GCSE
CHEMISTRY
8462/2H

Paper 2H

Mark scheme

Specimen (set 2)

Version: 1.1

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Please be aware that not all schools and colleges will be using these tests at the same time.

Help us to maintain the security of these papers by ensuring they are not distributed on social media or other platforms.

Important – please note

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers.

It must be stressed that a mark scheme is a working document. This mark scheme has **not** been through the full standardisation process. 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.

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.

The Information to Examiners is included as a guide to how the mark scheme will function as an operational document.

The layout has been kept consistent so that future operational mark schemes do not appear different from these test materials.

If the printing process in your school alters the scale of a diagram, measure the values on your printed papers and mark the scripts accordingly.

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
- the Assessment Objectives, level of demand 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 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore 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.

3.10 Do <u>not</u> accept

Do **not** accept 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.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- 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 two 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.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise 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.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 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.

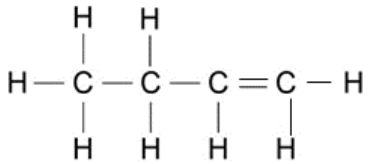
An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
01.1	$\frac{125}{8}$ = 15.6(25) (g)	an answer of 15.6(25) (g) scores **2** marks	1 1	AO2 4.8.1.2 Standard
01.2	copper (ions) sulfate (ions)	allow in either order	1 1	AO1 4.8.3.2 4.8.3.5 Standard
01.3	flame test yellow (flame)		1 1	AO1 4.8.3.1 Standard
01.4	add dilute acid (bubble gas produced through) limewater (turns) cloudy / milky	allow named acid allow forms white precipitate	1 1 1	AO1 4.8.2.3 4.8.3.3 Standard
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	**Level 2:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.		3–4	AO3 4.10.2.1 Standard
	Level 1: Relevant points are made. These are not logically linked.		1–2	
	No relevant content.		0	
	Indicative content **raw material** • wood will not run out • aluminium (ore) will run out • more expensive to process aluminium from its raw material **mass of frame** • wooden frame more expensive to transport • wooden frame uses more fuel to transport • wooden frame more difficult to handle / erect **useful lifetime** • wooden greenhouse would need replacing more often • fewer aluminium greenhouses needed over time **end of useful life** • both materials can be put to further use • aluminium can be recycled repeatedly			
02.2	$\frac{12\,000}{80}$ = 150	an answer of 150 scores **2** marks	1 1	AO2 4.10.2.1 Standard
02.3	any **two** from: • conserves finite ores • uses less energy • lower energy costs • reduces landfill	allow ores will last longer allow less waste	2	AO2 4.10.1.1 4.10.2.2 Standard

02.4	(polymer windows are) lighter		1	AO3 4.10.3.3 Standard

Total			**9**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	C_5H_{10}		1	AO2 4.7.2.1 Standard
03.2			1	AO1 4.7.2.1 Standard
03.3	bar labelled petrol to 28.6 (%)	allow a tolerance of ± ½ a square	1	AO2 4.7.1.2 Standard
03.4	100 tonnes		1	AO2 4.7.1.2 Standard
03.5	7.1 + 11.1 + 17.2 = 35.4 $\frac{2000 \times 35.4}{100}$ = 708 (kg)	an answer of 708 (kg) gains **3** marks allow ecf from step 1 an answer of 1276 (kg) gains **2** marks	1 1 1	AO2 4.7.1.2 Standard
03.6	higher percentage (by mass) of heavier fractions **or** higher percentage of larger molecules		1	AO3 4.7.1.4 Standard

03.7	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO1 4.7.1.2 4.7.1.4 Standard
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content **fractional distillation** • oil heated / boiled / vaporised • fractionating column used • fractions have different boiling ranges / temperatures • column hotter at bottom **or** column cooler at top • fractions condense at different levels • heavy fractions collect at bottom **or** light fractions collect at top **cracking** • high temperature • catalyst or steam • large molecules split into small molecules • mixture of alkanes and alkenes produced		

Total			**14**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
04.1	sulfur precipitate	 allow solid	1 1	AO2 4.2.2.2 4.6.1.2 Std./High
04.2	any **one** from: • (volumetric) pipette • burette		1	AO3 4.6.1.2 Standard
04.3	any **one** from: • concentration of hydrochloric acid • volume of hydrochloric acid • volume of sodium thiosulfate solution • temperature (of solution) • darkness of cross • same stirring/swirling	 allow same cross	1	AO1 4.6.1.2 Standard
04.4	7 points plotted correctly line of best fit	allow tolerance of ± half a small square allow 5 or 6 points plotted correctly for **1** mark must avoid anomalous point	2 1	AO2 4.6.1.2 Std./High
04.5	repeatable	do **not** accept reproducible	1	AO1 4.6.1.2 Std./High
04.6	discard any anomalous results calculate a mean		1 1	AO1 4.6.1.2 Standard Std./High

04.7	**conclusion:** the higher the concentration, the higher the rate of reaction **explanation:** (at higher concentrations) there are more particles in a fixed volume (therefore the) collisions are more frequent	allow converse	1 1 1	AO1 4.6.1.3 Std./High Standard

