



**General Certificate of Secondary Education
2019**

Double Award Science: Chemistry

Unit C2

Foundation Tier

[GDW51]

WEDNESDAY 12 JUNE 2019, MORNING

**MARK
SCHEME**

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

1	(a) (i) 78%	[1]	AVAILABLE MARKS
	(ii) tasteless [1] colourless [1]	[2]	
(b)	Gas	Use	
	nitrogen	clean fuel	
	hydrogen	coolant	
	oxygen	disinfectant	
	carbon dioxide	fizzy drinks	
		welding	
	(4 × [1])	[4]	7
2	(a) (i) copper	[1]	
	(ii) magnesium	[1]	
	(iii) hydrogen	[1]	
	(iv) potassium, magnesium, aluminium, zinc, iron, copper Allow [1] for all correct but reversed or for 4 correct and 2 adjacent “swapped”	[2]	
	(v) Any two of: zinc, iron, copper (2 × [1])	[2]	
	(b) magnesium sulfate + zinc (either order)	[1]	
	(c) DCBA	[1]	9
3	(a) (i) carbon and sulfur	[1]	
	(ii) magnesium	[1]	
	(iii) copper, iron, magnesium (all three needed)	[1]	
	(b) (i) the (colourless) solution becomes milky/a white precipitate forms [1] When more carbon dioxide is added the precipitate disappears/ a colourless solution is formed [1] second mark depends on first	[2]	
	(ii) calcium carbonate	[1]	6

Observation	Tick
calcium burns with a lilac flame	
calcium sinks and rises	✓ [1]
calcium melts into a sphere	
a white solid forms	✓ [1]
bubbles of gas form	✓ [1]
reaction is very slow	

[3]

[2]

[1]

AVAILABLE MARKS
6
7

Property of the homologous series of alkanes	Tick (✓)
they show a gradation in their physical properties	✓ [1]
they differ by a CH ₃ group	
they are all colourless liquids	
they have similar chemical properties	✓ [1]
they have the same general formula	✓ [1]

[3]

[1]

[1]

[1]

[1]

7

					AVAILABLE MARKS											
6	(a)	<table><thead><tr><th>Name</th><th>Molecular formula</th><th>Structural formula</th><th>Physical state at room temperature</th></tr></thead><tbody><tr><td>methane</td><td>CH₄ [1]</td><td>$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$</td><td>gas [1]</td></tr><tr><td>ethene [1]</td><td>C₂H₄</td><td>$\begin{array}{c} \text{H} \quad \text{H} \\ \diagdown \quad \diagup \\ \text{C}=\text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \text{H} \end{array}$ [1]</td><td>gas</td></tr></tbody></table> <div>[4]</div>	Name	Molecular formula	Structural formula	Physical state at room temperature	methane	CH ₄ [1]	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	gas [1]	ethene [1]	C ₂ H ₄	$\begin{array}{c} \text{H} \quad \text{H} \\ \diagdown \quad \diagup \\ \text{C}=\text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \text{H} \end{array}$ [1]	gas		
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(b) carbon dioxide and water – both needed					[1]											
(c) (i) carbon monoxide combines with haemoglobin [1] Idea that this reduces the capacity of haemoglobin/red blood cells/blood (accept red blood cells for this part) to carry oxygen [1]					[2]											
(ii) any three of: Idea of damaging (accept destroying) buildings/statues/named limestone features killing fish (in rivers and lakes) unless wrongly qualified, e.g. not in oceans/seas defoliating trees/destroying or damaging vegetation (3 × [1])					[3]											
					10											
7	(a) (i)	CuSO ₄ .5H ₂ O		[1]												
	(ii)	CuSO ₄		[1]												
	(iii)	B		[1]												
	(b) (i)	106		[1]												
	(ii)	286		[1]	5											

(ii) Indicative points

What is added to alumina and why:

- (Molten) cryolite is added
- Cryolite reduces melting point unless wrongly qualified
- Cryolite improves (electrical) conductivity
- Idea of lowering operating temperature **or** that temperature is 900 °C to 1000 °C
or of saving energy
or of reducing/lowering cost

The reaction that happens at the cathode

- **Aluminium ions** (are attracted to cathode)
- Gain (3) electrons to form aluminium/to be discharged

How the aluminium is removed

- Aluminium (formed) is **molten/liquid** or aluminium sinks/ goes to/is at the bottom
- Aluminium is tapped off/run off

Why the anode is replaced periodically

- It reacts with oxygen
- Carbon dioxide formed

Response	Marks
Candidates must use specialist terms throughout 8–10 indicative points required) They use good spelling, punctuation and grammar and the form and style of a high standard.	[5]–[6]
Candidates use some specialist terms throughout 5–7 indicative points required) They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates give 2–4 of the indicative points. They use limited spelling, punctuation and grammar and have little use of specialist terms.	[1]–[2]
Response not worthy of credit. Candidates make reference to less than 2 of the points above and offer no other suitable response.	[0]

[6]

(iii) Any **three** of:

idea that recycling: saves (natural) resources [1], reduces waste [1]
saves energy [1] reduces **carbon dioxide** emissions [1]
(3 × [1])

[3]

(b)

Electrode	Product formed
cathode	sodium/Na [1]
anode	bromine/Br ₂ [1]

[2]

apply ecf if **both** products correct but wrong way round

12

9	(a) (i)	burning wood	☒		[2]	
		photosynthesis	☐			
		neutralising hydrochloric acid with sodium hydroxide	☒			
		thermal decomposition of calcium carbonate	☐			
		reacting magnesium with oxygen	☒			
		three correct [2], two correct [1]				
	(ii)	idea that the boiling tube felt colder/temperature went down			[1]	
(b)	(i)	idea that products can change into reactants or the reaction can go both ways but do not credit "the reaction can be reversed"			[1]	
	(ii)	$\text{H}_2 + \text{Br}_2 \rightleftharpoons 2 \text{HBr}$				
		LHS [1]				
		RHS [1]				
		Balancing if LHS and RHS formula correct [1]				
		Reversible sign [1]			[4]	8
Total						70