SPECIMEN MATERIAL

GCSE
CHEMISTRY

PAPER 2H

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	C_6H_{14}		1	AO2/1 4.7.1.1, 4
01.2	**A**		1	AO1/1 4.7.1.3
01.3	**B**		1	AO2/1 4.7.2.2, 4 4.9.3.1
01.4	**C**		1	AO1/1 4.7.2.4
01.5	Propanol		1	AO2/1 4.7.2.3
Total			**5**	

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	filtration **or** by passing through filter beds to remove solids		1	AO1/1 4.10.1.2
	sterilisation to kill microbes	allow chlorine / ozone allow ultraviolet light	1	
02.2	water needs more/different processes		1	AO1/1 4.10.1.2 4.10.1.3
	because it contains any **two** from: • more organic matter • more microbes • toxic chemicals or detergents		2	

Question 2 continues on the next page

Question 2 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	*(as part of glassware attached to bung)* salt solution in (conical) flask *(at end of delivery tube)* pure water in test tube which must not be sealed heat source (to heat container holding salt solution)	allow suitable alternative equipment, eg, boiling tube allow suitable alternative equipment, eg, beaker, condenser if no other mark obtained allow for **1** mark suitable equipment drawn as part of glassware attached to bung **and** at end of delivery tube	1 1 1	AO1/2 4.1.1.2 4.10.1.2
02.4	determine boiling point should be at a fixed temperature 100°C	 allow should be 100°C allow if impure will boil at a temperature over 100°C	1 1	AO1/2 4.2.2.1 4.8.1.1 4.10.1.2
02.5	high energy requirement		1	AO1/1 4.10.1.2
Total			**11**	

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	1×10^{-2} g		1	AO2/2 4.10.3.1
03.2	allow for **1** mark, evidence of $\frac{0.46}{8.45} \times 100$		1	AO2/2 4.10.3.1
	(test tube 1) 5.44 % **and** (test tube 2) 0.854 %		1	
	4.59	allow 4.586	1	
	answer given to three significant figures	allow ecf answer correctly calculated to 3 significant figures allow 4.59 with no working for **4** marks allow 4.586 with no working for **3** marks	1	

Question 3 continues on the next page

Question 3 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	**Level 3:** Detailed and coherent conclusions based on the evidence together with an evaluation are given in a response that is coherent and well-structured. A range of relevant points is made demonstrating a broad understanding of the key scientific ideas.		5-6	AO3/2b
	Level 2: An attempt to relate relevant points and draw conclusions or to make an evaluation. The logic may be inconsistent at times but builds towards a coherent argument.		3-4	AO3/1b
	Level 1: Simple descriptive statements are made. The logic may be unclear and any conclusions, if present, may not be consistent with the reasoning.		1-2	AO2/2
	Indicative Content Simple statements • nail rusted in test tubes 1 and 5 • test tubes 1 and 4 contained air/oxygen and water • nail did not rust in test tubes 2, 3 and 4 • test tube 2 no water present • test tube 3 no air/oxygen present • test tube 4 paint stopped rusting • test tube 6 scratched galvanised iron did not rust • test tube 6 galvanising stopped rusting Conclusions • both water and oxygen are required for rusting • coatings that prevent water and oxygen reaching the metal prevent rusting • when paint is scratched, iron comes into contact with water and oxygen and the iron rusts • in test tube 5 less iron exposed so less rusting than in test tube 1 • galvanising is better at resisting rusting than paint when scratched • zinc is more reactive than iron, so when galvanised metal is scratched, zinc reacts with water and oxygen first/ sacrificially Evaluation • oil and paint are effective at preventing rusting when the coating is intact galvanising is the most effective coating because it prevents rusting even when scratched.			4.10.3.1

Question 3 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	iron + oxygen + water	all three needed for **2** marks 2 correct = **1** mark ignore air	2	AO1/1 4.10.3.1
Total			**13**	

Question 4

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>04.1</td><td>all points correct

suitable line drawn

<table>
<tr><th>Year</th><th>Percentage (%) of bottles made from other materials</th></tr>
<tr><td>1975</td><td>5</td></tr>
<tr><td>1980</td><td>10</td></tr>
<tr><td>1985</td><td>22</td></tr>
<tr><td>1990</td><td>42</td></tr>
<tr><td>1995</td><td>70</td></tr>
<tr><td>2000</td><td>72</td></tr>
<tr><td>2005</td><td>90</td></tr>
<tr><td>2010</td><td>95</td></tr>
</table></td><td>±1 small square
allow 1 mark for 6 or 7 plots correct</td><td>2

