



*Rewarding Learning*

**General Certificate of Secondary Education  
2019**

---

## **Chemistry**

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

**[GCM32]**

**WEDNESDAY 19 JUNE, 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 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.

1 (a) Indicative content:

- wear safety glasses
- using a safety pipette filler
- rinse pipette with deionised water
- rinse pipette with sodium hydroxide solution
- draw up the solution until the bottom of the meniscus is on the line
- release into the conical flask
- touch the tip of the pipette onto the surface of the solution

Band	Response	Mark
A	Candidates must use appropriate specialist terms to explain fully the preparation and use of the pipette [5–7 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 to explain fully the preparation and use of the pipette [3–4 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 describe briefly the preparation and use of the pipette [at least 2 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]

(b) any **two** from:

- dropwise addition near the end-point
- swirling the flask
- read at bottom of the meniscus (at eye level) [2]

(c) (i) to estimate the end-point/to allow faster subsequent titrations [1]

- (ii) yellow [1] to red [1] [2]

- (iii) sodium hydroxide + sulfuric acid → sodium sulfate + water  
 reactants and → [1]  
 products [1] [2]

13

			AVAILABLE MARKS	
2	(a)	(i) $Zn^{2+}$	[1]	12
		(ii) $Br^{-}$	[1]	
	(iii)	zinc bromide [1] $ZnBr_2$ [1]	[2]	
		(iv) zinc hydroxide	[1]	
	(b)	(i) nichrome wire [1] dipped in concentrated hydrochloric acid [1] dipped in sample and place in blue Bunsen burner flame [1] lilac flame [1]	[4]	
		(ii) make a solution of the solid [1] add barium chloride solution [1] white ppt [1]	[3]	
3	(a)	(i) conical flask [1] zinc and hydrochloric acid in contact [1] sealed apparatus and delivery tube [1] gas syringe [1] timer [1] max [4]	[4]	11
		(ii) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$ correct formulae of reactants [1] correct formulae of products [1] correct balancing [1]	[3]	
	(b)	(i) reaction stops or finishes/no more gas produced	[1]	
		(ii) starts at origin and remains higher and levels off at same volume	[1]	
		(iii) $70\text{ cm}^3$	[1]	
		(iv) 66–68 s	[1]	

4 (a) (i)

Metal	Initial temperature (°C)	Final temperature (°C)	Temperature change (°C)
zinc	20	25	5
copper	20	20	0
magnesium	20	39	<b>19</b>
iron	20	23	<b>3</b>
tin	20	21	<b>1</b>

[1]

(ii) Most reactive: magnesium

zinc

iron

**tin [1]**

Least reactive: copper

[1]

(iii) temperature increases [1]

[1]

(iv) any **two** from:

apparatus

volume of acid

concentration of acid

moles of metal

particle size/surface area of metal

[2]

(v)  $\text{Mg} + 2\text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2$   
correct formulae of reactants [1]  
correct formulae of products [1]  
correct balancing [1]

[3]

AVAILABLE  
MARKS

		AVAILABLE MARKS
<b>(b) (i)</b>	Chromium is more reactive than cobalt	<input checked="" type="checkbox"/>
	Cobalt is more reactive than chromium	<input type="checkbox"/>
	Cobalt is more reactive than copper and tin	<input checked="" type="checkbox"/>
	Chromium is more reactive than iron and less reactive than zinc	<input checked="" type="checkbox"/>
	3 ticks correct = [2] 2 ticks correct = [1] 0 or 1 tick correct = [0]	[2]
<b>(ii)</b>	cobalt nitrate [1] copper [1]	[2]
<b>(iii)</b>	$\text{Cr}(\text{NO}_3)_3$	[1]
		13

5	(a)	(i) gas jar	[1]	<b>AVAILABLE MARKS</b>		
		(ii) prevent loss of gas through the funnel	[1]			
		(iii) low solubility in water	[1]			
		(iv) $2\text{H}_2\text{O}_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$ correct balancing [1] correct state symbols [1]	[2]			
		(v) manganese(IV) oxide	[1]			
		(vi) substance which speeds up a chemical reaction [1] without being used up [1]	[2]			
		(vii) glowing splint [1] relights [1]	[2]			
	(b)	(i)	hydrochloric acid [1] white [1] smoke [1]		[3]	
			(ii) pH meter [1] pH between 8 and 14 [1]			
		<b>or</b>				
			universal indicator [1] blue/purple [1]		[2]	
	(c)	(i)	solid X is calcium carbonate [1] solution Y is hydrochloric acid [1]		[2]	
			(ii) limewater		[1]	
		(iii) colourless solution [1] changes to milky [1]	[2]			
		(iv) $\text{CO}_2$	[1]			
					<b>Total</b>	<b>21</b>
						<b>70</b>