GCSE

SCIENCE A / CHEMISTRY

CH1HP

Mark scheme

4405 / 4402

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Version 1.0 Final

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

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.

Further copies of this Mark Scheme are available from aqa.org.uk

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 Assessment Objectives and specification content that each question is intended to cover.

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 and underlining

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 bullet points 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.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

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	green, 5	0
2	red*, 5	1
3	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, 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 or by each stage of a longer calculation.

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 is 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.

3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Quality of Written Communication and levels marking

In Question 2(b) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
1(a)(i)	2,4 drawn (as dots / crosses / e^-)		1	2 / 1.1.1h	E
1(a)(ii)	Water (vapour) / steam	allow hydrogen oxide / H_2O *do **not** accept hydroxide*	1	1 / 1.4.3b	G
1(b)	any **two** pairs from: carbon dioxide (1) causes global warming (1) **or** carbon (particles) / *soot* (1) causes global dimming (1) **or** carbon monoxide (1) is toxic (1) **or** sulfur dioxide (1) causes acid rain (1)	*allow greenhouse effect / climate change / sea level rise / melting of polar ice caps* *allow particulates* *allow blocks out sunlight / smog / prevents plant growth / causes breathing difficulties* *allow kills plants / erosion / acidifies water*	4	1 / 1.4.3a/c	E
Total			**6**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
2(a)(i)	reaction with water / steam	allow add water / steam *(to produce ethanol)* *allow H_2O or hydrogen oxide for water* *ignore mix*	1	1 / 1.5.3a	E
2(a)(ii)	filter / decant (to remove the yeast) *(fractional) distillation / distil*	*allow answers in either order* *accept description of decanting* *ignore sieve* *accept evaporation then condensation*	1 1	2 / 1.5.3b	E

2(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content	There is a stated advantage **or** disadvantage of using biodiesel ***or*** petroleum diesel.	There is a stated advantage **or** disadvantage of using biodiesel **or** petroleum diesel with a linked consequence.	There is at least one stated advantage **and** at least one stated disadvantage of using biodiesel **or** petroleum diesel with a linked consequence for each.

Examples of points made in the response could include:

Advantages *of biodiesel*:

- Produces less carbon dioxide
- Produces no sulfur dioxide
- Produces less particulates
- Sustainable / renewable
- Growing crops absorb carbon dioxide
- Carbon neutral
- Produces less acid rain
- Conserves the limited amount of petroleum diesel

Disadvantages *of biodiesel*:

- Produces more nitrogen oxides
- Deforestation for land
- Destruction of habitats for land
- Uses land that could be used for food crops
- Creates food shortages
- Crops are not reliable

1+2+3 / 1.4.3e

E

Total			**9**

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
3(a)(i)	add bromine (water) *to the oil* *one drop at a time / dropwise* ***or*** *count / record number of drops* until the bromine (water) no longer decolourises **or** until bromine water remains orange	*it = bromine water* *allow shake / mix / stir* *ignore clear*	1 1 1	1+2 / 1.6.3a	E
3(a)(ii)	A 2 anomalous result ***or*** *explanation*	both need to be correct *allow A 17* *ignore does not fit pattern/trend* *independent marking points*	1 1	3 / 1.6.3a	E
3(a)(iii)	any **one** from: • temperature • concentration of bromine water • (same) *dropper / pipette*	*ignore references to time* *allow same bromine water* *allow (same) drop size*	1	3 / 1.6.3a	E

