SPECIMEN MATERIAL

GCSE
COMBINED SCIENCE: TRILOGY

PAPER 3: CHEMISTRY 1F

Mark scheme

Specimen 2018

Version 1.0

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. 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

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working.

Full marks can, however, be given for a correct numerical answer, without any working shown.

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 as well, will still mean that the mark is not awarded.

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

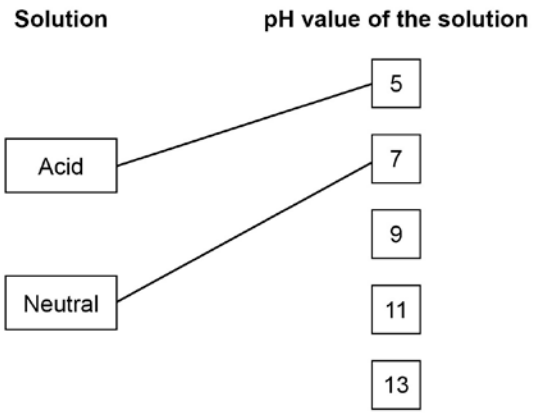
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question 1

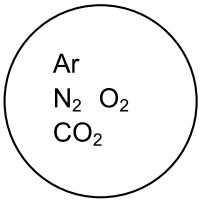
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		extra lines from solution negate the mark	1 1	AO1/1 5.4.2.4
01.2	H^+		1	AO1/1 5.4.2.4
01.3	3		1	AO2/1 5.1.1.1
01.4	Neutralisation		1	AO1/1 5.4.2.2, 4
01.5	sodium sulfate		1	AO1/1 5.4.2.2
01.6	Add indicator to sodium hydroxide solution Add sulfuric acid (gradually) until indicator just changes (colour) **or** until universal indicator turns green or shows pH7	allow add indicator to sulfuric acid allow add sodium hydroxide solution (gradually) allow pH probe	1 1 1	AO2/2 5.4.2.2, 4
Total			**9**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	Carbon and silicon		1	AO1/1 5.1.1.1 5.1.2.2
02.2	Atomic number		1	AO1/1 5.1.2.1
02.3	Hydrogen / fluorine / chlorine are not in Group 1 of the periodic table **or** Hydrogen and fluorine / chlorine are not in the same group of the periodic table Lithium / sodium / potassium are in Group 1 of the periodic table		1 1	AO2/2 5.1.2.1 5.1.2.2

Question 2 continues on the next page

Question 2 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	plum pudding model has a single ball of positive charge and nuclear model has positive charges in the centre / nucleus plum pudding model has electrons in random positions and nuclear model has electrons in fixed positions plum pudding model has no nucleus and the nuclear model has a nucleus plum pudding model has no neutrons and the nuclear model has neutrons in the nucleus		1 1 1 1	AO1/1 5.1.1.3, 4, 5, 7
02.5			1	AO2/1 5.1.1.2
02.6	Covalent bond		1	AO1/1 5.2.1.4
Total			**10**	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	**Z**		1	AO3/1a 5.4.1.2
03.2	magnesium sulfate does not react with any of the metals	allow there is no change/increase in temperature with any of the metals	1	AO3/2b 5.4.1.2
03.3	temperature increase		1	AO2/2 5.5.1.1,
03.4	**Level 2:** A detailed and coherent plan covering all the steps. The steps include the improvements and are set out in a logical manner.		3–4	AO3/3b 5.4.1.2
	Level 1: Simple statements of improvements to the apparatus or steps are made but they may not be set out in a logical manner.		1–2	
	No relevant content		0	
	Indicative content Simple statements • stir the solution • use the same amount of each solution • use the same concentration of solution • put insulation or a lid on the beaker • measure how high temperature goes Coherent statements in a logical order • pour a fixed, measured volume of the metal salt solution into a plastic/polystyrene cup • measure and record the temperature of the solution • stir and add 1 g of metal to the solution • (put a lid on the cup) • measure and record the temperature after a set time or measure and record the greatest/highest temperature • calculate and record the temperature increase • (repeat each individual experiment at least two more times and calculate the mean temperature increase)			

