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General Certificate of Secondary Education

Additional Science 4463 / Chemistry 4421

CHY2H Unit Chemistry 2

Mark Scheme

2011 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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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.

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Question 1

question	answers	extra information	mark
1(a)	kills <u>bacteria</u> **or** stops growth of <u>bacteria</u>	allow destroys bacteria ignore attacks / reacts with bacteria ignore 'traps the smell' ignore microbes	1
1(b)	small<u>er</u> / <u>very</u> small / tiny	assume they are referring to nanoparticles unless they state otherwise accept 1 – 100nm in size accept a few hundred atoms in size accept normal size particles are (much) larg<u>er</u>	1
1(c)	any **one** from: • big(ger) surface area • react fast(er)	 accept more reactive ignore kill faster	1
1(d)	so they do not get released during washing **or** so they do not get into rivers / ecosystem / environment because this could harm fish / aquatic life **or** so the socks keep their odour – preventing properties (owtte)		1 1
Total			**5**

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Question 2

question	answers	extra information	mark
2(a)	because they are gases	ignore vapours / evaporate / (g) allow it is a gas	1
2(b)(i)	80 / 79.5	correct answer with or without working = **2** marks ignore units if no answer **or** incorrect answer then evidence of 64 / 63.5 + 16 gains **1** mark	2
2(b)(ii)	80 / 79.87 / 79.9 / 79.375 / 79.38 / 79.4	correct answer with or without working = **2** marks if no answer **or** incorrect answer then evidence of $\frac{64}{80}$ **or** $\frac{63.5}{79.5}$ (x100) gains **1** mark accept (ecf) $\frac{64 \; or \; 63.5}{answer(b)(i)}(\times 100)$ for **2** marks if correctly calculated. if incorrectly calculated evidence of $\frac{64 \; or \; 63.5}{answer(b)(i)}(\times 100)$ gains **1** mark	2
2(b)(iii)	3.2	correct answer with or without working = **1** mark allow (ecf) 4 x ((b)(ii)/100) for **1** mark if correctly calculated	1

Question 2 continues on the next page

Question 2 continued

question	answers	extra information	mark
2(c)(i)	3.3	accept 3.33…….. or $3\frac{1}{3}$ or $3.3^{\bullet}$ or 3.3^{r}	1
2(c)(ii)	measure to more decimal places **or** use a more sensitive balance / apparatus	allow use smaller scale (division) **or** use a smaller unit ignore accurate / repeat	1
2(c)(iii)	any **two** from:	ignore systematic / human / apparatus / zero / measurement / random / weighing / reading errors unless qualified	2
	• different balances used **or** faulty balance	ignore dirty apparatus	
	• reading / using the balance incorrectly **or** recording error	accept incorrect weighing of copper / copper oxide	
	• spilling copper oxide / copper	allow some copper left in tube	
	• copper oxide impure	allow impure copper (produced)	
	• not all of the copper oxide was reduced / converted to copper **or** not enough / different amounts of methane used	accept not all copper oxide (fully) reacted	
	• heated for different times		
	• heated at different temperatures	accept Bunsen burner / flame at different temperatures	
	• some of the copper made is oxidised / forms copper oxide		
	• some of the copper oxide / copper blown out / escapes (from tube)	ignore some copper oxide / copper lost	
	• some water still in the test tube		
Total			**10**

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Question 3

question	answers	extra information	mark
3(a)	particles move faster **or** particles have more energy	accept molecules / atoms / ions instead of particles ignore move / vibrate more	1
	so they collide more often / frequently **or** more of the collisions are successful / have the activation energy	allow particles collide harder / with more force ignore collide quicker ignore collide more / more collisions	1
3(b)	any **one** from: • increase surface area (of the rock) • increase the concentration (of the acid) • add a catalyst • stir / mix the mixture	 accept crush / powder the rock ignore increase the pressure / temperature	1
Total			**3**

