SPECIMEN MATERIAL

GCSE
CHEMISTRY

PAPER 1H

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 '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 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	The forces between iodine molecules are stronger		1	AO1/1 4.2.2.4
01.2	anything in range +30 to +120		1	AO3/2a 4.1.2.6
01.3	Brown		1	AO2/1 4.1.2.6
01.4	$2\ I^{-} + Cl_2 \rightarrow I_2 + 2\ Cl^{-}$		1	AO2 /1 4.1.2.6 4.1.1.1
01.5	It contains ions which can move		1	AO1/1 4.2.2.3
01.6	hydrogen iodine		1	AO2/1 4.4.3.4
Total			**6**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	13 (protons) 14 (neutrons) 13 (electrons)	The answers must be in the correct order. if no other marks awarded, award **1** mark if number of protons and electrons are equal	1 1 1	AO2/1 4.1.1.4, 5
02.2	has three electrons in outer energy level/shell	allow electronic structure is 2.8.3	1	AO1/1 4.1.2.1

Question 2 continues on the next page

Question 2 continued

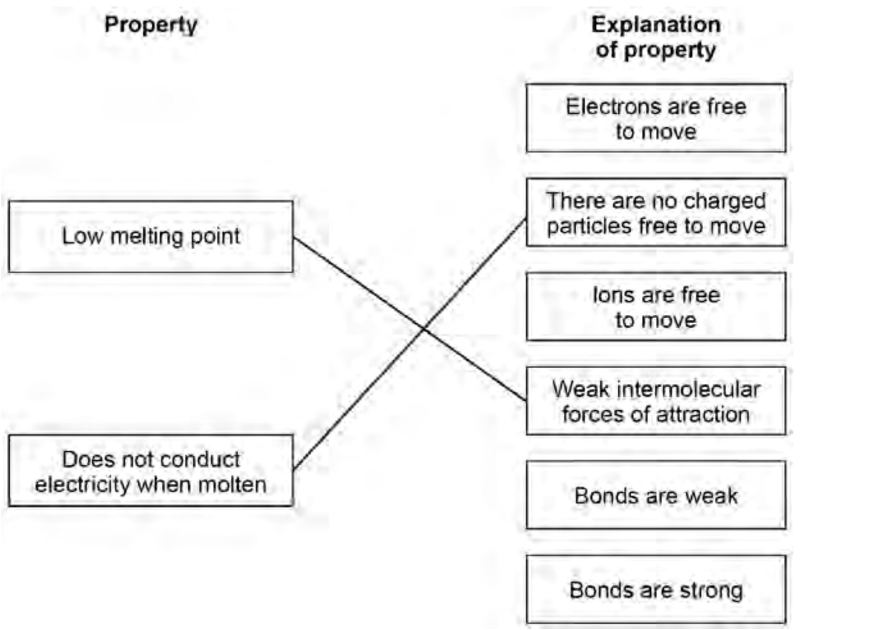
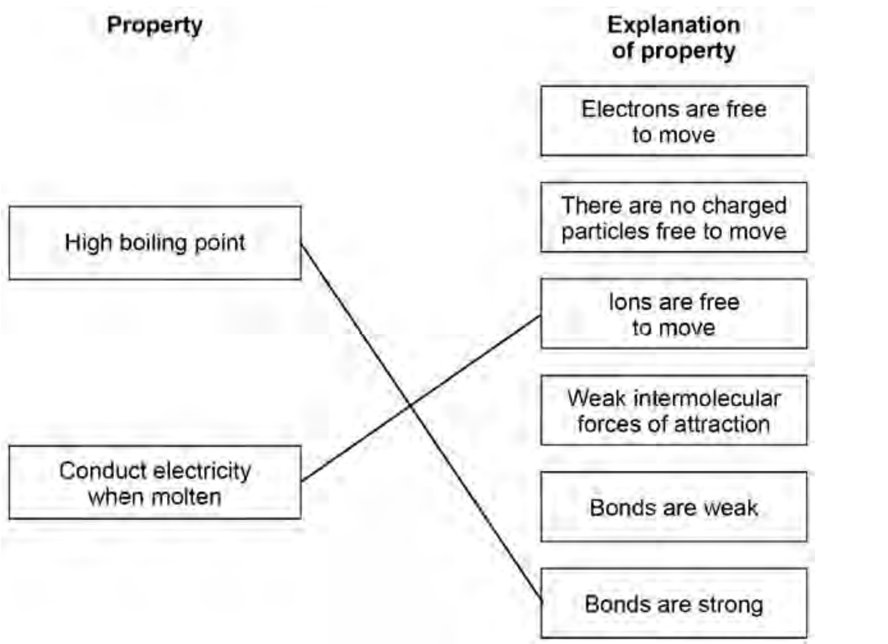
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	**Level 3:** A detailed and coherent comparison is given, which demonstrates a broad knowledge and understanding of the key scientific ideas. The response makes logical links between the points raised and uses sufficient examples to support these links.		5–6	AO1/1 4.1.2.5 4.1.3.1 4.1.3.2
	Level 2: A description is given which demonstrates a reasonable knowledge and understanding of the key scientific ideas. Comparisons are made but may not be fully articulated and / or precise.		3–4	
	Level 1: Simple statements are made which demonstrate a basic knowledge of some of the relevant ideas. The response may fail to make comparisons between the points raised.		1–2	
	No relevant content		0	
	Indicative content Physical Transition elements • high melting points • high densities • strong • hard Group 1 • low melting points • low densities • soft Chemical Transition elements • low reactivity/react slowly (with water or oxygen) • used as catalysts • ions with different charges • coloured compounds Group 1 • very reactive/react (quickly) with water/non-metals • not used as catalysts • white/colourless compounds • only forms a +1 ion			
Total			**10**	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	electrons transferred from potassium to sulfur two potassium atoms each lose one electron forming K^+ / 1+ ions sulfur atoms gain 2 electrons forming S^{2-} / 2- ions		1 1 1 1 1	AO2/1 AO1/1 AO2/1 AO1/1 AO2/1 4.2.1.2
03.2	there are no gaps/sticks between the potassium ions and sulfide ions		1	AO1/1 4.2.1.3
03.3	(two) shared pairs between H and S rest correct - no additional hydrogen electrons and two non- bonding pairs on sulfur	second mark dependent on first	1 1	AO2/1 4.2.1.4
03.4	342	allow **1** mark for evidence of (2 × 27) + 3[32 + (16 × 4)]	2	AO2/1 4.2.1.4 4.3.1.2