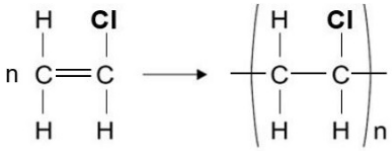
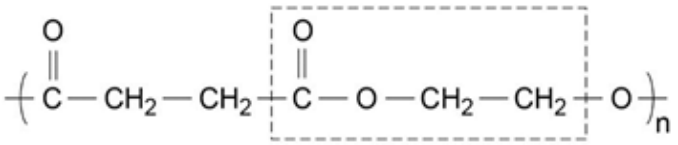
04.8	120 (s) 0.18 / 120 = 1.5×10^{-3} (g/s)	an answer of 1.5×10^{-3} (g/s) scores **3** marks allow 0.0015 an answer of 9×10^{-2} scores **2** marks allow an answer of 0.09 for **1** mark	1 1 1	AO2 4.6.1.1 Std./High

Total			**16**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
05.1	cool to −34 °C	 allow temperatures below −34 °C but above −196 °C	1 1	AO1 AO3 4.2.2.1 4.10.4.1 Standard High
05.2	recycled (to the reactor)		1	AO1 4.10.4.1 Standard
05.3	 $825 \times \frac{2}{3}$ = 550 (dm^3)	an answer of 550 (dm^3) scores **2** marks	 1 1	AO2 4.3.5 High
05.4	a lower pressure would decrease the equilibrium yield a lower temperature would make the reaction too slow		1 1	AO1 4.6.1.2 4.6.2.1 4.6.2.6 4.6.2.7 4.10.4.1 Std./High
05.5	nitrogen / N		1	AO1 4.10.4.2 Standard
05.6	**B** and **C** contain nitrogen, phosphorus and potassium		1 1	AO3 4.10.4.2 Std./High

05.7	(**B**) any **two** from: • more stages • uses more energy • uses more raw materials • takes longer	allow converse for **C**	2	AO3 4.10.4.2 Std./High

Total			**12**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1	chloroethene		1	AO2 4.7.3.1 Standard
06.2		an answer of:  scores **3** marks		AO2 4.7.3.1 Std./High High
	double bond in monomer		1	
	in polymer one C–C bond **and** two open ended bonds		1	
	'n' in front of monomer		1	
06.3	addition		1	AO1 4.7.3.1 Std./High
06.4	–OH	allow alcohol	1	AO1 4.7.2.3 Standard
06.5	–COOH		1	AO1 4.7.2.4 Standard
06.6	C=O bond		1	AO2 4.7.3.2 Std./High High
	2 × C–O bonds		1	
	an answer of:  scores **2** marks			

06.7	water		1	AO1 4.7.3.2 Std./High

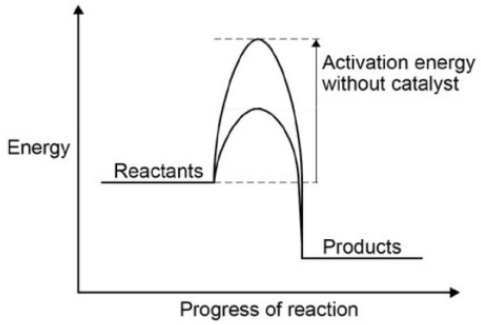
06.8	glucose amino acids		1 1	AO1 4.7.3.3 4.7.3.4 Std./High

06.9	any **two** from: • two polymer chains • double helix • four different monomers / nucleotides		2	AO1 4.7.3.4 Std./High

Total			**14**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
07.1	in a closed system the rate of the forward and backward reactions are equal		1 1	AO1 4.6.2.3 Std./High High
07.2	concentration increases (because) reaction / equilibrium moves to the left / reactant side (since the) reverse reaction is exothermic	 allow (so that) temperature increases	1 1 1	AO2 4.6.2.6 High
07.3	becomes blue (because) reaction / equilibrium moves to the right / product side (so) concentration of blue cobalt compound increases	 allow (so that) concentration of hydrochloric acid decreases	1 1 1	AO2 4.6.2.5 High
07.4	(cobalt has) ions with different charges	allow (cobalt is a) transition metal	1	AO1 4.1.3.2 Std./High
07.5	Co^{3+}		1	AO3 4.2.1.2 Std./High
07.6	they allow reactions to reach equilibrium more quickly they provide a different reaction pathway		1 1	AO1 4.1.3.2 4.6.1.4 Std./High High
07.7	$\mathbf{13}H_2 + \mathbf{6}CO \rightarrow C_6H_{14} + \mathbf{6}H_2O$	allow multiples	1	AO2 4.3.1.1 High

07.8	C_8H_{18}		1	AO2 4.7.1.1 Std./High

07.9	curve below printed curve vertical arrow from reactant level to peak of **printed** curve an answer of:  scores **2** marks	do **not** accept different reactant or product levels	1 1	AO1 4.6.1.4 Std./High

Total			**16**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
08.1	72/24 = 3 (mm/year)	an answer of 3 (mm/year) scores **2** marks an answer of 3.125 (mm/year) scores **1** mark	1 1	AO2 4.9.2.3 Std./High
08.2	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.		5–6	AO3 4.9.2.2 4.9.2.3 Std./High High
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.		3–4	
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.		1–2	
	No relevant content		0	
	Indicative content **description** • global air temperature has risen overall / erratically • mean sea level has risen (steadily) • carbon dioxide has risen steadily • methane has risen overall / erratically **explanations** • (carbon dioxide increase because) increase in fossil fuel combustion **or** (carbon dioxide increase because) increase in deforestation • methane from cattle / landfill / rice plantations • carbon dioxide and / or methane trap heat **or** carbon dioxide and / or methane are greenhouse gases • polar ice caps melt **or** seawater expands **linked explanation** • greenhouse gases linked to temperature rise • temperature rise linked to seawater level			

08.3	any **two** from: • bias • simplified models • lack of peer review	ignore reproducible	2	AO1 4.9.2.2 Std./High

Total			**10**