
GCSE

Science A / Chemistry

CH1FP

Mark scheme

4405 / 4402

June 2016

Version 1.0: Final Mark Scheme

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. 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 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 errors / 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 Accept / allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

3.9 Ignore / Insufficient / Do not allow

Ignore or insufficient is 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.

4. Quality of Communication and levels marking

In Question **5(c)** students are required to produce extended written material in English, and will be assessed on the quality of their 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 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	7		1	AO2 1.1.1g
1(a)(ii)	-1		1	AO1 1.1.1d
1(a)(iii)	neutrons		1	AO1 1.1.1c
1(b)	number of protons		1	AO1 1.1.1f
1(c)	atom Y		1	AO2 1.1.1 h; 1.1.2a
1(d)(i)	Ne	allow neon	1	AO2 1.1.2a/b
1(d)(ii)	has a full outer shell or full outer energy level or has 8 electrons in its outer shell	allow in Group 0 allow a noble gas allow the shells are full ignore in Group 8	1	AO2 1.1.2b; 1.1.3a
Total			7	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	the Earth's (surface) temperature was high or at/above 100 °C	allow the Earth's (surface) temperature was too/very hot or water evaporated/ boiled or turned to steam/gas allow because of heat from volcanoes ignore the Earth's (surface) was covered by volcanoes ignore water turned to water vapour	1	AO3 1.7.2b
2(a)(ii)	plates	allow plate	1	AO1 1.7.1d
2(b)(i)	air _____ mixture carbon dioxide _____ compound argon _____ element	allow only one line from each substance	1 1 1	AO1 1.1.1a; 1.1.3a; 1.7.2a
2(b)(ii)	oxygen		1	AO1 1.4.3b
2(b)(iii)	about 80 %		1	AO1 1.7.2a
2(c)(i)	0.03(0) (%)		1	AO2 1.7.2 c
2(c)(ii)	increased slowly then rapidly	allow figures from graph to indicate increase	1 1	AO2 1.7.2i
2(c)(iii)	any two from: <ul style="list-style-type: none"> • use of fossil fuels • deforestation • cars/transport • industry/factories 	ignore more people allow less trees / plants	2	AO3 1.7.2i
Total			12	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	because it is a good conductor of electricity.		1	AO1 1.3.3b
3(b)(i)	2.1 (%)		1	AO2 1.3.1c
3(b)(ii)	correct bar for calcium at 3.6 % correct bar for iron at 5.0 %	allow error of +/- 0.05% allow error of +/- 0.05%	1 1	AO2 1.3.1c
3(c)(i)	decomposition		1	AO1 1.1.3b; 1.2.1b/c
3(c)(ii)	carbon dioxide		1	AO1 1.2.1c
3(c)(iii)	carbon = 1 oxygen = 3	allow one allow three	1 1	AO2 1.1.3 a
3(c)(iv)	44 (g)	allow forty four	1	AO2 1.1.3 c
3(d)(i)	to make alloys for specific uses.		1	AO1 1.3.2a/b/c
3(d)(ii)	any three from: <ul style="list-style-type: none"> to conserve resources of iron or iron ore to avoid the need for quarrying/mining to conserve energy resources or fossil fuels to limit the amount of carbon dioxide produced or to reduce global warming to reduce the amount of landfill 	“it” = steel ignore cost and reuse and time and waste allow steel instead of iron or iron ore allow limited resource or non-renewable	3	AO1 1.3.1j
Total			13	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)(i)	fermentation		1	AO1 1.5.3b
4(a)(ii)	hydration		1	AO1 1.5.3a
4(a)(iii)	resources of crude oil are non-renewable		1	AO3 1.4.3e; 1.5.3b
	producing ethanol from plants uses less energy		1	
4(b)(i)	turns cloudy / milky / white because carbon dioxide is produced	ignore bubbles	1	AO1 1.2.1e
		allow CO ₂ produced	1	
4(b)(ii)	filter paper		1	AO3 1.5.3b; 4.3
4(c)(i)	vegetable oils cook foods at higher temperatures than boiling water		1	AO1 1.6.1c
4(c)(ii)	(flask A) vegetable oil and water <u>do not mix</u> or are immiscible or vegetable oil <u>does not dissolve</u> in water		1	AO2+AO3 1.6.2a
	(flask B) vegetable oil, water and an emulsifier form an emulsion or a suspension or a stable mixture	allow correct description using hydrophilic and/or hydrophobic	1	
Total			10	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	high temperature catalyst or steam	allow heating / hot / 250-900 °C	1	AO1 1.5.1a
		allow named catalyst eg zeolite, Al ₂ O ₃ , silica, ceramic allow in the absence of air / oxygen	1	
		ignore any references to pressure		
5(a)(ii)	colourless	allow decolourised ignore clear / discoloured	1	AO1 1.5.1d
5(a)(iii)	$ \begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\ & & & \\ \text{H}-\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{H} \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array} $		1	AO2 1.4.2a
5(b)(i)	20.3(0) (kJ)	if answer incorrect allow 1 mark for 24.36/1.2	2	AO2 1.4.3b
5(b)(ii)	use a lid reduce energy / heat loss	allow insulate beaker or use draught shield	1	AO3 4.3.2b/c/d
		ignore references to thermometer or repeats or distance of flame or loss of water vapour allow stir (1) to distribute energy / heat (1) allow use a metal can (1) as it's a better conductor (1)	1	
5(b)(iii)	carbon/soot (produced by) incomplete combustion	ignore tar, smoke allow from a limited supply of oxygen/air	1 1	AO1+AO2 1.4.3a/b
5(b)(iv)	hexane gives out the greatest energy (per 1.0 g) hexane produces the least smoke / carbon / soot	ignore more energy	1	AO3 1.4.2c; 1.4.3a/b
		allow has the cleanest flame ignore less smoke / carbon / soot	1	

QWC Mark Scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(c)			6	AO1+AO2+ AO3 1.1.3b; 1.4.1b/c; 1.4.3a/b/c/d ;1.7.2h/i
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	Statements made from the information that indicate whether at least one statement is an advantage or a disadvantage or a linked advantage or disadvantage	Descriptions of an advantage and a disadvantage with some use of their knowledge to add value.	Descriptions of advantages and disadvantages that are linked to their own knowledge.	
<p>Examples of the added value statements and links made in the response could include:</p> <p>Note that link words are in bold; links can be either way round.</p> <p>Accept reverse arguments and ignore cost throughout.</p> <p>Advantages of using hydrogen:</p> <ul style="list-style-type: none">• Combustion only produces water so causes no pollution• Combustion does not produce carbon dioxide so this does not contribute to global warming or climate change• Combustion does not produce sulfur dioxide so this does not contribute to acid rain• Incomplete combustion of petrol produces carbon monoxide that is toxic• Incomplete combustion of petrol produces particulates that contribute to global dimming• Petrol comes from a non-renewable resource but there are renewable/other methods of producing hydrogen• Hydrogen releases more energy so less fuel needed or more efficient <p>Disadvantages of using hydrogen:</p> <ul style="list-style-type: none">• Hydrogen is a gas so is difficult to store or transfer to vehicles• Hydrogen gas is very flammable so leaks cause a greater risk of explosion• Most hydrogen is produced from fossil fuels which are running out• Cannot be used in existing car engines so modification / development or replacement is needed• Lack of filling stations so difficult to refuel your vehicle				
Total				18