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INTERNATIONAL GCSE
CHEMISTRY

9202/1

Paper 1

Mark scheme

November 2020

Version: 1.0 Final Mark Scheme

20by9202/1/MS

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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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.

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

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 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.

Question 1

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.1	$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{C}=\text{O} \\ \quad \\ \text{H} \quad \text{O}-\text{H} \end{array} $		1	AO1 3.10.3.2a

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.2	164 °C		1	AO3 3.10.3.2a

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.3	C ₄ H ₉ COOH		1	AO3 3.10.3.2a

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.4	(mean volume =) $\frac{20.35 + 20.30 + 20.25 + 20.35}{4}$	allow $\frac{81.25}{4}$	1	AO2 3.6.4b
	(=) 20.31 (cm ³)	allow 20.3125 (cm ³) correctly rounded to at least 3 significant figures	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.5	(percentage of ethanoic acid =) $\frac{1.2}{30} \times 100\%$		1	AO2 3.10.3.2b
			1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.6	react with carbonates to produce carbon dioxide		1	AO1 3.10.3.2b

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.7	water		1	AO1 3.10.3.3a

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.8	perfume		1	AO1 3.10.3.3b

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
01.9	-COO-		1	AO1 3.10.3.3a

Total Question 1			11	
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Question 2

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.1	(from helium to xenon the density) increases		1	AO3 3.1.3c

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.2	bar plotted at 9.8 g/dm ³	allow tolerance of $\pm \frac{1}{2}$ a small square	1	AO2 3.1.3c

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.3	(similarity) same number of energy levels	allow shells for energy levels allow 2 electrons in first energy level allow 8 electrons in second energy level	1	AO2 3.1.2i 3.1.3b 3.1.3c
	(difference) different number of electrons in outer energy level or the outer energy level in argon is complete but sodium is incomplete	allow different number of electrons	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.4	Na ⁺		1	AO1 3.7.1a

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
02.5	going down the group reactivity increases	allow shells for energy levels	1	AO1 3.7.1f
	(because) the outer electron is in a higher energy level	allow (because) outer electron is further away from the nucleus	1	
		allow (because) there are a greater number of energy levels		
		allow (because) there is greater shielding		
		allow (because going down the group) the atoms become larger		
	(so) outer electron less attracted to nucleus		1	
	(so outer) electrons are more easily lost		1	

Total Question 2		9
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Question 3

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.1	$2\text{Na(s)} + \text{Cl}_2\text{(g)} \rightarrow 2\text{NaCl(s)}$		1	AO2 3.6.1a

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.2	solid		1	AO1 3.6.1b

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.3	contains only one substance	allow contains only one compound allow contains no other substances mixed with the compound	1	AO1 3.2.1a 3.4.1a

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.4	the melting point is a range	allow the melting point is below the melting point of pure sodium chloride	1	AO3 3.4.1a
	melting point is below the data book value		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.5	any one from: <ul style="list-style-type: none"> • measuring cylinder • pipette • burette 		1	AO4 3.4.1c

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.6	any two from: <ul style="list-style-type: none">• use hot / warm water• stir (the mixture)• grind (the mixture)		2	AO4 3.4.1c

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
03.7	(use) filtration		1	AO4 3.4.1c

Total Question 3		9
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Question 4

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.1	(on the end diagram) one circle / spot level with A and one circle / spot level with C , both in line above D	max 1 mark if circles / spots drawn above A , B or C	1	AO3 3.4.1d
	(on the end diagram) one circle / spot above D that is not level with any other circles / spots		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.2	ink might dissolve in the solvent	allow converse for pencil allow the ink might run in the solvent	1	AO2 3.4.1d

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.3	(food colour) B		1	AO2 3.4.1e
	spot did not move (from baseline)		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
04.4	$\frac{3}{15}$	ignore units	1	AO2 3.4.1d
	($R_f =$) 0.2		1	

Total Question 4		7
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Question 5

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.1	passing an electric current through (a substance)		1	AO1 3.3.2b
	to break down the substance (into elements)		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.2	aluminium is more reactive than carbon	allow aluminium is above carbon in reactivity series	1	AO1 3.3.1.1e
	(so) carbon cannot displace aluminium or (so) carbon cannot reduce aluminium oxide		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.3	lowers the melting point (of the mixture)		1	AO1 3.3.2i
	(so) less energy used		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.4	(so that) ions	dependent on MP1 being awarded	1	AO1 3.3.2a
	are free to move		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.5	oxygen forms (at the positive electrode)	allow anode for positive electrode	1	AO1 3.3.2i
	(positive) electrode is made of carbon / graphite		1	
	oxygen reacts with the carbon	allow $C + O_2 \rightarrow CO_2$	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.6	$Al^{3+} + 3e^{-} \rightarrow Al$	allow multiples	1	AO2 3.3.2f

