



General Certificate of Secondary Education

Additional Science 4463 / Chemistry 4421

CHY2H Unit Chemistry 2

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. 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 / ; 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.

CHY 2H

Question 1

question	answers	extra information	mark
1(a)(i)	(nitrogen) + hydrogen → ammonia	accept H ₂ and NH ₃ ignore incorrect symbols ignore balancing	1
1(a)(ii)	any one from: <ul style="list-style-type: none"> • catalyst • to speed up the reaction • lower activation energy 	ignore causes reaction ignore heat / reference to particles	1
1(a)(iii)	any two from: <ul style="list-style-type: none"> • cooled • ammonia condenses / turns into liquid • nitrogen and hydrogen do not condense / turn into liquid or nitrogen and hydrogen stay as gases	it = ammonia ignore references to boiling point if no marks awarded accept pass through / separated in condenser or unreacted nitrogen and hydrogen / gases recycled for 1 mark	2

Question 1 continues on the next page

CHY 2H

Question 1 continued

question	answers	extra information	mark
1(b)	80	<p>correct answer with or without working gains 2 marks</p> <p>ignore units</p> <p>if answer incorrect, evidence of correct working gains 1 mark</p> <p>eg</p> $14 + (4 \times 1) + 14 + (3 \times 16) (= 70)$ <p>or</p> $2N + 4H + 30$	2
1(c)	<p>fertiliser is C</p> <p>evidence of correct working</p>	<p>examples of minimum correct working:</p> <p>39/101</p> <p>or</p> <p>14/101</p> <p>or</p> <p>38.61/100</p> <p>or</p> <p>13.86/100</p>	<p>1</p> <p>1</p>
Total			8

CHY 2H**Question 2**

question	answers	extra information	mark
2(a)(i)	(different) properties	allow ideas of different property / behaviour / element	1
2(a)(ii)	any one from: <ul style="list-style-type: none"> • they had high status or they were lecturers / doctors / professors / famous scientists <ul style="list-style-type: none"> • other scientists repeated experiments • they had proof or lots of / strong / conclusive / enough / clear evidence	they = Crawford + Cruikshank allow experiment could be repeated allow other scientists showed they had different properties ignore evidence unqualified	1
2(a)(iii)	other scientists obtained similar results / proved it or experiments were repeated		1

Question 2 continues on the next page

CHY 2H

Question 2 continued

question	answers	extra information	mark
2(b)(i)	any one from: <ul style="list-style-type: none"> mass of solid / strontium (chloride) / barium (chloride) volume of water type of container 	allow amount / volume allow amount / mass allow initial / starting temperature (of water) ignore room temperature / time / concentration ignore reference to hydrochloric acid	1
2(b)(ii)	2 and takes in heat / energy or 2 and temperature goes down (owtte)		1
2(b)(iii)	temperature increased for one experiment and decreased for the other (owtte) or one was exothermic and one was endothermic (owtte)	accept experiment 1 was exothermic	1
2(c)	any one from <ul style="list-style-type: none"> positive / + (charge) opposite (charges) attract 	do not accept incorrect further qualification eg electrons / atoms / electrodes	1
Total			7

CHY 2H

Question 3

question	answers	extra information	mark
3(a)	2,4 (drawn as crosses) on shells	accept dots / e / - etc.	1
3(b)(i)	hard	allow rigid / high melting point do not allow references to bonding ignore strong ignore unreactive ignore structure	1
3(b)(ii)	any three from <ul style="list-style-type: none"> giant structure / lattice / macromolecular covalent (bonds) (covalent) bonds are strong (each) carbon / atom forms four bonds or (each) carbon / atom bonded to four other atoms	max 2 if ionic / metallic / molecule / intermolecular bonds or incorrect number of bonds allow many bonds accept needs lots of energy to break bonds (owtte)	3

Question 3 continues on the next page

CHY 2H

Question 3 continued

question	answers	extra information	mark
3(c)	<p>any three from:</p> <p>graphite</p> <ul style="list-style-type: none"> has delocalised / free electrons <p>or</p> <p>electrons that can move through / around the structure</p> <ul style="list-style-type: none"> each carbon is joined to three other carbon atoms <p>or</p> <p>one electron from each atom is free / delocalised</p> <p>diamond</p> <ul style="list-style-type: none"> has no free / delocalised electrons <p>or</p> <p>no electrons that move around the structure</p> <ul style="list-style-type: none"> all the electrons are used for bonding <p>or</p> <p>each carbon joined to four other carbon atoms</p>	<p>max 2 if ionic / ions / metallic / molecule</p> <p>'it' needs to be qualified</p> <p>do not accept the electrons move unless qualified (around structure etc)</p> <p>allow graphite has three bonds</p> <p>do not accept the electrons do not move</p> <p>allow diamond has 4 bonds</p>	3
Total			8