1</td><td>AO2/2
4.10.2.2,
4.10.3.3</td></tr>
<tr><td>04.2</td><td>Level 3: A detailed and coherent argument is provided which considers a range of issues and comes to a conclusion consistent with the reasoning.</td><td></td><td>5-6</td><td rowspan="4">AO3/2b
4.7.1.2, 4
4.10.2.2
4.10.3.3</td></tr>
<tr><td>Level 2: An attempt to describe the advantages and disadvantages of the production and uses is made, which comes to a conclusion. The logic may be inconsistent at times but builds towards a coherent argument.</td><td></td><td>3-4</td></tr>
<tr><td>Level 1: Simple statements made. The logic may be unclear and the conclusion, if present, may not be consistent with the reasoning.</td><td></td><td>2-1</td></tr>
<tr><td>No relevant content.</td><td></td><td>0</td></tr>
</table>

Question 4 continues on the next page

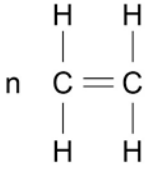
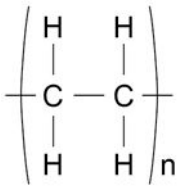
Question 4 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
	Indicative Content • glass – 2 stages in production of soda-lime glass • glass – second stage, heating sand, limestone and sodium carbonate • HDPE – 3 stages in production • HDPE – second stage, cracking of naphtha to obtain ethene • HDPE – third stage, polymerisation of ethene • fewer stages in glass production, may be quicker • higher temperature in glass manufacture, therefore maybe higher energy requirement • glass bottle can be reused • consideration of collection / cleaning costs to reuse glass bottles • other glass products can be made from recycled glass • plastic has greater range of sizes • both produced from limited raw materials • higher percentage recycled materials in glass conserves raw materials This indicative content is not exhaustive, other creditworthy responses should be awarded marks as appropriate.			
Total			**9**	

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	any **one** from: • complex systems • many different variables • many alternative theories		1	AO1/1 4.9.2.2
05.2	carbon dioxide allows short wavelength radiation to pass through the atmosphere to the Earth's surface carbon dioxide absorbs outgoing long wavelength radiation	allow greenhouse gas(es) for carbon dioxide	1 1 1	AO1/1 4.9.2.1
05.3	general increase in temperature caused by increase in greenhouse gases any **two** human activities correctly linked to a named greenhouse gas	eg increased burning of fossil fuels causes more carbon dioxide deforestation causes more carbon dioxide more cattle production causes more methane use of landfill causes more methane	1 2	AO2/1 AO1/1 4.9.2.1, 2
Total			**7**	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	*(ethene)*  *(polyethene)* 		1 1	AO1/1 4.7.2.1 4.7.3.1

Question 6 continues on the next page

Question 6 continued

Question	Answers	Extra information	Mark	AO / Spec.
06.2	any **four** from: • poly(ethene) produced by addition polymerisation whereas polyester by condensation polymerisation • poly(ethene) produced from one monomer whereas polyester produced from two different monomers • poly(ethene) produced from ethene / alkene whereas polyester from a (di)carboxylic acid and a diol/ alcohol • poly(ethene) is the only product formed whereas polyester water also produced • poly(ethene) repeating unit is a hydrocarbon whereas polyester has an ester linkage		4	AO1/1 AO2/1 AO2/1 AO2/1 AO2/1 4.7.3.1, 2
Total			**6**	

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	water level above the start line **and** start line drawn in ink	allow water level too high	1	
	water level food colours would dissolve into water **or** *start line* the ink would 'run' on the paper		1	AO3/3a 4.8.1.3
07.2	(distance moved by **A**) 2.8cm **and** 8.2 cm (distance moved by solvent)	allow values in range 2.7 - 2.9 cm and 8.1 – 8.3 cm	1	AO2/2 4.8.1.3
	$\frac{2.8}{8.2}$		1	
	0.34	allow 0.33 or 0.35 allow ecf from incorrect measurement to final answer for **2** marks if given to 2 significant figures accept 0.34 without working shown for **3** marks	1	

