

GCSE 2004

June Series



Mark Scheme

Chemistry (Modular) Specification A *(3423/H)*

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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GCSE CHEMISTRY (MODULAR)

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. 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

Where *Quality of written communication* appears in the mark scheme, one mark is to be awarded for either of the following points:

- Using correct scientific terms
- Correct sequencing or linking of ideas or points

The mark scheme will specify which of the points is to be awarded in a particular question. A QoWC mark can be awarded for a scientific answer, even if it is not accurate. It cannot be awarded for a nonsensical or non-scientific answer. On the script, the QoWC tick should be identified by a ‘q’ written next to it.

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;
- if the answer is correct, but an incorrect relationship is written in the working, then no marks can be awarded (see 3.5.2).

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 Interpretation of marginal points

There will be times when the answer is almost, but not quite, correct. Some examiners would award a mark while others would not. In any one script, an attempt should be made to balance these nearly correct answers by giving the mark on some occasions but not on others. If this is not done, the marking would end up being too lenient or too harsh.

3.11 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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Chemistry (Modular)
Summer 2004
3423/H**3423/H Q1**

	answers	extra information	mark
(a)	<ul style="list-style-type: none"> fermentation 		1
(b)	<ul style="list-style-type: none"> carbon dioxide/CO₂ 		1
(c)	<ul style="list-style-type: none"> enzymes <u>destroys</u> them/kills yeast/ denatured/changes shape OWTTE 	<u>not</u> kills enzymes	1 1
(d) (i)	<ul style="list-style-type: none"> RMM = 180 	ignore units	1
(ii)	<ul style="list-style-type: none"> 40% 	If % wrong but displayed method correct – 1 mark correct answer gains 2 marks ECF $\frac{12}{29} \times 100 = 41\% \checkmark X$ $\frac{12}{180} \times 100 = 6.7\% \checkmark X$ $\frac{72}{178} \text{ (e.g.)} \times 100 = \% \checkmark \checkmark$	2
total			7

3423/H Q2

	answers	extra information	mark
(a)	• rate increases OWTTE		1
	• particles closer together/more chance of collision	do not accept move faster	1
(b)	• energy given out/gets hotter/gives out heat		1
total			3

3423/H Q3

	answers	extra information	Mark
(a) (i)	<ul style="list-style-type: none"> (one) too few protons/(one) too many electrons/number of +/- not equal 		1
(ii)	<ul style="list-style-type: none"> 6 or 7 or halogens (1 mark) explanation for 2nd mark 	e.g. they need one more electron	1 1
(b)	<ul style="list-style-type: none"> Lithium/Li 		1
(c) (i)	<ul style="list-style-type: none"> sodium hydroxide + hydrogen 		1
(ii)	<ul style="list-style-type: none"> 10 → 14 		1
(d)	<ul style="list-style-type: none"> $2\text{Ca} + \text{O}_2 \rightarrow 2\text{CaO}$ 	1 mark – formulae 1 mark – balance	1 1
total			8

3423/H Q4

	answers	extra information	mark
(a) (i)	<ul style="list-style-type: none"> oxidation 	accept synthesis	1
(ii)	<ul style="list-style-type: none"> acid rain 		1
(iii)	<ul style="list-style-type: none"> catalyst/speed up the reaction 		1
(iv)	<ul style="list-style-type: none"> oleum 		1
(v)	<ul style="list-style-type: none"> (acid) mist/fumes/vapour formed difficult to contain/Exothermic/ Stable 	do not accept gas 1 mark each	2
(vi)	<ul style="list-style-type: none"> 2 		1
(b)	<ul style="list-style-type: none"> dehydrating (agent) 	accept removes water accept affinity for water	1
total			8

3423/H Q5

	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></p> <p>any two from the following (max 2) Comparing (South America and Africa) continents</p> <ul style="list-style-type: none"> • shapes matched OWTTE • same/similar fossils • similar rock stratus/types/patterns <p>any one from the following (max 1)</p> <ul style="list-style-type: none"> • Earth <u>shrank</u> • <u>shrinking</u> caused by cooling • shrinkage caused mountains etc. <p>or</p> <ul style="list-style-type: none"> • Earth <u>expanded</u> • continents forced <u>apart</u> <p>any two from the following (max 2)</p> <ul style="list-style-type: none"> • mountains on bottom of sea • rocks older under sea further away from central ridge <p>QoWC – correct use of scientific terms any three from e.g. fossils/rocks/shapes/shrinkage/expanding/force/volcanoes/trench/tectonic/pressure/plates</p>	<p>do not accept similar flora and fauna</p> <p>accept volcanic activity accept magnetic reversal patterns do not accept fossils</p>	<p>4</p> <p>1</p>
total			5

3423/H Q6

	answers	extra information	mark
(a)	<ul style="list-style-type: none"> Conduct (electricity)/etc. 	do not accept solid do not accept structure	1
(b)	<ul style="list-style-type: none"> low high high low 		1 1
(c)	<ul style="list-style-type: none"> green 		1
(d)	<ul style="list-style-type: none"> more/too/very reactive metals 	accept high in reactivity series accept group 1 metals are more reactive than c OWTTE	1
total			5

