



GCSE

Chemistry

CH3FP
Final Mark Scheme

4402
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Version/Stage: v1.0

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 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 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 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	Pluto, Mars, Moon	1
2	Pluto, 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 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 'ecf' 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 a 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 Written Communication and levels marking

In Question 6(c)(i) 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

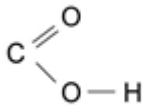
- Knowledge of basic information.
- Simple understanding.
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail.
- The spelling, punctuation and grammar are very weak.

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.
1 (a)(i)	numbers	allow number allow numbers circled in the box	1	AO1 3.1.2b
1 (a)(ii)	electrons	allow electron allow electrons circled in the box	1	AO1 3.1.2b
1 (b)(i)	Cl/chlorine	allow CL / cL / cl	1	AO1 3.1.3f
1 (b)(ii)	Cu/copper	allow CU / cU / cu	1	AO2 3.1.3c
1 (b)(iii)	7/seven		1	AO1 3.1.3e
1(c)(i)	tick (✓) by: displacement		1	AO1 3.1.3g
1(c)(ii)	tick (✓) by: Fluorine		1	AO3 3.1.3g
1(d)	tick (✓) by: yellow		1	AO1 3.4.1e
1(e)(i)	circle around: 		1	AO2 3.6.2a
1(e)(ii)	carbon dioxide	allow carbon dioxide circled in the box	1	AO2 3.6.2b
1(e)(iii)	esters	allow esters circled in the box allow ethers	1	AO2 3.6.2b
Total			11	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	filter → to remove solids	more than one line from any treatment negates the mark	1	AO1 3.2.2a,c
	sterilise → to kill microbes		1	
2(a)(ii)	tick (✓) by: chlorine		1	AO1 3.2.2c
2(b)	large amount of energy / fuel needed	allow electricity / heat for energy ignore time / temperature / lots of stages	1	AO1 3.2.2d
2(c)(i)	improve dental health	do not allow bones	1	AO1 3.2.2c
2(c)(ii)	personal choice or may not benefit everyone		1	AO3 3.2.2c
Total			6	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	air	allow air circled in the box	1	AO1 3.5.1.a
3(a)(ii)	tick (✓) by: lowers the activation energy		1	AO1 3.3.1h
3(a)(iii)	(gases) cooled (ammonia) condensed	ignore turn to a liquid if no other mark, allow fractional distillation for 1 mark	1 1	AO1 AO2 3.5.1b
3(b)	hydrogen ammonia	must be in correct order	1	AO1 3.5.1b
3(c)(i)	all points correctly plotted	allow 1 mark for 3 correct points allow +/- one small square	2	AO2 3.5.1b
3(c)(ii)	correctly drawn line		1	AO2 3.5.1b
3(c)(iii)	line extrapolated to at least 300°C 0.50 - 0.60		1 1	AO2 3.5.1b
3(c)(iv)	increases		1	AO2 3.5.1b
Total			11	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	any two from: <ul style="list-style-type: none"> • floats • moves around • fizzes / bubbles / gas • melts / spherical • dissolves / gets smaller / disappears • (lilac) flame / burns / sparks 	ignore hydrogen	2	AO1 AO2 3.1.3a
4(b)(i)	burette		1	AO1 3.4.1g
4(b)(ii)	indicator	allow any named indicator	1	AO1 3.4.1g
4(b)(iii)	add alkali until end point / until acid is neutralized / colour change any one from: <ul style="list-style-type: none"> • swirl • add dropwise / slowly • take reading of volume of alkali used. 	ignore clear accept read initial and final volumes of alkali	1 1 1	AO1 AO3 3.4.1g
4(b)(iv)	any one from: <ul style="list-style-type: none"> • volume of acid • concentration of acid • concentration of hydroxide. 	allow amount of acid	1	AO3 3.4.1g
4(c)(i)	$(18.2 + 19.0 + 18.6)/3$ = 18.6	correct answer with or without working gains 2 marks allow $((23.8 + 18.2 + 19.0 + 18.6)/4 =)19.9$ for 1 mark	1 1	AO2 AO3 3.4.1g

4(c)(ii)	any two from: <ul style="list-style-type: none">• repeat more times• (calculate) a mean• measure to one decimal place.		2	AO3 3.4.1g
Total			12	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)	calcium/magnesium (ions) dissolve or go into solution from rocks	allow limestone	1	AO1 3.2.1b
			1	
5(b)	solubility increases to 68 (°C) and/or until solubility reaches 59 (g/100g water) then decreases		1	AO2 AO3 3.2.1b
			1	
			1	
5(c)	advantage: • good for bones or teeth or heart. disadvantage: • any one from: ○ scale ○ more soap used ○ scum ○ reduce efficiency of heating systems or kettles.	ignore cost ignore time	1	AO1 3.2.1a,e,f
			1	
5(d)	(Resin) contains sodium or hydrogen <u>ions</u> (so these ions) replace / exchange with (so water) no longer contains magnesium <u>ions</u> or calcium <u>ions</u>	do not accept references to reactivity	1	AO1 3.2.1g
			1	
			1	
Total			10	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)	tick (✓) by: CH ₃ OH		1	AO2 3.6.1a
6(b)	tick (✓) by: C		1	AO2 3.3.1d
6(c)(i)			6	AO1 AO2 AO3 3.3.1a
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	some of the steps for a method or measurements are stated	a method and some measurements are described	a method and measurements are described which would allow a comparison to be made between the two alcohols	
<p>Examples of chemistry points made in response:</p> <ul style="list-style-type: none"> • measure mass or volume of water • measure initial mass of ethanol (and burner) • measure initial temperature of water • ignite alcohol to heat the water • stir water • after a suitable temperature rise or time (or after a given volume is burned) • extinguish the flame • measure final temperature of water • measure final mass of ethanol (and burner) • repeat with next alcohol • calculate the energy released and compare or compare temperature rise (for given mass of alcohol burnt or for given time of burning). 				

6(c)(ii)	lid or lagging or windshield or copper/metal container (so that) less energy lost (to surroundings) OR stir(rer) (1) (so that) energy distributed (1)	M2 dependent on M1 ignore digital thermometer ignore evaporation	1 1	AO3 3.3.1a
Total			10	