



**General Certificate of Secondary Education
2024**

Double Award Science: Chemistry

Unit C2

Higher Tier

[GDW52]

FRIDAY 14 JUNE, 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) Any **three** from:
sinks then rises
metal disappears
heat given out
colourless solution
white precipitate
3 × [1] [3]

(b) (i)

Metal \ Salt solution				
	Silver nitrate	Copper(II) nitrate	Zinc nitrate	Lead(II) nitrate
silver		no reaction	no reaction	no reaction [1]
copper	reaction		no reaction	no reaction
zinc	reaction [1]	reaction		reaction
lead (II)	reaction	reaction	no reaction [1]	

[3]

- (ii) $\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$
correct reactants [1]
correct products [1]
balancing [1]

[3]

(iii) displacement

[1]

(iv) too reactive/too dangerous

[1]

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- 2 (a) heat is taken in [1]

(b) reduction [1]

- (c) $\text{Pb}^{2+} + \text{Mg} \longrightarrow \text{Pb} + \text{Mg}^{2+}$
LHS [1] RHS [1] [2]

(d) (i) hydrated [1] iron(III) oxide [1] [2]

- (ii) zinc is more reactive than iron [1]
zinc reacts in preference to iron [1] [2]

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- 3 (a) graphite/carbon [1]

(b) oxygen reacts (with the graphite anode) [1]
to produce carbon dioxide/burns away [1] [2]

(c) the ions [1] are free to move and carry a charge [1] [2]

(d) improves conductivity [1] lowers melting point [1] [2]

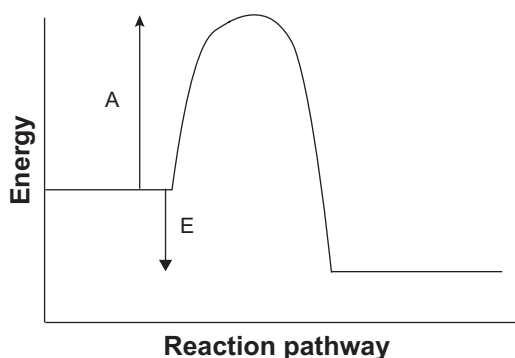
			AVAILABLE MARKS
(e) $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$ correct reactant and correct product [1] electrons correct [1] balanced [1]			[3] 10
4	(a)	(i) compound consisting of/made up of/containing only carbon and hydrogen atoms	[1]
		(ii) Any three from: crude oil is evaporated condenses where temperature matches boiling point process is continuous	[3]
		(iii) cracking	[1]
	(b)	(i) $\begin{array}{cc} \text{H} & \text{H} \\ & \\ \text{C} & = & \text{C} \\ & \\ \text{H} & \text{H} \end{array}$	[1]
		(ii) steam	[1]
		(iii) ethanol	[1]
		(iv) C_nH_{2n}	[1]
		(v) $\begin{array}{ccccc} & \text{H} & & \text{H} & \\ & & & & \\ \text{H} & - \text{C} & - & \text{C} & - \text{H} \\ & & & & \\ & \text{Br} & & \text{Br} & \end{array}$	[1]
		(vi) propanoic acid	[1]
		(vii) molecular formula = $\text{CH}_3\text{CH}_2\text{COONa}/\text{C}_3\text{H}_5\text{O}_2\text{Na}$	[1]
		(viii) neutralisation	[1] 13
5	(a)	(i) water that is chemically bonded [1] into the crystal structure [1]	[2]
		(ii) thermal decomposition	[1]
		(iii) BaCl_2 [1] + $2\text{H}_2\text{O}$ [1] Any order	[2]

(b) (i) 0.05	[1]
(ii) 1.6	[1]
(iii) 0.1	[1]
(iv) MnO_2	[1]

AVAILABLE
MARKS

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6 (a) (i)



products lower than reactants [1]
 reaction pathway line [1]
 E labelled correctly [1]
 A labelled correctly [1]

[4]

(ii) energy to break bonds = 2237 [1]
 Energy released forming bonds = 2346 [1]
 Energy change = $2237 - 2346 = -109$ [1]

[3]

(b) sulfuric acid

[1]

(c) Indicative content

Name the solid **X** and the pieces of apparatus labelled **Y** and **Z**.

- X = zinc/magnesium
- Y = delivery tube
- Z = gas jar

Describe the test for hydrogen and state the result for a positive test.

- lit splint
- burns with a pop

Explain why hydrogen is described as a clean fuel.

- only water produced/no carbon dioxide produced
- doesn't cause pollution/global warming/climate change/
greenhouse effect/acid rain/smog

Level of response	Marking Criteria	Marks	AVAILABLE MARKS
Excellent	Candidate clearly articulates the details of the two industrial processes. There is excellent use of spelling, punctuation and grammar. Form and style are of an excellent standard using 5 or more indicative points.	[5]–[6]	14
Good	Candidate provides a good description of the two industrial processes. There is good use of spelling, punctuation and grammar. Form and style are of a good standard using 3–4 indicative points.	[3]–[4]	
Basic	Candidate provides a limited description of the industrial process. There is limited use of spelling, punctuation and grammar. Form and style are of basic standard. 2 indicative points used.	[1]–[2]	
D	Response not worthy of credit	[0]	
[6]			
(i) decrease in mass = 65 g [1] Average rate of reaction = 1.625 [1] Units = g/s [1]			[3]
(ii) Any three from: particles have more energy/move faster/more collisions [1] more successful collisions [1] per unit time [1]			[3]
(iii) graph starts at same point [1] steeper curve below original line [1] end at same point [1]			[3]
(i) any number in range 3–6 inclusive			[1]
(ii) CO ₂ + H ₂ O ⇌ H ₂ CO ₃ correct formulae [1] arrow [1] (g) and (l) [1] (aq) [1]			[4]
(iii) rate of the forward reaction is the same as the rate of the reverse reaction			[1]
Total			80