Rewarding Learning

General Certificate of Secondary Education
2022–2023

Double Award Science
Chemistry

Unit C1

Foundation Tier

[GDW21]

THURSDAY 23 FEBRUARY 2023, 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 Double Award Science.

Candidates must:

AO1 Demonstrate knowledge and understanding of:
- scientific ideas; and
- scientific techniques and procedures;

AO2 Apply knowledge and understanding of and develop skills in:
- scientific ideas; and
- scientific enquiry, techniques and procedures; and

AO3 Analyse scientific information and ideas to:
- interpret and evaluate;
- make judgements and draw conclusions; and
- 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. The exception to this for GCSE Double Award Science is when examiners are marking complex calculations when the Examiners are briefed to mark by error or omission. 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 'carry error through' rule so that candidates are not penalised more than once for a computational error. To avoid a candidate being penalised, marks can be awarded where correct conclusions or inferences are made from their incorrect calculations.

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
In deciding which level of response to award, examiners should look for the number of indicative content points in candidate responses to ensure that the answer has been written to coincide with the question. In deciding which mark within a particular level to award to any response, quality of communication will be assessed and 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.

- ***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 bands of response. The description for each band of response includes reference to the quality of written communication.

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

Band A: Quality of written communication is excellent.
Band B: Quality of written communication is good.
Band C: Quality of written communication is basic.
Band D: Response not worthy of credit.

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

Band A (Excellent): Excellent reference to scientific terminology. 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.

Band B (Good): Good reference to scientific terminology. 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.

Band C (Basic): Basic reference to scientific terminology. 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.

1 (a)

	Number
Total number of electrons	15
Total number of neutrons	16 [1]
Total number of protons	15 [1]
Number of electron shells containing electrons	3 [1]
Number of electrons in outer shell	5 [1]

[4]

(b) atomic [1]
mass [1] [2]

(c) **(i)** 27 [1]

(ii) 2, 6 [1]

(iii) X [1]
3+ [1] [2]

AVAILABLE MARKS

10

AVAILABLE MARKS

2 (a) Indicative content

Apparatus and chemicals

- nichrome wire
- concentrated hydrochloric acid
- Bunsen burner

Steps

- dip nichrome wire into the concentrated hydrochloric acid
- dip into solid and place in a blue Bunsen burner flame

Observations

- lithium chloride – crimson flame
- calcium chloride – brick red flame

Band	Response	Mark
A	Candidates must use appropriate specialist terms including a minimum of **6 points** of indicative content. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates must use appropriate specialist terms including a minimum of **4 points** of indicative content. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates' brief and partial response includes a minimum of **2 points** of indicative content. They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

(b) (i) base line/origin [1]

(ii) 2 [1]

(iii) 4 [1]

9

				AVAILABLE MARKS
3	**(a)**	**(i)** F	[1]	
		(ii) J	[1]	
		(iii) D	[1]	
		(iv) H	[1]	
	(b)	4	[1]	
	(c)	alkali metals	[1]	
	(d)	**(i)** lithium hydroxide [1] hydrogen [1]	[2]	
		(ii) Any **two** from: moves [1] fizzing [1] colourless solution formed [1]	[2]	10
4	**(a)**	correct sharing [1] correct number of outer shell electrons [1] dot and cross [1] (each mark dependent on previous one)	[3]	
	(b)	**(i)** sodium atom: diagram of 2, 8, 1 [1] fluorine atom: diagram of 2, 7 [1]	[2]	
		(ii) sodium ion: diagram of 2, 8, charge + [1] fluoride ion: diagram of 2, 8, charge – [1]	[2]	
		(iii) ionic (bonding)	[1]	
		(iv) NaF	[1]	
	(c)			

Physical property	
Conducts electricity when solid	
Conducts electricity when molten	✓
Soluble in water	✓
Insoluble in water	
Solid at room temperature	✓
Liquid at room temperature	
Gas at room temperature	

[1] 10

	AVAILABLE MARKS

5 **(a)** **A** and **D** [1]

(b) **B** [1]

(c) **C** [1]

(d) 14 [1]

(e) 12 [1]

5

6 **(a)** 101 [1]

(b) M_r NH_4NO_3 = 80 [1]

% N = $\frac{28}{80} \times 100 = 35$ [1] % [2]

(c) moles = $\frac{17}{188} = 0.09$ [2]

(0.1 or 0.0904…. etc [1]) [2]

(d) 0.0245 × 242 = 5.929 g [1]

6

7 **(a)**

Solution	Test paper	Colour
Ethanoic acid	Universal indicator paper	orange/yellow [1]
Deionised water	Red litmus paper	red [1]
Hydrochloric acid	Blue litmus paper	red [1]
Sodium hydroxide solution	Universal indicator paper	dark blue/purple [1]

[4]

(b) **(i)** temperature increases [1]

(ii) 6 °C [1]

(iii) potassium chloride [1]

(iv) carbon dioxide [1]
water [1] [2]

(v) reaction is complete/acid used up [1]

10

Total **60**