3423/H Q7

	answers	extra information	mark
(a) (i)	<ul style="list-style-type: none">• 50g/51g		1
(ii)	<ul style="list-style-type: none">• 31/32/33°C		1
(b) (i)	<ul style="list-style-type: none">• no more solid will dissolve/ solution over solid		1
(ii)	<ul style="list-style-type: none">• 110g		1
total			4

3423/H Q8

	answers	extra information	mark
(a) (i)	<ul style="list-style-type: none"> increasing pressure increases the yield 	or vice versa	1
(ii)	<ul style="list-style-type: none"> increasing temperature decreases yield 	or vice versa	1
(iii)	<ul style="list-style-type: none"> exothermic reaction so would move equilibrium to left 	or endothermic (in opposite direction)	1
(iv)	<ul style="list-style-type: none"> higher temperature gives less NH₃ <u>but</u> faster (so more economical) 	separate mark points	2
(b)	<ul style="list-style-type: none"> <u>catalyst/faster</u> production 	accept reduces energy requirement accept use lower temperature	1
total			6

3423/H Q9

	answers	extra information	mark
(a)	• $\text{Mg CO}_3 = 84$		1
	• $\text{MgCO}_3 = \frac{84}{4} \rightarrow 21\text{g}$		1
	• $\text{MgO} = 40$ $\text{MgO} = \frac{40}{4} = 10\text{g}$	10g gains all 3 marks	1
(b)	• $\frac{24}{4} = 6\text{dm}^3$		1
total			4

3423/H Q10

	answers	extra information	mark
(a)	<ul style="list-style-type: none">lower temperatures (so more economical)		1
(b)	<ul style="list-style-type: none">batch – all used up at one time/ continuous – continues so can remove as it keeps going.		1
(c)	<ul style="list-style-type: none">trap on inert solid support	accept beads etc.	1
(d)	<ul style="list-style-type: none">enzymes can be used continuously/don't need to be separated as in a batch process	do not accept energy	1
total			4

3423/H Q11

	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></p> <p>any three of the following:</p> <ul style="list-style-type: none"> • cations/positive ions • giant structure • outer electrons free/delocalised • electrons hold ‘atoms’/ions together/ +/e⁻ attraction • allow conduction of electricity by movement of electrons/electrons can carry charge <p>QoWC – correct linking of ideas atoms lose electrons → ‘sea of electrons’ concept → delocalised electrons</p>		<p>3</p> <p>1</p>
total			4

3423/H Q12

	answers	extra information	mark
(a)	<ul style="list-style-type: none">ions cannot move		1
(b) (i)	<ul style="list-style-type: none">2/2		1
(ii)	<ul style="list-style-type: none">2		1
(c)	<ul style="list-style-type: none">weak forces between molecules	do not accept weak bonds	1
total			4

3423/H Q13

	answers	extra information	mark
(a)	<ul style="list-style-type: none">hydrogen		1
(b)	<ul style="list-style-type: none">sodium hydroxide		1
(c)	<ul style="list-style-type: none">(damp) litmus paperbleaches/goes white/OWTTE	accept Universal indicator	1
			1
(d)	<ul style="list-style-type: none">$\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$	1 – correct symbols 1 – balance	2
total			6

3423/H Q14

	answers	extra information	mark
	1. NH_4^+ /ammonium	do not accept ammonia	1
	2. K^+ /potassium		1
	3. SO_4^{2-} /sulphate		1
	4. I^- /iodide	do not accept iodine	1
total			4

3423/H Q15

	answers	extra information	mark
(a)	• CO	accept carbon monoxide	1
(b)	• 2/3/2		1
(c)	• neutralisation		1
(d)	• Cr/Ni		1
total			4

3423/H Q16

	answers	extra information	mark
(a)	<ul style="list-style-type: none">• same general formula or same functional group or differ only by CH₂ or carbon chain		1
(b)	<ul style="list-style-type: none">• any correct isomer		1
(c) (i)	<ul style="list-style-type: none">• water/H₂O		1
(ii)	<ul style="list-style-type: none">• ester		1
(iii)	<ul style="list-style-type: none">• ethanoic acid		1
(iv)	<ul style="list-style-type: none">• oxidation	accept redox	1
total			6

3423/H Q17

	answers	extra information	mark
(a)	<ul style="list-style-type: none">• NaOH = 40• moles = $\frac{4.00}{40} = 0.1$ / $\frac{1}{10}$		1
(b)	<ul style="list-style-type: none">• 0.01	consequential on (a)	1
(c)	<ul style="list-style-type: none">• 0.005	consequential on (b)	1
(d)	<ul style="list-style-type: none">• $\frac{0.005 \times 1000}{32}$ = 0.156/0.16	consequential on (c)	1
total			4

3423/H Q18

	answers	extra information	mark
(a)	<ul style="list-style-type: none">• H_2CO_3		1
(b)	<ul style="list-style-type: none">• CaCO_3/calcium carbonate		1
(c)	<ul style="list-style-type: none">• $\text{Mg}(\text{HCO}_3)_2$		1
(d)	<ul style="list-style-type: none">• oceans absorb as much CO_2 as they can now, cannot deal with the 'extra'/too much to absorb or deal with		1
total			4