



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

June 2003

GCSE

Chemistry (Modular)

3423

Higher

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ADDITIONAL INFORMATION FOR 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. Boldening

- 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 boldened. 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 / ; e.g. allow smooth / free movement.)

3. Marking points

3.1 Marking of Quality of Written Communication

Examiners are reminded of the need to assess QoWC by the following statement appearing in the appropriate parts of the mark scheme:

The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme.

The maximum marks available to a candidate whose answer is not well expressed will be (the number of marks available –1).

3.2 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

3.3 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.

3.4 The marking of quantitative relationships

Full credit can be given for a correct quantitative relationship expressed in:

- named units;
- physical quantities;
- standard symbols;
- a combination of physical quantities and units.

No credit can be given for any quantitative relationship expressed in terms of:

- a combination of physical quantities, units and symbols;
- a diagram, e.g. the ohm’s law triangle, unless the rest of the answer shows clearly that the candidate understands the relationships involved.

3.5 Marking procedure for calculations

3.5.1 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.

3.5.2 Where calculations are based on incorrectly recalled relationships, neither the incorrectly recalled relationship, nor the resulting calculation based on the incorrect relationship, will be credited.

3.6 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.

3.7 Errors carried forward

There should be no error carried forward from a previous answer which has been based on wrong science. Any error in the answers to a structured question should be penalised once only.

Examples

- (a) A candidate who calculates average speed using $\text{speed} = \text{time}/\text{distance}$ **and** then proceeds to use this incorrect answer to calculate an acceleration based on the correct quantitative relationship should be given credit for the use of the correct acceleration relationship but none for either numerical answer.
- (b) A candidate who incorrectly calculates average speed using $\text{speed} = \text{distance}/\text{time}$ and then proceeds to use this incorrect value to calculate an acceleration based on the correct quantitative relationship, should be given credit for the use of both correct quantitative relationships **and** for the correct substitution and use of the incorrect value in the calculation of the rate of acceleration.

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.

3.8 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.9 Brackets

(.....) is 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.

3.10 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

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GCSE CHEMISTRY (MODULAR) 3423H
MARK SCHEME – HIGHER TIER (TERMINAL PAPER)
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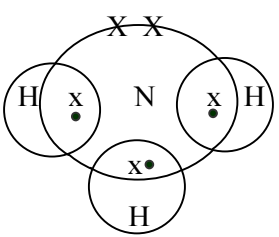
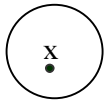
Question 1

	answers	extra information	mark
(a)	<u>gas</u> evolved/lost/given off	accept carbon dioxide ignore hydrogen	1
(b)	1 – C 2 – D 3 – A 4 – B	3 or 4 correct → 2 marks 1 or 2 correct → 1 mark	2
(c)	<u>same mass</u> of magnesium carbonate has all reacted/been used up	accept all magnesium carbonate accept same mass of CO ₂ given off accept same volume of CO ₂ given off not Mg accept same amount of reactants each time	1
total			4

Question 2

	answers	extra information	mark
(a)	21.2(%)	accept 21-21.2 accept 1 mark $M_r(\text{NH}_4)_2\text{SO}_4 = 132$ accept 10.6% (1 mark)	2
(b)	<p>Quality of written communication <i>The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms.</i> <i>Quality of written communications should be considered in crediting points in the mark scheme.</i></p> <p>Maximum of two from each section up to a maximum total of 4.</p> <ul style="list-style-type: none"> • <u>Increased use (max 3 marks)</u> more food required more land under cultivation increasing world population more crops produced/grow better • <u>damage (max 3 marks)</u> eutrophication (term used) growth of algae/plants oxygen depletion (by bacteria/decay) cut out sunshine bacteria grown death of aquatic life/wild life 	<p>maximum of 3 if ideas not well expressed</p> <p>✓✓✓XQ</p> <p>accept growth of weeds not accept depletion of oxygen by plant growth</p> <p>not harms</p>	4
total			6

