produce <u>different</u> colours' or a correct statement of colours or hard to distinguish	1
5(b)(i)	eg essential (mineral) or everyone needs it / some (salt) or problems with health if have no salt	accept preservative / flavouring / taste it = salt (all) foods contain / use it / sodium chloride / salt	1

Question 5 continued on the next page...

COMPONENT NUMBER: CHY3F**COMPONENT NAME: Chemistry****STATUS: Final****DATE: January 2009**

question	answers	extra information	mark
6(a)	eg plastic (beaker) / insulation / lid / cover or any mention of enclosed	any sensible modification to reduce heat loss ignore prevent draughts ignore references to gas loss	1
6(b)	all the substances react or all (the substances) react fully / completely or heat evolved quickly or distribute heat	accept to mix them 'so they react' is insufficient for the mark accept increase chances of (successful) collisions / collision rate increase do not accept rate of reaction increase / make reaction faster	1
6(c)	experiment 2 and different / higher / initial / starting temperature	accept experiment 2 and the room is hotter / at higher temperature do not accept temperature change / results higher	1
6(d)	temperature change does not fit pattern	accept anomalous / odd or it is the lowest or it is lower than the others or it is different <u>to the others</u> 'results are different' is insufficient	1
6(e)	7 / 7.0		1
6(f)	$(100 \times 4.2 \times 7) = 2940$	ecf from (e)	1
6(g)	diagram A and reaction exothermic / heat evolved / ΔH is negative / temperature rises	accept energy is lost (to the surroundings)	1
Total			7