

OXFORD

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**INTERNATIONAL GCSE
CHEMISTRY**

9202/1

Paper 1

Mark scheme

June 2022

Version: 1.0 Final Mark Scheme



2 2 6 Y 9 2 0 2 / 1 / M S

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 Examiner.

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 oxfordaqaexams.org.uk

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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 their judgement
- 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 do not form the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent (for example, a scientifically correct answer that could not reasonably be expected from a student's knowledge of the specification).

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**.
Alternative words in the mark scheme are shown by a solidus 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 a correct response. So, if the number of errors / 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** magnetic materials.

[2 marks]

Student	Response	Marks awarded
1	iron, steel, tin	1
2	cobalt, nickel, nail*	2

3.2 Use of symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, or uses symbols to denote quantities in a physics equation, 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. At any point in a calculation students may omit steps from their working. If a subsequent step is given correctly, the relevant marks may be awarded.

Full marks are **not** awarded for a correct final answer from incorrect working.

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

An error can be carried forward from one question part to the next and is shown by the abbreviation 'ecf'.

Within an individual question part, an incorrect value in one step of a calculation does not prevent all of the subsequent marks being awarded.

3.6 Phonetic spelling

Marks should be awarded if spelling is not correct but the intention is clear, **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 not 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.

3.11 Numbered answer lines

Numbered lines on the question paper are intended to support the student to give the correct number of responses. The answer should still be marked as a whole.

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 or three marks in each level.

Before you apply the mark scheme to a student's answer; read through the answer and, if necessary, 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. 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 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	fermentation		1	AO1 3.10.1.2.f

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	a value in the range 20–35 (°C)		1	AO1 3.10.1.2.g

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	carbon dioxide		1	AO1 3.10.1.2.f

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	turns white		1	AO1 3.4.2.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	oxygen	allow an oxidising agent allow a named oxidising agent	1	AO2 3.10.3.1.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	ethanoic acid		1	AO1 3.10.3.1.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	(more) crops needed for fuel		1	AO1 3.10.1.2.g
	(so) less land available to grow crops for food		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	any one from: <ul style="list-style-type: none"> • crude oil is non-renewable • more energy is required 	allow ethene is non-renewable ignore references to temperature ignore more expensive	1	AO1 3.10.1.2.f

Total Question 1		9
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Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	7 (%)		1	AO2 3.8.3.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(test) damp red litmus paper		1	AO1 3.4.2.d
	(result) turns blue		1	
	alternative approach: (test) contact with concentrated hydrochloric acid fumes (1) (result) white smoke (1)			

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	neutralisation		1	AO1 3.5.1.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	9		1	AO2 3.2.1.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	measure the temperature before and after the reaction		1	AO4 AO2 3.9.1.b
	temperature increases		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	heat (to crystallisation point)	allow evaporate (some) water	1	AO4 3.5.2.b
	leave to cool / crystallise		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	$(M_r = (14 \times 2) + (1 \times 4) + (16 \times 3) =) 80$ (percentage =) $\frac{28}{80} \times 100$ = 35 (%)	allow correct use of an incorrectly determined value for M_r allow for 2 marks overall $\frac{14}{80} \times 100 = 17.5$ (%)	1	AO2 3.6.2.a 3.6.2.b
			1	
			1	

Total Question 2		12
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Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(electrons) 4		1	AO2
	(neutrons) 5		1	3.1.2.c
	(protons) 4		1	3.1.2.d

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	substance made of one type of atom		1	AO1 3.1.2.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	(conversion) ($36 \times 10^{-9} =$) 3.6×10^{-8} (m)		1	AO2 3.2.4
	$\frac{3.6 \times 10^{-8}}{2.5 \times 10^{-10}}$ = 144	allow correct use of incorrect / no conversion	1	
	alternative approach: (conversion) $\left(\frac{2.5 \times 10^{-10}}{10^{-9}} =\right)$ 0.25 (nm) (1) $\frac{36}{0.25}$ (1) = 144 (1)	allow correct use of incorrect / no conversion	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.												
03.4	<table border="1"> <thead> <tr> <th></th> <th>Be</th> <th>N</th> </tr> </thead> <tbody> <tr> <td>(moles =)</td> <td>$\frac{5.4}{9}$</td> <td>$\frac{5.6}{14}$</td> </tr> <tr> <td></td> <td>= 0.6</td> <td>= 0.4</td> </tr> <tr> <td></td> <td>3</td> <td>2</td> </tr> </tbody> </table>		Be	N	(moles =)	$\frac{5.4}{9}$	$\frac{5.6}{14}$		= 0.6	= 0.4		3	2	allow correct use of incorrectly determined value(s) for number of moles allow correct use of incorrectly determined ratio	1	AO2 3.6.2.c
		Be	N													
	(moles =)	$\frac{5.4}{9}$	$\frac{5.6}{14}$													
		= 0.6	= 0.4													
	3	2														
		1														
		1														
(empirical formula =) Be_3N_2		1														
Total Question 3			11													

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(X) condensing	allow condensation	1	AO1 3.1.1.a
	(Y) freezing		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	the crystal dissolves	allow the crystal is soluble in water	1	AO2 3.1.1.b
	(so) the (purple) particles diffuse (through the water) or (so) the (purple) particles spread out (through the water)		1	
		allow (so) the (purple) particles move randomly (through the water)		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	a value in the range 15 to 24 (s)		1	AO3 3.1.1.b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	$\frac{38+39+X}{3}=37$		1	AO2 3.1.1.b
	(X =) 34 (s)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	as temperature increases, time taken decreases	allow as temperature increases, the rate of dissolving increases	1	AO3 3.1.1.b
	(because) the particles have more energy		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	any one from: <ul style="list-style-type: none">• mass of crystal• surface area of crystal• volume of water	allow 5 cm ³ of water allow size of crystal	1	AO4 3.1.1.b