3(b)	any **three** from: • A's oil has more unsaturated fat (than Vegio) **or** has the most unsaturated fat • B's oil has more unsaturated fat (than Vegio) • C's oil has less unsaturated fat (than Vegio) **or** has the least unsaturated fat • D's oil has less unsaturated fat (than Vegio) • Vegio is in 3rd position	*comparison must be to Vegio* allow *healthier **or** better (for you)* for *more* unsaturated fat *ignore references to bromine water* *allow <u>only</u> A and B have more unsaturated fat than Vegio **or** <u>only</u> C and D have less unsaturated fat than Vegio for **3** marks*	3	3 / 1.6.3a	E
Total			**9**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
4(a)(i)	phytomining		1	1 / 1.3.1g	G
4(a)(ii)	*(the land contains)* very little copper	*allow low grade ore **or** large amounts of waste* *ignore quarrying / benefits of using plants*	1	3 / 1.3.1f/g	E
	uneconomical	*accept (smelting) uses a lot of energy / fossil fuels* *allow expensive*	1		
4(a)(iii)	Cu **2** $CuO + C \rightarrow$ **2** $Cu + CO_2$	 *allow 2 $CuO + C \rightarrow Cu_2 + CO_2$ for **1** mark*	1 1	2 / 1.3.1f	E
4(b)(i)	iron is more reactive (than copper) iron is cheap(er than copper)	 *allow cheaper **or** uses less energy than electrolysis*	1 1	1 + 2 / 1.3.1h	E
4(b)(ii)	*any **two** from:* • copper / ions move **or** are attracted to the negative electrode / *cathode* • where they are reduced **or** gain (two) electrons • *where they form copper (metal / atoms)*		2	1 / 1.3.1h	E
Total			**9**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
5(a)	(thermal) decomposition	accept limestone decomposes allow endothermic	1	1 / 1.2.1b	E
	(to produce) calcium oxide / *CaO* ***or*** *quicklime*	accept a correct word or chemical equation for the last two marking points	1		
	(to produce) carbon dioxide / CO_2		1		
5(b)(i)	1.8(g)	*accept correct answer with or without working* accept $1.8 + 1.9 + 1.7 \div 3$ for **1** mark if no other mark awarded allow **1** mark for 1.6(g) or any calculation with one error	2	2 + 3 / 1.2.1b	E
5(b)(ii)	the limestone was not pure (calcium carbonate) **or** *contained impurities*		1	2 + 3 / 1.2.1b	E
	so less carbon dioxide was produced		1		
	the temperature was not high enough	allow not heated for long enough	1		
	so the limestone / *calcium carbonate* did not fully decompose / *react*		1		
Total			**9**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
6(a)(i)	*Wegener / they* could not explain how continents could move	*allow not enough or no evidence or no proof (of movement)* *ignore status / technology*	1	1 / 1.7	E
6(a)(ii)	*because the (Earth's) crust* *(is divided into tectonic) plates* *the heat (released) from radioactive processes* *causes convection currents* *in the mantle (that move the tectonic plates)*		1 1 1 1 1	1 / 1.7.1b/c	E
6(b)(i)	forms a solid **or** freezes	accept would block pipes	1	2 / 1.7.2j	E
6(b)(ii)	neon		1	2 / 1.7.2j	A
6(b)(iii)	argon because the boiling points are almost the same **or** only 3 degrees different	*do **not** allow reference to melting points*	1 1	3 / 1.7.2j	E
Total			**10**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
7(a)(i)	alkanes **and** alkenes	any order allow saturated **and** unsaturated (hydrocarbons)	1	1 / 1.4.2a	E
7(a)(ii)	high temperature catalyst **or** steam	*allow temperatures from 300 – 900 ^{o}C* *allow vapours* *ignore heat / hot **or** pressure* *allow zeolite / aluminium oxide* *ignore names of other catalysts*	1 1	1 / 1.5.1a	E
7(a)(iii)	*oxygen* could react / *burn* with the hydrocarbons	allow *oxygen* could cause an explosion	1	2 / 1.5.1a	E
7(a)(iv)	*(fractional)* distillation		1	2 / 1.4.2b	E
7(b)(i)	displayed structure of butene drawn		1	2 / 1.5.1c	E
7(b)(ii)	many monomers **or** many butene molecules *form chains **or** very large molecules*	 if no other mark awarded allow double bond breaks / opens up **or** double bond forms a single bond for **1** mark	1 1	1 / 1.5.2a	E
Total			**8**		