Question 3 continues on the next page

Question 3 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	 more than one line drawn from a variable negates the mark		2	AO1/1 4.2.2.4
03.6	 more than one line drawn from a variable negates the mark		2	AO1/1 4.2.2.3
Total			**14**	

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	any **one** from: • heat • stir		1	AO3/3b 4.1.1.2 4.4.2.3
04.2	filter	accept use a centrifuge accept leave longer (to settle)	1	AO3/3b 4.1.1.2 4.4.2.3
04.3	any **one** from: • wear safety spectacles • wear an apron		1	AO3/3b 4.1.1.2 4.4.2.3
04.4	evaporation at **A** condensation at **B**		1 1	AO2/2 4.1.1.2
04.5	100		1	AO2/1 4.1.1.2
Total			**6**	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	add excess copper carbonate (to dilute hydrochloric acid) filter (to remove excess copper carbonate) heat filtrate to evaporate some water **or** heat to point of crystallisation leave to cool (so crystals form)	accept alternatives to excess, such as 'until no more reacts' reject heat until dry accept leave to evaporate or leave in evaporating basin until crystals form must be in correct order to gain **4** marks	1 1 1 1	AO1/2 4.4.2.3
05.2	M_r $CuCl_2$ = 134.5 moles copper chloride = (mass/M_r = 11/134.5) = 0.0817843866 M_r $CuCO_3$= 123.5 Mass $CuCO_3$ (=moles × M_2 = 0.08178 × 123.5) = 10.1(00)	correct answer scores **4** marks accept 10.1 with no working shown for **4** marks	1 1 1 1	AO2/1 AO2/1 AO2/1 AO2/1 4.3.2.2
05.3	$\frac{79.1}{100}$ x 11.0 **or** 11.0 × 0.791 8.70 (g)	accept 8.70(g) with no working shown for **2** marks	1 1	AO2/1 4.3.3.1

Question 5 continues on the next page

Question 5 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	Total mass of reactants = 152.5 $\frac{134.5}{152.5}$ 88.20 (%)	allow ecf from step 1 allow 88.20 with no working shown for **3** marks	1 1 1	AO2/2 4.3.3.2
05.5	atom economy using carbonate lower because an additional product is made **or** carbon dioxide is made as well	allow ecf	1	AO3/2b 4.3.3.2
Total			**14**	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	(zinc has) lost electron(s)	accept loss of electrons	1	AO1/1 4.4.1.4
06.2	copper is the least reactive because it gave the most negative voltage when it was metal 2 **or** it gave the biggest voltage with chromium **or** it gave the most positive voltage when it was metal 1		1 1	AO3/1a AO3/2a 4.5.2.1
06.3	−0.7 V The voltage with chromium and copper is 1.2 The voltage with chromium and iron is 0.5 **and** copper is less reactive (than iron)	accept use of other cell pairings such as tin with copper and tin with iron	1 1 1	AO3/2a AO3/2b AO3/2b 4.5.2.1
06.4	hydrogen + oxygen = water		1	AO1/1 4.5.2.2
06.5	$H_2 \rightarrow 2H^+ + 2e^-$ $O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$		1 1	AO1/1 4.5.2.2
Total			**9**	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(delivery) tube sticks into the acid the acid would go into the water **or** the acid would leave the flask or go up the delivery tube	ignore no gas collected	1 1	AO3/3a 4.4.2.2
07.2	any **one** from: • bung not put in firmly/properly • gas lost before bung put in • leak from tube		1	AO3/3a 4.4.2.2
07.3	all of the acid has reacted		1	AO2/2 4.3.2.4 4.4.2.2
07.4	take more readings in range 0.34 g to 0.54 g	take more readings is insufficient ignore repeat	1	AO3/3a 4.3.2.4 4.4.2.2
07.5	$\frac{95}{24000}$ 0.00396 **or** 3.96×10^{-3}	accept 0.00396 or 3.96×10^{-3} with no working shown for **2** marks	1 1	AO2/2 4.3.2.4 4.4.2.2