Total Question 4		10
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Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	$2\text{K} + \text{Cl}_2 \rightarrow 2\text{KCl}$	allow 1 mark for K and Cl_2	2	AO2 3.6.1.a 3.7.1.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	lilac		1	AO1 3.4.3.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	K^+ and Cl^-		1	AO2 3.2.1.c 3.7.1.a 3.7.1.c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	giant structure (of ions) (with) strong electrostatic forces of attraction (between ions) or strong electrostatic forces between oppositely charged ions in all directions (so) a large amount of energy is needed to overcome the (strong electrostatic) forces of attraction	max 3 marks if incorrect bonding or structure		AO1 3.2.2.a 3.2.1.f
		allow lattice	1	
		allow (with) strong forces of attraction between oppositely charged ions	1	
			1	
		allow (so) a large amount of energy is needed to break the (strong ionic) bonds	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	ions are free to move		1	AO1
	(so the ions) can carry current	allow (so the ions) can carry charge	1	3.2.2.b 3.3.2.a
Total Question 5			10	

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	brown colour produced		1	AO3 3.7.1.e

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	(melting point) increases		1	AO1 3.7.1.d

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	chlorine + potassium bromide (→) → potassium chloride + bromine	allow for 2 marks $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$	1	AO2 AO3 3.6.1.a 3.7.1.e
			1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	reactivity decreases (down the group) (because) the outer electrons / shell and the nucleus become further apart (so) the attraction between the outer electrons / shell and the nucleus decreases (so) an electron is gained less easily	allow converse statements explaining the trend going up the group allow the number of shells increases or allow the size of the atom increases allow (so) shielding increases	1	AO1 3.7.1.f
			1	
			1	
			1	

Total Question 6		8
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Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(test) add universal indicator	allow pH value of 4 / 5 / 6	1	AO1 AO4 3.5.1.f
	(result) yellow or orange alternative approach: (test) use a pH probe / meter (1) (result) pH value is in the range 4.0–6.9 (1)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	pipette measures one fixed volume		1	AO4 3.6.4.b
	(but) burette measures variable volumes		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	(recorded) volume is too high		1	AO3 3.6.4.c
	(because) volume includes air bubble		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	<p>(moles of sodium hydroxide = 0.15×0.025) = 0.00375</p> <p>(moles of citric acid = $\frac{0.00375}{3}$) = 0.00125</p> <p>(concentration =) $\frac{0.00125}{0.02005}$</p> <p>or</p> <p>$\frac{0.00125 \times 1000}{20.05}$</p> <p>= 0.062 (mol/dm³)</p> <p>alternative approach:</p> <p>$\frac{3}{1} = \frac{\text{concentration NaOH} \times \text{volume NaOH}}{\text{concentration C}_6\text{H}_8\text{O}_7 \times \text{volume C}_6\text{H}_8\text{O}_7}$ (1)</p> <p>$\frac{3}{1} = \frac{0.15 \times 25.0}{\text{concentration C}_6\text{H}_8\text{O}_7 \times 20.05}$ (1)</p> <p>(concentration C₆H₈O₇ =) $\frac{0.15 \times 25.0}{3 \times 20.05}$ (1)</p> <p>= 0.062 (1)</p>	<p>allow correct use of an incorrectly determined moles of sodium hydroxide</p> <p>allow correct use of an incorrectly determined moles of citric acid</p> <p>allow 0.062344196 correctly rounded to at least 2 significant figures</p> <p>allow 0.062344196 correctly rounded to at least 2 significant figures</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>AO2 3.6.4.c</p>
Total Question 7			12	

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	giant (covalent) structure	allow lattice allow macromolecular	1	AO1 3.2.3.b
	covalent bonds		1	
	4 bonds per carbon / atom		1	
	(so) difficult to break many / strong bonds		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	each carbon / atom forms three bonds		1	AO1 AO2 3.2.3.c 3.2.3.d
	(so) one electron per (carbon) atom is delocalised		1	
	(so delocalised) electrons move through the structure transferring energy		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	spherical shape or weak intermolecular forces		1	AO1 3.2.3.e
	(so molecules) can slide or (so molecules) can roll		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	any one from: <ul style="list-style-type: none"> • for drug delivery (into the body) • as catalysts • reinforcing materials 	allow in tennis rackets	1	AO1 3.2.3.e

Total Question 8			10	
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Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	no reactants or products can enter or leave the system		1	AO2 3.8.2.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	the reactions occur at the same rate in each direction	allow the concentrations of the products and reactants are constant	1	AO1 3.8.2.a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	Level 3: Relevant reasons are identified, given in detail and logically linked to form a clear account.		5–6	AO2 AO3 3.8.2.b 3.8.2.c 3.8.2.d 3.8.2.e
	Level 2: Relevant reasons 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			
	<ul style="list-style-type: none"> • yield increases as temperature increases • (because) forward reaction is endothermic • (so) equilibrium moves to right at high temperature • (but) after 800 °C yield increases more slowly • higher temperature gives faster rate • (but) high temperature results in high energy costs • yield decreases as pressure increases • (because) 2 mols gas on left and 4 mols of gas on right • (so) equilibrium moves to right at low pressure • (but) low pressure may be too slow • costs increase as pressure increases 			

Total Question 9	8
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