Question 3

	answers	extra information	mark
(a) (i)	same Atomic Number, different Mass Number or same proton number, different number of neutrons or same element with different number of neutrons	<u>both</u> needed for mark	1
(ii)	2,8		1
(iii)	K ₂ O		1
(b)		 <p>in overlaps gains 1 mark</p> <p>8 electrons around N give 1 mark</p> <p>accept lone pair split accept all dots/crosses</p>	2
total			5

Question 4

	answers	extra information	mark
(a)	too brittle (1 mark) OWTTE too much carbon/impurities content (1 mark)	accept not strong ignore corrosion ignore specific impurities	2
(b)	‘molten scrap iron’ / converter 1		1
(c)	oxidation		1
(d)	cause acid rain (1 mark) pollutant/causes specified damage/poisonous (1)	accept specific health effects	2
(e)	calcium carbonate/lime/calcium oxide/limestone		1
(f)	chromium, titanium, tungsten – any suitable	accept any metal except Group One	1
total			8

Question 5

	answers	extra information	mark
(a)	Gritstone		1
(b)	Fossils or layers		1
(c)	crack/movement/displacement	accept 'weak point' etc. ignore plates	1
	large forces/pressure		1
total			4

Question 6

	answers	extra information	mark
(a)	sodium		1
(b)	silver, gold, copper	2 out of 3 needed for mark	1
(c)	sodium or aluminium more reactive (than carbon) or above carbon/higher in reactivity series		1 1
total			4

Question 7

	answers	extra information	mark
(a)	H ⁺	accept hydrogen not accept H ₂	1
(b)	acidic + reason (1 mark) acidic + pH value/reacts with Mg/magnesium (1 mark) <u>weak acid</u> (1 mark) + high pH value/slow reactivity		2
total			3

Question 8

	answers	extra information	mark
(a)	A (1 mark) kJ ÷ pence (1 mark)	some evidence of working must be present	2
(b)	B – (1 mark) no soot and no residue – (1 mark)		1 1
(c)	carbon monoxide – (1 mark) water – (1 mark)	accept carbon	1 1
total			6

Question 9

	answers	extra information	mark
(a)	N \equiv N 945 3 H – H 3 x 436 = 1308 total = 2253 (1)		1
	6 N – H 6 x 390 total = 2340 (1)	correct subtraction (consequential from first answer)	1
	(2253 – 2340) answer = (-)87	correct answer – 3 marks	1
(b)	- 87 decreases/less	If +87 or no sign allow increases/more	1
	exothermic reaction/gets hotter as goes to rhs	endothermic reaction/gets colder as goes to lhs	1
total			5

Question 10

	answers	extra information	mark
	$24\text{g} + 32\text{g} (\Leftarrow 56\text{g})$		1
	$\frac{6}{24}$ <u>factor</u>	allow $\frac{1}{4}$	1
	$32 \times \frac{6}{24}$ $\frac{1}{4}$	if '6' (no units) – 3 marks	1
	$24 \times \frac{1}{4} \rightarrow \underline{6\text{dm}^3}$	6dm^3 – 4 marks	1
total			4

Question 11

	answers	extra information	mark
	<p>Quality of written communication <i>The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms.</i> <i>Quality of written communication should be considered in crediting points in the mark scheme.</i></p> <p><u>any 5 of the following for 1 mark each (max 5)</u></p> <ul style="list-style-type: none"> • exothermic reaction • identifies A and B as reactants and products (both needed) • identifies E as heat (enthalpy) ‘lost’ or ‘of reaction’ • identifies C as activation energy • profile 1 – uncatylised and profile 2 – catalysed • identifies D as activation energy • states catalyst produces route/pathway of lower activation energy (not ‘lowers the AE’) 	<p>✓✓✓✓XQ maximum of 4 marks if ideas not well expressed</p>	5
total			5

Question 12

	answers	extra information	mark
(a)	-80 to -160		1
(b)	7 electrons in outer shell/orbit	7 <u>is essential</u>	1
(c)	<ul style="list-style-type: none">• electron most easily gained or attracted <ul style="list-style-type: none">• into lowest energy level/orbit/outer shell or less shielding or nearer to nucleus		1 1
total			4