CHY 2H

Question 4

question	answers	extra information	mark
4(a)(i)	84 / 84.5 / 83.98	<p>correct answer with or without working gains 3 marks</p> <p>(moles of NaN_3 =) 130/65 (1) moles of nitrogen = 3 (1) mass of nitrogen = 3 x 28 = 84 (1)</p> <p>or</p> <p>2 x (23 + (3 x 14)) (1) 3 x (2 x 14) (1)</p> <p>or</p> <p>2NaN_3 = 130 (1) 3N_2 = 84 (1)</p> <p>if answer is incorrect then look for evidence of correct working. allow ecf from previous stage</p> <p>1 mark lost for each mistake in the working if they do not have the correct answer.</p>	3
4(a)(ii)	72 / 72.24 / 72.2 or 69 or 68.8	allow ecf from part (i) × 0.86 ignore working	1
4(b)(i)	2 and 5		1
4(b)(ii)	any one from: <ul style="list-style-type: none"> corrosive / burns alkaline / basic attacks / destroys / damages living tissue / cells 	do not accept acidic allow irritant ignore reference to reactivity ignore reference to silicates ignore harmful / toxic	1
Total			6

CHY 2H**Question 5**

question	answers	extra information	mark
5(a)(i)	lead nitrate	accept $\text{Pb}(\text{NO}_3)_2$ do not accept nitride	1
	sodium iodide / potassium iodide	accept NaI / KI accept other correct soluble iodides do not accept sodium iodine / potassium iodine	1
5(a)(ii)	filter / filtration / filtering	accept decant / decanting etc. accept centrifugation ignore evaporation or heating if after filtration	1

Question 5 continues on the next page

Question 5 continued

question	answers	extra information	mark
5(b)	<p>magnesium <u>loses 2 electrons</u></p> <p>iodine gains <u>1 / an electron</u></p>	<p>metallic / sharing / covalent or molecule = max 3</p> <p>all three underlined ideas must be present</p> <p>two underlined ideas = 1 mark eg magnesium loses electrons or magnesium gains 2 electrons or magnesium loses 2 ions</p> <p>nb magnesium ion loses 2 electrons = 1 mark</p> <p>2 errors = 0 marks eg magnesium gains electrons</p> <p>all four underlined ideas must be present</p> <p>three underlined ideas = 1 mark eg iodine gains electron(s) or iodine loses 1 / an electron or iodine gains 1 / an ion or iodide (ion) gains 1 / an electron</p> <p>2 errors = 0 marks</p>	<p>2</p> <p>2</p>
5(c)	<p>any two from:</p> <ul style="list-style-type: none"> forces (of attraction) / bonds are <u>strong</u> or lot of energy needed to break bonds oppositely charged ions <u>attract</u> or electrostatic <u>attraction</u> between ions <u>giant</u> structure or <u>lattice</u> 	<p>mention of molecules / intermolecular / covalent / atoms = max 1</p> <p>allow many bonds</p> <p>ignore ionic bonding unqualified</p>	2
Total			9

CHY 2H

Question 6

question	answers	extra information	mark
6(a)	same number of (gaseous) molecules / moles / volume on both sides of the equation	allow particles for molecules do not accept atoms ignore amount	1
6(b)	(forward) reaction is exothermic	accept reverse answer	1
6(c)	any three from: <ul style="list-style-type: none"> particles gain energy particles move faster particles collide more or more collisions more of the collisions are successful or more of the particles have the activation energy or particles collide with more force / energy 	allow particles collide faster / quicker ignore move more / vibrate more	3

Question 6 continues on the next page

CHY 2H

Question 6 continued

question	answers	extra information	mark
6(d)	<p>any two from:</p> <ul style="list-style-type: none"> more product (obtained in shorter time) less fuel needed <p>or</p> <p>lower fuel costs</p> <ul style="list-style-type: none"> less pollution caused by burning fuels <p>or</p> <p>less specified type of pollution caused by producing heat / burning fuels</p> <ul style="list-style-type: none"> using less fuel conserves resources 	<p>accept better yield (of product)</p> <p>accept less energy / heat / electricity needed</p> <p>ignore cheaper unqualified</p> <p>allow correct specified pollutants caused by burning fossil fuels eg CO₂ / greenhouse gases or correct effect of burning fossil fuels eg global warming</p> <p>accept thermal / heat pollution</p> <p>accept sustainable accept fossil fuels are non-renewable</p>	2
Total			7