Question 7 continues on the next page

Question 7 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	6.6 cm	allow values between 6.48 and 6.64 cm	1	AO2/2 4.8.1.3
07.4	solvent moves through paper different dyes have different solubilities in solvent and different attractions for the paper and so are carried different distances		1 1 1 1	AO1/1 4.8.1.3
07.5	calcium ions sodium ions	allow Ca^{2+} allow Na^{+}	1 1	AO3/2b 4.8.3.7
07.6	two different colours **or** Ca^{2+}/one is orange-red and Na^{+}/the other is yellow (so) colours mix **or** (so) one colour masks the other	allow brick red for Ca^{2+} and/or orange for Na^{+} allow incorrect colours if consistent with answer to **7.5**	1 1	AO2/1 AO1/1 4.8.3.1, 5

Question 7 continues on the next page

Question 7 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	(Student **A** was incorrect) because sodium compounds are white not green **or** because sodium carbonate is soluble		1	AO1/1 AO3/2b 4.7.2.4 4.8.2.3 4.8.3.3
	so can't contain sodium ions		1	
	(Student **B** was incorrect) because adding acid to carbonate produces carbon dioxide		1	
	so must contain carbonate not chloride ions		1	
Total			**18**	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	ammonia **and** nitric acid	allow NH_4OH allow $NH_3(aq)$	1	AO1/1 4.10.4.2
08.2	shows fertilisers are formulations	allow gives percentage / proportion of nitrogen, phosphorus and potassium in the fertiliser	1	AO1/1 4.8.1.2 4.10.4.2
	(so) farmers can choose fertiliser with required properties		1	
08.3	as world population increases, ammonia production increases		1	AO3/1b
	ammonia is used to produce fertilisers		1	AO1/1
	so increasing need for fertilisers as more food required for increased population	allow as more food produced less mortality	1	AO3/2a 4.10.4.1, 2
Total			**6**	

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$	allow **1** mark for correct formulae	2	AO2/2 4.1.1.1 4.4.2.2 4.6.1.2
09.2	sensible scales, using at least half the grid for the points		1	AO2/2
	all points correct	± ½ small square allow **1** mark if 8 or 9 of the points are correct	2	AO2/2 x 2
	best fit line		1	AO3/2a 4.6.1.2, 3,
09.3	steeper line to left of original		1	AO3/2a 4.6.1.1, 2, 3
	line finishes at same overall volume of gas collected		1	
09.4	acid particles used up	allow marble/reactant used up	1	AO3/1b
	so concentration decreases	allow surface area of marble decreases	1	AO2/1
	so less frequent collisions/fewer collisions per second	do **not** accept fewer collisions unqualified	1	AO1/2
	so rate decreases/reaction slows down		1	AO1/2 4.6.1.2, 3, 4

Question 9 continues on the next page

Question 9 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	mass lost of 2.2 (g)		1	AO2/2 x 4
	time taken of 270 s	allow values in range 265 - 270	1	4.6.1.1
	$\frac{2.2}{270}$ = 0.00814814	allow ecf for values given for mass and time	1	
	0.00815 (g/s)		1	
	or			
	8.15×10^{-3}	allow **1** mark for correct calculation of value to 3 sig figs		
		accept 0.00815 or 8.15×10^{-3} with no working shown for **4** marks		
09.6	correct tangent		1	AO2/1 4.6.1.1
	eg 0.35/50		1	
	0.007	allow values in range of 0.0065 – 0.0075	1	
	7×10^{-3}		1	
		accept 7×10^{-3} with no working shown for **4** marks		
Total			**20**	

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	both water <u>vapour</u> and ethanol will condense	allow steam for water vapour allow they both become liquids allow ethane condenses at a lower temperature allow some of the steam hasn't reacted allow it is a reversible reaction/equilibrium	1	AO3/2a 4.1.1.2 4.2.2.4 4.7.2.2
10.2	amount will decrease because the equilibrium will move to the left		1 1	AO1/1 AO2/1 4.6.2.1, 2, 4, 6 4.7.2.2
10.3	more ethanol will be produced because system moves to least/fewer molecules		1 1	AO2/1 4.6.2.1, 2, 3, 6 4.7.2.2
Total			**5**	