



Rewarding Learning

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

**Single Award Science
Chemistry**

Unit 2
Higher Tier

[GSA22]

THURSDAY 24 FEBRUARY 2022, 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

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.

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.

			AVAILABLE MARKS	
1	(a)	35 000 – 5750 = 29 250 kJ	[1]	3
	(b)	Can be produced from solar power/a renewable source [1] non-renewables are running out [1] or Only produces water/doesn't produce polluting carbon dioxide when burned [1] does not contribute to global warming [1]	[2]	
2	(a)	(i) Carbon dioxide	[1]	8
		(ii) Measuring cylinder/gas jar	[1]	
	(b)	(i) As time increases the volume of gas produced increases [1] Until 140 s/40 cm ³ of gas is produced and then there is no more gas produced [1]	[2]	
		(ii) All points plotted correctly [2] (5 points plotted correctly [1]) smooth curve drawn [1]	[3]	
		(iii) 40 cm ³	[1]	

3 Indicative content:

- Measure temperature (of the acid) at the start
- Add magnesium to the acid
- Measure temperature at the end/highest temperature
- Calculate the temperature increase
- Repeat using more magnesium
- Fair test (any two from): same volume of acid/same type of acid/same concentration of acid/same size of beaker or test tube
- Expected result: more magnesium gives a larger temperature rise/more heat given off/more exothermic

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe the experiment using six or more of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to describe the experiment using three, four or five of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe the experiment using one or two of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Not worthy of credit.	[0]

[6]

6

AVAILABLE
MARKS

4 (a)

Alkane	Formula	Structure
propane	C_3H_8	<pre> H H H H — C — C — C — H H H H [1] </pre>
methane [1]	CH_4	<pre> H H — C — H H </pre>
butane	C_4H_{10} [1]	<pre> H H H H H — C — C — C — C — H H H H H </pre>

[3]

- (b) Carbon dioxide [1]
 water [1]
 (either order)

[2]

- (c) (i) A molecule that contains carbon and hydrogen [1] only [1]

[2]

- (ii) Polymerisation

[1]

- (iii) (Carbon-carbon) double bond **breaks** [1] and many monomer molecules join [1] to form a long chain [1]

[3]

AVAILABLE
MARKS

11

5 (a)

element	hydrogen
compound	lithium nitride/water [1]
mixture	air [1]

[2]

(b) (i) Two electrons drawn in overlap [1]

(ii) Oxygen/nitrogen/chlorine/other acceptable alternative [1]

(c) 1×10^{-9} m [1]

(d) (i)

Particle	Lithium (Li)	Nitrogen (N)	Lithium Nitride (Li ₃ N)
proton			
electron	3	7	16
neutron	4	7	19

(2/3 correct [1] 4/5 correct [2] all correct [3]) [3]

(ii) An ionic bond involves the attraction [1] between oppositely charged ions [1] [2]

6 (a) In order of mass [1]

(b) Mn is in Mendeleev's table/At is in modern Periodic Table [1]

(c) Noble gases [1]
they were not discovered/too unreactive [1] [2]

7 (a) To stop the oxygen escaping/to stop products escaping [1]

(b) Green [1]

(c) Universal indicator tells the strength of the acid or alkali [1]

(d) Non-metal oxides are acidic [1]
non-metal oxides are gaseous [1] [2]

(e) MgO [1]
 $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ balancing [1] [2]

(f) (i) Delivery tube correctly drawn into the limewater [1]

(ii) Colourless [1] to cloudy/milky [1] [2]

AVAILABLE
MARKS

10

4

10

8	(a) Using electricity [1] to decompose/split up a compound [1]	[2]
	(b) Carbon/graphite [1] Inert/unreactive [1]	[2]
	(c) (Electrolytes contain) ions [1] that are free to move/carry the charge [1]	[2]
	(d) Al ³⁺ [1] 3e ⁻ [1]	[2]
	Total	

AVAILABLE MARKS
8
60