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General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1H Unit Chemistry 1

Mark Scheme

2012 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 students' 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 students' 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 students' 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 students 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)

Student	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)

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student 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)(i)	a reasonable attempt at a smooth curve	allow a curve which is close to but does not necessarily touch all points	1
1(a)(ii)	any **two** from: • biodiesel is more viscous than petroleum diesel at all / lower temperatures • biodiesel – as the temperature increases the viscosity decreases or vice versa • petroleum diesel – the viscosity does not change	allow thicker / thinner / runny for viscous if no other mark awarded allow **1** mark for any correct conclusion based on time or rate of flow	2
1(a)(iii)	does not flow as easily (through pipes / engine) **or** needs a high temperature to flow	allow could form a solid / block pipes / engine at low temperatures allow more difficult to vaporise / ignite ignore burning ignore references to viscosity	1
1(b)(i)	global dimming	allow correct description	1
1(b)(ii)	56 (%)		1

Question 1 continues on the next page . . .

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Question 1 cont'd….

question	answers	extra information	mark
1(b)(iii)	(increases) acid rain		1
	because there is more nitrogen oxide(s)	ignore sulfur dioxide if no other mark awarded allow **1** mark for nitrogen oxide(s) given	1
1(b)(iv)		answer yes or no does not gain credit because the marks are for an explanation ignore references to petroleum diesel allow carbon for carbon dioxide	
	no because carbon dioxide (26%) is released / produced		1
	this will not all be absorbed by photosynthesis / growing plants for biodiesel	accept growing plants / farming uses machinery / fossil fuels releases carbon dioxide	1
	OR yes because although carbon dioxide (26%) is released / produced (1)		
	this was absorbed by photosynthesis / growing plants(for biodiesel) (1)	allow this will be absorbed by photosynthesis / growing plants for biodiesel	
Total			**10**

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Question 2

question	answers	extra information	mark
2(a)	(improve) appearance	allow add colour allow these food colourings have not been proven to cause hyperactive behaviour in young children do **not** accept taste / flavour / preservatives ignore reference to E-numbers	1
2(b)	X		1
2(c)	any **three** from: • S contains six / 6 colourings • P contains five / 5 colourings • both S and P contain the same five / 5 colourings • both contain W **and** Y • both sweets (may) cause hyperactivity • neither contain X **and** Z	if neither of first 2 bullet points given allow **1** mark for S contains more colours than P **or** converse ignore unsafe	3
Total			**5**

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Question 3

question	answers	extra information	mark
3(a)(i)	contains enough metal to make it economical to extract		1
3(a)(ii)	Fe (+) CO_2	formula of both products must be correct	1
	(Fe_2O_3) (+) ....3....(CO)	balancing correct	1
	→		
	.....2.....(Fe) (+) .....3...(CO_2)	allow correct balancing using Fe_2	
3(a)(iii)	reduction	accept redox	1
3(b)(i)	oxygen reacts with the carbon	allow carbon monoxide for carbon dioxide	1
	to produce carbon dioxide		1
	OR		
	carbon dioxide is produced (1) which escapes as a gas (1)		
3(b)(ii)	to give steels with different / particular properties or for different / particular uses	ignore to make different alloys	1
3(c)	copper is very expensive	accept the metal (iron / steel) costs less than copper ignore energy	1
	because copper ores are 'low grade' / running out	allow copper is rare ignore nickel	1
Total			**9**

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Question 4

question	answers	extra information	mark
4(a)(i)	3 / three		1
4(a)(ii)	nitrogen does not react	allow nitrogen is not used up in the reaction	1
	carbon dioxide is a product of methane / fuel burning / reacting with oxygen	accept oxygen in the air reacts with methane	1
	carbon dioxide is a product of calcium carbonate decomposing (to produce calcium oxide)	do **not** allow calcium carbonate reacts with oxygen	1
4(b)	any **two** from: • water and calcium oxide / quicklime <u>react</u> • to produce calcium hydroxide / slaked lime • energy / heat <u>released</u> / exothermic	ignore mix ignore gets hot/heats up correct word equation = **2** marks	2
Total			**6**

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Question 5

question	answers	extra information	mark
5(a)(i)	any **one** from: • insufficient evidence for any of the theories • mountain ranges formed millions of years ago • scientists do not know what happens below the Earth's crust • scientists cannot test any theory	 accept no proof accept no scientist is certain of what the Earth was like millions of years ago ignore different scientists have different theories ignore references to other theories	1
5(a)(ii)	the Earth cooled (and formed a crust) the Earth contracted / shrank (causing wrinkles in the crust)	ignore references to other theories	1 1
5(b)(i)	radioactive processes / decay release energy / heat (inside the Earth) forming convection currents in the mantle		1 1 1
5(b)(ii)	oceanic plate and the continental plate / two plates are moving towards each other the continental plate / land is pushed up	accept oceanic plate and the continental plate / two plates are colliding with each other allow subduction accept sediments are pushed up **or** seabed is pushed up	1 1
Total			**8**

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Question 6

question	answers	extra information	mark
6(a)		allow answers referring specifically to the naphtha fraction	
	crude oil is <u>evaporated/vaporised</u> (by heating)		1
	the vapours are <u>condensed</u> (by cooling)		1
	(fractions condense) / boil at different temperatures	allow fractions have different boiling points	1
6(b)	any **four** from:	answer yes or no does not gain credit ignore references to volume of milk held / number of bottles used / biodegradability / habitats / pollution / mining / dust each marking point must be a comparison	4
	milk bag points		
	• uses (75%) less **crude oil** to make (than a plastic milk bottle)	allow eg uses 75% less poly(ethene) which is made from crude oil	
	• uses less **energy** / fuel to make (than a plastic / glass milk bottle)		
	• produces less **carbon dioxide** to manufacture (than a plastic / glass milk bottle)	allow produces less greenhouse gases / causes less global warming allow produces less CO_2 on burning	
	• produces less **waste** (than a plastic / glass milk bottle)	allow takes up less landfill (space) allow an argued case for more waste eg milk bags are discarded / cannot be reused	

	• less fuel used for **transport** than glass milk bottles • (produces waste because) milk bags are only used once whereas glass bottles can be **re-used** poly(ethene) points • uses a limited **raw material** / crude oil whereas the raw materials for glass are almost unlimited • **less** (5%) poly(ethene) is **recycled** (compared to glass (35%))	allow milk bags are discarded but glass bottles can be reused (24 / many times) allow glass bottles can be reused but milk bags can't allow (35%) glass is recycled or (5%) poly(ethene) (bottles) recycled BUT milk bags aren't / are discarded **or** recycled poly(ethene) is not used to make new bags whereas recycled glass is used to make new bottles	
Total			**7**

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