



**General Certificate of Secondary Education
2021–2022**

**Single Award Science
Chemistry**

Unit 2
Higher Tier

[GSA22]

TUESDAY 23 NOVEMBER, MORNING

**MARK
SCHEME**

General Marking Instructions

Introduction

Mark schemes are intended to ensure that the GCSE examinations are marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria which they should apply in allocating marks to candidates' responses.

Assessment objectives

Below are the assessment objectives for GCSE Single Award Science

Candidates must:

- AO1** Demonstrate knowledge and understanding of scientific ideas, scientific techniques and procedures;
- AO2** Apply knowledge, skills and understanding of scientific ideas, scientific enquiry, techniques and procedures; and
- AO3** Analyse information and ideas to interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking

COVID-19 Context

Given the unprecedented circumstances presented by the COVID-19 public health crisis, senior examiners, under the instruction of CCEA awarding organisation, are required to train assistant examiners to apply the mark scheme in case of disrupted learning and lost teaching time. The interpretation and intended application of the mark scheme for this examination series will be communicated through the standardising meeting by the Chief or Principal Examiner and will be monitored through the supervision period. This paragraph will apply to examination series in 2021–2022 only.

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Marking Calculations

In marking answers involving calculations, examiners should apply the 'own figure rule' so that candidates are not penalised more than once for a computational error.

Types of mark schemes

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

Levels of response

Tasks and questions requiring candidates to respond in extended writing are marked in terms of levels of response. In deciding which level of response to award, examiners should look for the 'best fit' bearing in mind that weakness in one area may be compensated for by strength in another. In deciding which mark within a particular level to award to any response, examiners are expected to use their professional judgement. The following guidance is provided to assist examiners.

- **Threshold performance:** Response which just merits inclusion in the level and should be awarded a mark at or near the bottom of the range.
- **Intermediate performance:** Response which clearly merits inclusion in the level and should be awarded a mark at or near the middle of the range.
- **High performance:** Response which fully satisfies the level description and should be awarded a mark at or near the top of the range.

Quality of written communication

Quality of written communication is taken into account in assessing candidates' responses to all tasks and questions that require them to respond in extended written form. These tasks and questions are marked on the basis of levels of response. The description for each level of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within levels of response as follows:

Level 1: Quality of written communication is basic.

Level 2: Quality of written communication is good.

Level 3: Quality of written communication is excellent.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided below:

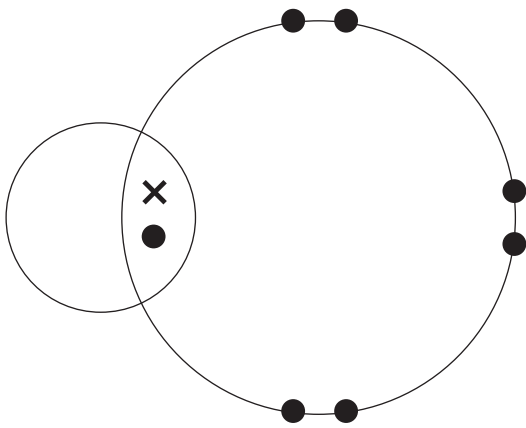
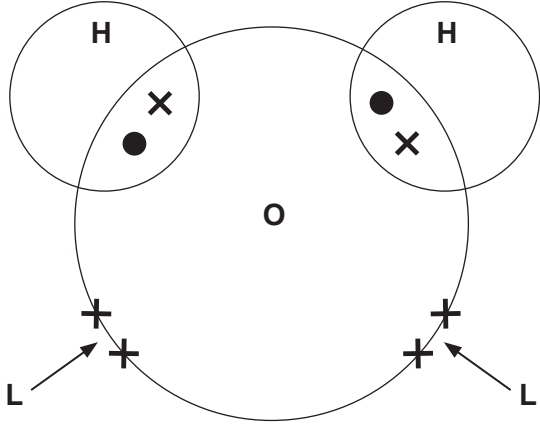
Level 1 (Basic): The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