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Question 4

question	answers	extra information	mark
4(a)	gives out heat / energy **or** energy / heat transferred to surroundings	allow more energy given out in making bonds than is used in breaking bonds ignore light	1
4(b)	activation	allow phonetic spelling	1
4(c)(i)	2 crosses on inner circle **and** 8 crosses on outer circle	accepts dots / e / ─ for electrons	1
4(c)(ii)	opposite charges (attract)	allow electrostatic forces (attract) do **not** accept intermolecular attraction / shared electrons	1
Total			**4**

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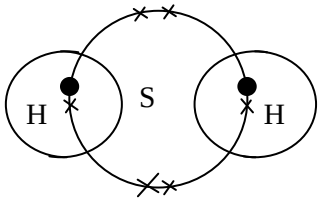
Question 5

question	answers	extra information	mark
5(a)(i)	electron(s)	allow free / delocalised / negative electrons do **not** accept additional particles	1
5(a)(ii)	ion(s)	allow named ions from table ignore positive or negative do **not** accept additional particles	1
5(b)(i)	copper	accept Cu do **not** accept Cu^{2+}	1
5(b)(ii)	it is / they are positive (ions) and it is the least reactive	accept formula of positive ion	1 1
5(c)(i)	loss of electron(s)	ignore numbers	1
5(c)(ii)	$\mathbf{2H^+} + \mathbf{2e^-} \rightarrow H_2$	accept correct multiples / fractions accept e / e^- allow $\mathbf{2H^+} \rightarrow H_2 - \mathbf{2e^-}$	1
Total			**7**

CHY2H

Question 6

question	answers	extra information	mark
6(a)	$\frac{6.21}{207}$ $\quad$ $\frac{0.64}{16}$	**1** mark for dividing mass by A_r max **2** if A_r divided by mass	1
	= 0.03 $\quad$ = 0.04	**1** mark for correct proportions	1
	3 $\quad$ 4	**1** mark for correct whole number ratio (allow multiples) can be awarded from correct formula	1
	Pb_3O_4	**1** mark for correct formula **ecf** allowed from **step 2 to step 3** and **step 3 to step 4** if sensible attempt at **step 1** correct formula with no working gains **2** marks	1
6(b)(i)		allow all dots **or** all crosses **or** e **or** e^- ignore inner shells and any inner electrons allow 4 non-bonded electrons anywhere on shell as long as not in overlap – need not be paired	1

Question 6 continue on the next page

Question 6 continued

question	answers	extra information	mark
6(b)(ii)	forces of attraction / bonds <u>between</u> molecules are weak (owtte) **or** <u>intermolecular</u> forces / bonds are weak (owtte) **or** it is made of small molecules with weak forces of attraction	do **not** accept intramolecular forces / covalent bonds are weak do **not** accept reference to ions if **2** marks not awarded made of small molecules / simple molecular gains **1** mark forces of attraction are weak (without specifying between molecules / intermolecular) gains **1** mark (accept easily broken / not much energy needed to break instead of weak) bonds are weak without specifying intermolecular would not gain a mark and would be ignored	2
6(b)(iii)	4		1
Total			**8**

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Question 7

question	answers	extra information	mark
7(a)(i)	nitrogen – air	accept atmosphere	1
	hydrogen – north sea gas / natural gas / methane / CH_4	accept water / (crude) oil / coal / hydrocarbons / brine	1
7(a)(ii)		allow converse throughout	
	• high temperature gives a low yield		1
	• because reaction is exothermic	must be linked to first bullet point	1
	• but at low temperatures the rate is (too) slow		1
		if no other marks awarded accept 450°C is a compromise between yield and rate **or** 450°C gives a reasonable yield in a reasonable time for **1** mark	
7(a)(iii)	nitric (acid)	accept HNO_3	1
7(b)	Ammonia / Haber process can be used to make fertiliser		1
	with a specified economical reason eg raw materials for Haber process readily available eg transport costs are lower or no need to import eg Haber process is a continuous process	ignore employment / labour costs	1
Total			**8**

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