Question 3 continues on the next page

Question 3 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	Activation energy		1	AO1/1 5.5.1.1, 2
03.6	386 (kJ)/1370 × 100 28 %		1 1	AO2/1 5.5.1.1, 2
Total			**10**	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	LiOH (aq) H_2 (g)	this order	1 1	AO1/1 5.1.2.5, 5.2.2.2
04.2	**C**		1	AO3/1a 5.2.2.1
04.3	**A** and **D**		1	AO3/1a 5.2.2.1
04.4	point x at –10 °C point ● at +150 °C		1 1	AO2/2 5.2.2.1
04.5	substance **B** will not reach its boiling point of 190 °C because the boiling point of water is only 100 °C		1 1	AO3/1b 5.2.2.1
04.6	there is too much substance **B** to melt instantly.	allow answers based on thermal conductivity or temperature gradient from the wall of the test tube to the thermometer	1	AO3/3b 5.2.2.1
Total			**9**	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05	**Level 3:** A coherent method is described with relevant detail, which demonstrates a broad understanding of the relevant scientific techniques, procedures and safety precautions. The steps in the method are logically ordered with the dependent and control variables correctly identified. The method would lead to the production of valid results.		5–6	AO1/2 5.4.2.3
	Level 2: The bulk of a method is described with mostly relevant detail, which demonstrates a reasonable understanding of the relevant scientific techniques, procedures and safety precautions. The method may not be in a completely logical sequence and may be missing some detail.		3–4	
	Level 1: Simple statements are made which demonstrate some understanding of some of the relevant scientific techniques, procedures and safety precautions. The response may lack a logical structure and would not lead to the production of valid results.		1–2	
	No relevant content		0	

Question 5 continues on the next page

Question 5 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
	Indicative content Named chemicals • copper oxide • sulfuric acid • copper sulfate Correct use of apparatus • stirring rod • spatula • beaker • filter funnel and filter paper • evaporating basin • Bunsen burner • tripod and gauze • bench mat • conical flask Method • add (excess) copper oxide to sulfuric acid • heat the mixture • filter the mixture • method to evaporate some of the water from the filtrate eg using a water bath or evaporating to half volume • leave solution (to cool and) to form crystals • remove and dry crystals Safety • wearing of safety glasses / goggles • care with use of sulfuric acid as corrosive • warming not boiling mixture of copper oxide and sulfuric acid • hold beaker containing warm mixture with tongs whilst filtering			
Total			**6**	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	electrolysis		1	AO1/1 5.4.3.1
06.2	Cathode – hydrogen Anode – bromine		1 1	AO3/1b AO2/1 5.4.3.4
06.3	copper ions are positive so the copper ions are attracted to the negative cathode	 allow so the copper ions gain electrons from the cathode to form copper atoms	1 1	AO2/1 5.4.3.4
Total			**5**	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	A base		1	AO1/1 5.4.2.2
07.2	forces		1	AO1/1 5.2.1.3 5.2.2.3
07.3	calcium loses electrons and oxygen gains electrons	max 3 for incorrect reference to atom/ion or to oxygen / oxide	1	AO1/1
	two electrons are transferred		1	AO2/1
	calcium has a 2^+ charge		1	AO2/1
	oxide has a 2^- charge		1	AO2/1
				5.1.1.7 5.2.1.2
Total			**6**	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	408 kg		1	AO2/1 5.3.1.1
08.2	all points correct best fit line	± ½ small square allow **1** mark if 5 points correct	2 1	AO2/2 5.3.2.5
08.3	$\frac{1989 \times 100}{36}$ 5525 dm^3		1 1	AO2/1 5.3.25
08.4	relative formula mass of $TiCl_4$ is 190 25.26 % Answer given to 3 significant figures = 25.3 %	 25.23% with or without working gains **3** marks	1 1 1	AO2/1 5.3.1.2
08.5	argon is unreactive water (vapour) would react with sodium and air contains oxygen that would react with reactants	 allow water (vapour) would react with titanium(IV) chloride allow and air contains oxygen that would react with products	1 1 1	AO3/2a 5.1.2.4, 5 5.4.1.1

Question 8 continues on the next page

Question 8 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	(titanium conducts electricity) because electrons in the outer shell of the metal atoms are delocalised and so electrons are free to move through the whole structure	allow the delocalised electrons in the metal carry electrical charge through the metal	1 1 1	AO1/1 5.2.1.5 5.2.2.8
Total			**15**	