Level 2 (Good): The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

Level 3 (Excellent): The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

			AVAILABLE MARKS
1	(a) (i)	All points correctly plotted [2] 4 points correctly plotted [1] line through points [1]	[3]
	(ii)	As atomic number increases, boiling point decreases	[1]
	(b) (i)	Heat produced	[1]
	(ii)	Increases	[1]
	(iii)	Potassium hydroxide	[1]
	(iv)	A lit splint [1] burns with a squeaky pop [1]	[2]
	(c) (i)	Exothermic	[1]
	(ii)	Same mass of metal/same volume of acid/same type of acid/same concentration of acid/same length of time	[1]
	(iii)	He needs to measure the change [1] in temperature [1]	[2]
			13
2	(a) (i)	C_2H_3Cl	[1]
	(ii)	$ \begin{array}{cccc} & H & H & H & H \\ & & & & \\ H & -C & -C & -C & -C-H \\ & & & & \\ & H & H & H & H \end{array} $	[1]
	(iii)	Gas	[1]
	(b) (i)	3	[1]
	(ii)	9	[1]
3	(a)	4	[1]
	(b)	Neon	[1]
	(c)	Neon	[1]
	(d)	As atomic number increases metallic character decreases	[1]
	(e)	Li_2O	[1]
4	(a)	The process of using electricity to decompose/breakdown an (ionic) compound	[1]
	(b)	Aluminium is either:	
		- cheaper than copper wire [1] a large amount is needed [1] - much lighter than copper wire [1] pylons not under stress [1]	[2]
			5
			3

			AVAILABLE MARKS
5	(a) (i)	0.000000001 m/1 × 10 ⁻⁹ m [1]	7
	(ii)	A few hundred [1]	
	(iii)	Can see any gaps in application/check on coverage (so child does not get burnt) [1]	
	(iv)	May cause damage to sea life (as they can enter sea)/more thorough research is needed to examine the dangers [1]	
	(b) (i)	Can change their properties [1] with changes in the surroundings [1] [2]	
	(ii)	Photochromic materials change colour as light changes [1]	
6	(a) (i)	68.8 + 14.2 + 0.8 + 0.3 + 1.0 + 0.2 + 0.1 + 1.7 = 87.1 [1] 100 – 87.1 = 12.9% [1] [2]	5
	(ii)	2 [1]	
	(b)	Carbon dioxide causes global warming/ increased greenhouse gases [1] leading to climate change/more weather extremes/droughts/severe storms/ (polar) ice caps melt/sea levels rise/increased flooding, loss of low-lying land/spread of tropical diseases. [1] [2]	

- 7 (a) (i) Magnesium atom loses electrons [1]
It transfers 2 electrons [1]
oxygen atom gains electrons [1] [3]
- (ii) O^{2-} [1]
- (b)
- 
- [1]
- (c) (i) correct labelling of **one** lone pair
- 
- [1]
- (ii) Covalent [1]
- 8 (a) It will run out over time/there is only a certain amount left/limited amount [1]
- (b) (i) Choose from:
- crude oil is heated
 - on heating the oil evaporates (into gases)
 - different fractions have different boiling points
 - different liquids condense at different levels in the tower
- [3]
- (ii) Bitumen [1]
- (c) (i) Alkane [1]
- (ii) $C_3H_8 + 5 O_2 \rightarrow 3 CO_2 + 4 H_2O$
- Left hand side formula [1]
 - Right hand side formula [1]
 - balancing correct [1]
- [3]

AVAILABLE
MARKS

7

9

9 Indicative Content:

Similarities

- Groups and periods
- Elements with similar properties in the same group.

Differences

- Mendeleev arranged elements by atomic mass/mass no, now atomic number
- Mendeleev left gaps/Mendeleev predicted properties of undiscovered elements
- Transition Metals now between Gp 2 & 3, in Mendeleev's table they were mixed through groups/Metals and non-metals separated in modern periodic table.
- Hydrogen sits out on its own in the modern periodic table.
- Noble gases not discovered in Mendeleev's periodic table/Noble gases not discovered in Mendeleev's periodic table as they were too unreactive.
- More elements/no gaps in the modern periodic table/modern periodic table includes Lanthanides/Actinides.

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to compare Mendeleev's periodic table and the modern table, using seven to eight of the points above. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates must use some appropriate specialist terms throughout to compare Mendeleev's periodic table and the modern table, using three to six of the above points. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe Mendeleev's periodic table and the modern table using only one or two of the above points however these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1]–[2]
D		[0]

[6]

Total

AVAILABLE
MARKS

6

60