Question 7 continues on the next page

Question 7 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	use a pipette/burette to measure the acid because it is more accurate volume than a measuring cylinder **or** greater precision than a measuring cylinder **or** use a gas syringe to collect the gas so it will not dissolve in water **or** use a flask with a divider so no gas escapes when bung removed	 accept description of tube suspended inside flask	1 1	AO3/3b 4.3.2.4 4.4.2.2
07.7	they should be collected because carbon dioxide is left in flask at end and it has the same volume as the air collected/displaced		1 1	AO3/2b 4.3.2.4 4.4.2.2
Total			**11**	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	(sulfuric acid is) completely/fully ionised In aqueous solution **or** when dissolved in water		1 1	AO1/1 4.4.2.6
08.2	$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$	allow multiples **1** mark for equation **1** mark for state symbols	2	AO1/1 4.4.2.4
08.3	adds indicator, eg phenolpthalein/methyl orange/ litmus added to the sodium hydroxide (in the conical flask) (adds the acid from a) burette with swirling **or** dropwise towards the end point **or** until the indicator just changes colour until the indicator changes from pink to colourless (for phenolphthalein) or yellow to red (for methyl orange) or blue to red (for litmus)	do **not** accept universal indicator	1 1 1 1	AO1/2 4.3.4 4.4.2.5
08.4	titrations 3, 4 and 5 **or** $\frac{27.05 + 27.15 + 27.15}{3}$ 27.12 cm^3	accept 27.12 with no working shown for **2** marks allow 27.1166 with no working shown for **2** marks	1 1	AO2/2 4.3.4 4.4.2.5

Question 8 continues on the next page

Question 8 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	Moles H_2SO_4 = conc × vol = 0.00271	allow ecf from 8.4	1	AO2/2
	Ratio H_2SO_4:NaOH is 1:2 **or** Moles NaOH = Moles H_2SO_4 × 2 = 0.00542		1	AO2/2
	Concentration NaOH = mol/vol = 0.00542/0.025 = 0.2168		1	AO2/2
	0.217 (mol/dm^3)		1	AO2/2
		accept 0.217 with no working for **4** marks accept 0.2168 with no working for **3** marks		4.3.4 4.4.2.5
08.6	$\frac{20}{1000} \times 0.18$ = no of moles **or** 0.15 × 40 g		1	AO2/2 4.3.4 4.4.2.5
	0.144 (g)	accept 0.144g with no working for **2** marks	1	
Total			**16**	

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	line goes up before it goes down energy given out correctly labelled activation energy labelled correctly		1 1 1	AO1/1 4.5.1.2
09.2	electrostatic force of attraction between shared pair of negatively charged electrons and both positively charged nuclei		1 1	AO1/1 4.2.1.1
09.3	bonds formed = 348 +4(412) + 2(276) = 2548 kJ/mol bonds broken – bonds formed = 612 + 4(412) + (Br-Br) – 2548 = 95 kJ/mol 193 (kJ/mol)	Alternative approach without using C-H bonds For step 1 allow = 348 + 2(276) = 900 kJ/mol Then for step 2 allow 612 + (Br-Br) – 900 = 95 kJ/mol accept (+)193 (kJ/mol) with no working shown for **3** marks -193(kJ/mol) scores **2** marks allow ecf from step 1 and step 2	1 1 1	AO2/1 4.5.1.3

Question 9 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	**Level 3:** A detailed and coherent explanation is given, which demonstrates a broad understanding of the key scientific ideas. The response makes logical links between the points raised and uses sufficient examples to support these links. A conclusion is reached.		5–6	AO3/2a X 2
	Level 2: An explanation is given which demonstrates a reasonable understanding of the key scientific ideas. A conclusion may be reached but the logic used may not be clear or linked to bond energies.		3–4	AO2/1 X 2
	Level 1: Simple statements are made which demonstrate a basic understanding of some of the relevant ideas. The response may fail to make logical links between the points raised.		1–2	AO2/1 X 2
	No relevant content.		0	
	Indicative content Size and strength • chlorine atoms have fewer electron energy levels/shells • chlorine atoms form stronger bonds • Cl–Cl bond stronger then Br–Br • C–Cl bond stronger that C–Br Energies required • more energy required to break bonds with chlorine • more energy given out when making bonds with chlorine • overall energy change depends on sizes of energy changes Conclusions • if C–Cl bond changes more, then less exothermic • if C–Cl bond changes more then more exothermic • can't tell how overall energy change will differ as do not know which changes more.			4.1.1.7 4.5.1.1
Total			**14**	