



Rewarding Learning

**General Certificate of Secondary Education
2024**

Chemistry

**Unit 3: Practical Skills
Practical Booklet B
Higher Tier**

[GCM34]

FRIDAY 21 JUNE, AFTERNOON

**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 Chemistry.

Candidates must:

- AO1** Demonstrate knowledge and understanding of:
 - scientific ideas;
 - scientific techniques and procedures.
- AO2** Apply knowledge and understanding of and develop skills in:
 - scientific ideas;
 - scientific enquiry, techniques and procedures.
- AO3** Analyse scientific 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. The exception to this for GCSE Chemistry 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.

		AVAILABLE MARKS
1	(a) (i) tongs	[1]
	(ii) (bright) white light [1] white solid/powder [1] formed	[2]
	(b) (i) magnesium in crucible with lid [1] heat and tripod [1] crucible in pipeclay triangle [1]	[3]
	(ii) to ensure sufficient oxygen is available to react with the magnesium	[1]
	(iii) moles of Mg = $\frac{0.36}{24} = 0.015$ [1] moles of MgO = 0.015 [1] mass of MgO = $0.015 \times 40 = 0.6$ [1] g	[3]
	(c) mass of Sc = $45.25 - 42.10 = 3.15$ g [1] mass of O = $46.93 - 45.25 = 1.68$ g [1] moles of Sc = $\frac{3.15}{45} = 0.07$ [1] moles of O = $\frac{1.68}{16} = 0.105$ [1] ratio 2:3 so empirical formula Sc ₂ O ₃ [1]	[5]
		15

			AVAILABLE MARKS	
2	(a)	(i) $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$ correct formula of reactant [1] correct formulae of products [1] correct balancing [1]	[3]	15
		(ii) in a low temperature oven/in a desiccator	[1]	
		(iii) relights a glowing splint	[1]	
		(iv) $\% \text{O} = \frac{32}{46} \times 100$ [1] = 69.6 [1] %	[2]	
	(b)	(i) volume = 36 cm^3 [1] moles = $\frac{36}{24000} = 0.0015$ [1]	[2]	
		(ii) more NO_2 present [1] position of equilibrium moves to the left [1] in direction of endothermic (reverse) reaction [1]	[3]	
		(iii) less NO_2 present [1] position of equilibrium moves to the right [1] fewer moles of gas on right/2:1 ratio of moles of gas [1]	[3]	

3 (a) **Indicative content**

names of reagents

- hydrochloric acid
- calcium carbonate or other suitable reagents

names of pieces of apparatus

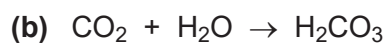
- conical flask
- thistle funnel/dropping funnel
- delivery tube
- stopper with delivery tube exiting to trough
- trough with water
- beehive shelf with gas jar filled with water

how to test for carbon dioxide

- limewater
- changes from colourless
- to milky

Band	Response	Mark
A	Candidates must use appropriate specialist terms [9–11 indicative content points]. Relevant material is organised with a high degree of clarity and coherence. They must use excellent spelling, punctuation and grammar and the form and style are of a very high standard.	[5]–[6]
B	Candidates must use appropriate specialist terms [5–8 indicative content points]. Relevant material is organised with some clarity and coherence. They use good spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates give a brief description [2–4 indicative content points]. The organisation of material may lack clarity and coherence. They use limited spelling, punctuation and grammar and they have limited use of specialist terms. The form and style are of limited standard.	[1]–[2]
D	A response not worthy of credit.	[0]

[6]



correct formulae of either the reactants or product [1]

rest of equation correct [1]

[2]

(c) (i)

Gas	Colour	Density compared to air	Acidic, basic or neutral?
carbon dioxide	colourless	denser than air	acidic [1]
hydrogen	colourless	less dense than air [1]	neutral
ammonia	colourless [1]	less dense than air	basic

[3]

(ii) glass rod dipped in/stopper from a bottle of [1]

concentrated hydrochloric acid [1]

white smoke [1]

[3]

AVAILABLE
MARKS

14

		AVAILABLE MARKS
4 (a)	burette/pipette	[1]
(b)	$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$ correct formulae of either the reactants or the product [1] rest of equation correct [1] correct state symbols [1]	[3]
(c)	any one source of heat loss with associated method to reduce heat loss heat absorbed by the beaker [1] use polystyrene cup instead/insulate the beaker [1] or heat loss from open beaker [1] use a lid [1]	[2]
(d) (i)	temperature increases	[1]
(ii)	A $(26.5 - 23.0) = 3.5^\circ C$ [1] B $(25.0 - 23.0) = 2.0^\circ C$ [1]	[2]
(iii)	reaction is complete/all acid is used up	[1]
(iv)	A (is stronger) as more heat is given out	[1]
		11

			AVAILABLE MARKS	
5	(a) (i)	lithium floats and calcium sinks [1] lithium reacts more vigorously [1] colourless solution forms in lithium reaction and cloudy solution forms in calcium reaction [1]	max [2]	
		(ii) bubbles/fizzing [1] heat given out [1] metal disappears [1] both move [1]	max [2]	
	(b)	no reaction [1] $Zn^{2+}(aq) + Fe(s)$ [1] no reaction [1]	[3]	
		(c) (i)	$2Al + 3CuSO_4 \rightarrow Al_2(SO_4)_3 + 3Cu$ correct formulae of reactants [1] correct formulae of products [1] correct balancing [1]	[3]
	(ii) blue solution fades/blue solution changes to colourless [1] red-brown solid forms [1]		[2]	
	(iii) aluminium		[1]	
	(iv) protective layer [1] of aluminium oxide [1]		[2]	15
	Total			70