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
05.7	(aluminium ions) gain electrons		1	AO2 3.3.2d

Total Question 5		13
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Question 6

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.1	increases (rate of reaction)		1	AO1 3.8.1g 3.8.1h

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.2	it would be lower (than expected)		1	AO4 3.8.1g

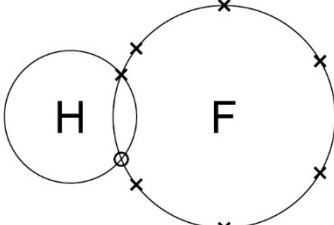
Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.3	as time increases the volume of gas increases		1	AO3 3.8.1a
	volume increases at a decreasing rate	allow as time increases rate of reaction decreases	1	
	the reaction stops at 210 seconds	allow rate of reaction is zero after 210 seconds allow maximum volume of gas collected is 80 cm ³	1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.4	(mean rate =) $\frac{48}{60}$		1	AO2 3.8.1a
	(=) 0.8		1	
	cm ³ /s		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
06.5	the volume of gas collected per second is less (because) concentration of hydrogen peroxide is lower (so) frequency of collisions between particles decreases	allow rate of reaction is decreased allow (because) hydrogen peroxide is more dilute ignore fewer collisions unqualified	1 1 1	AO2 ×2 AO3 ×1 3.8.1e

Total Question 6		11
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Question 7

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
07.1	1 shared pair of electrons in the overlap 6 non-bonding electrons in outer shell of fluorine	allow any combination of dots, crosses, open circles or e ⁽⁻⁾ do not accept non-bonding electrons in the outer shell of hydrogen an answer of  scores 2 marks	1 1	AO2 3.2.1g

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
07.2	(bond breaking) (436 + 158 =) 594 (bond forming) (2 × 568 =) 1136 594 – 1136 or 542 -542 (kJ/mol)	allow correct use of incorrectly calculated values in step 1 and/or step 2	1 1 1 1	AO2 3.9.1a 3.9.2f

Total Question 7	6
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Question 8

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.1	dip wire (in solution)	allow use of splint	1	AO1 3.4.3a
	hold in (blue) Bunsen burner flame		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
08.2	both ions produce shades of red or one colour would mask the other		1	AO2 3.4.3a

Question	Answers	Mark	AO/ Spec. Ref.
08.3	Level 3: The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO1 × 4 AO4 × 2 3.4.3b 3.4.3c 3.4.3e 3.4.3f
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content		
	<ul style="list-style-type: none"> • add sodium hydroxide solution to a small amount of each solution • iron(II) sulfate gives green precipitate • aluminium sulfate, calcium iodide and magnesium sulfate all give white precipitates • add excess sodium hydroxide solution • precipitate produced by aluminium sulfate redissolves • precipitates produced by calcium iodide and magnesium sulfate do not dissolve in excess sodium hydroxide solution • add (acidified) silver nitrate • calcium iodide produces a yellow precipitate • add (acidified) barium chloride solution • aluminium sulfate, iron(II) sulfate and magnesium sulfate produce white precipitates 		

Total Question 8		9
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Question 9

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.1	in the centre or between groups 2 and 3	allow between groups 2 and 13	1	AO1 3.7.2a

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.2	any two from: <ul style="list-style-type: none"> • can be bent • hard • does not react with water 	allow unreactive	2	AO1 3.3.1c

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.3	grow plants		1	AO1 3.3.1.1f
	(then) burn plants		1	
	(to) produce ash which contains copper compounds		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.4	bioleaching		1	AO1 3.3.1.1f

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.5	(moles of copper = $\frac{1.27}{63.5}$ =) 0.02		1	AO2 3.6.1d
	(mass of iron =) 0.02×56	allow correct use of incorrectly calculated value of moles	1	
	(mass of iron =) 1.12 (g)		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.6	$\text{Cu}^{2+} + \text{Fe} (\rightarrow)$		1	AO1 3.3.1.1h
	$(\rightarrow) \text{Fe}^{2+} + \text{Cu}$		1	

Question	Answers	Extra information	Mark	AO/ Spec. Ref.
09.7	$\frac{63.5}{1.05 \times 10^{-22}}$		1	AO2 3.6.3b
	$(=) 6.047619048 \times 10^{23}$		1	
	$(=) 6.05 \times 10^{23}$	allow an answer given to 3 significant figures for a calculation using values in the question	1	

Total Question 9		15
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