Question 13

	answers	extra information	mark
(a) (i)	<u>giant</u> structures or need to break <u>covalent</u> bonds or many bonds to break OWTTE		1
(ii)	each carbon linked in tetrahedral structure or 3 dimensional or 4 carbon bonds or graphite in layers/weak forces between layers/each carbon only linked to 3 others		1
(iii)	<u>layers</u> can slide over each other	accept plates	1
(b)	conduct electricity 'free' (OWTTE) electrons	accept conduct heat (1) accept shiny & layers not aligned (1)	1 1
total			5

Question 14

	answers	extra information	mark
(a)	Octave = '8' / every eighth element had similar properties, so in same group		1 1
(b)	left spaces for undiscovered elements		1
(c)	noble gases (Group O)		1
total			4

Question 15

	answers	extra information	mark
	any five from <ul style="list-style-type: none">• use of <u>Na/Mg</u>• Na/Mg more <u>reactive</u> than Ti• use of <u>argon</u> atmosphere• Argon <u>prevents oxidation</u> of Ti• $4 \text{ Na} + \text{TiCl}_4 \rightarrow \text{Ti} + 4 \text{ NaCl}$ or $2 \text{ Mg} + \text{TiCl}_4 \rightarrow \text{Ti} + 2 \text{ MgCl}_2$ <ul style="list-style-type: none">• Ti^{4+} gains 4e (reduction)	accept Ti^{4+} gains electrons to form atoms	5
total			5

Question 16

	answers	extra information	mark
(a) (i)	<u>test</u> Add sodium hydroxide (solution)		1
	<u>result</u> White ppt, soluble in excess	both parts needed for mark	1
(ii)	<u>test</u> Add barium chloride (solution) and hydrochloric acid		1
	<u>result</u> White ppt	both parts needed for mark	1
(b)	<u>any method from list below:</u> - infra-red spectroscopy - ultra-violet spectroscopy - mass spectroscopy - gas liquid chromatography etc.		1
	<u>idea of:</u> - more sensitive/more accurate - use smaller samples - easier to operate - more versatile etc.		1
total			6

Question 17

	answers	extra information	mark
(a) (i)	alkenes		1
(ii)	C_nH_{2n}		1
(iii)	<p>any two from</p> $CH_3 - CH = CH - CH_3$ $CH_2 = CH - CH_2 - CH_3$ $CH_2 = C - CH_3$ $\begin{array}{c} \\ CH_3 \end{array}$ $\begin{array}{c} H & H \\ & \\ H - C & - C - H \\ & \\ H - C & - C - H \\ & \\ H & H \end{array}$	<p>displayed formula <u>must</u> be given</p> <p>omission of H from displayed formula penalise once only</p> <p>accept condensed form</p>	2
(b) (i)	$\begin{array}{cccccc} H & Cl & H & Cl & H & Cl \\ & & & & & \\ - C & - C & - C & - C & - C & - C - \\ & & & & & \\ H & H & H & H & H & H \end{array}$	<p>C- C gains 1 mark</p> <p>Cl's must be separated for second mark</p> <p>if 2 units – max 1</p> <p>if not open structure – max 1</p>	2
(ii)	hydrogen chloride	accept HCl	1
total			7

Question 18

	answers	extra information	mark
(a)	$\frac{28}{1000} \times 0.5$	award both marks if correct answer with no workings	1
	= 0.014		1
(b)	0.33 moles H ₃ PO ₄ reacts with 1 mole NaOH	award if any correct ratios from equation	1
	moles H ₃ PO ₄ in 50 cm ³ = 0.014 x 0.33 (or 0.0046)	consequential marking applies from part (a)	1
	∴ moles H ₃ PO ₄ in 1 dm ³ = $\frac{0.014 \times 0.33 \times 1000}{50}$ = 0.09(3)	correct answer (3 marks)	1
total			5