



Rewarding Learning

General Certificate of Secondary Education
2019

Double Award Science: Chemistry

Unit C2

Higher Tier

[GDW52]

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.

			AVAILABLE MARKS		
1	(a) (i)	answer in range 1%–2%	[1]	11	
	(ii)	argon	[1]		
	(b) (i)	its triple (covalent) bond	[1]		
	(ii)	dip a glass rod [1] in concentrated hydrochloric acid [1] and then in sample of the gas. Idea that white smoke/ white fumes is formed [1]	[3]		
	(c) (i)	$2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$ RHS [1] balancing [1]	[2]		
	(ii)	blue	[1]		
	(iii)	acidic	[1]		
	(iv)	basic	[1]		
2	(a)	Any four of the following ideas: (initially) sinks/sinks and rises/rises and sinks/ not floats idea that it reacts quickly/vigorously unless wrongly qualified fizzing/effervescence/bubbles/gas given off/gas evolved/gas released not gas produced idea of heat given out white or grey solid/precipitate forms or idea of turning cloudy calcium disappears/dissolves or other correct (Max 4 × [1])	[4]		7
	(b)	$\text{Mg} + \text{ZnSO}_4 \longrightarrow \text{MgSO}_4 + \text{Zn}$ [1] [1] i.e. LHS [1] RHS [1] if wrongly balanced maximum is [1]	[2]		
	(c)	DCBA	[1]		

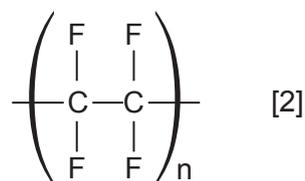
			AVAILABLE MARKS
3	<p>(a) (i) $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ [1]</p> <p>(ii) Carbon dioxide is reduced to carbon monoxide or carbon dioxide loses oxygen [1] carbon is oxidised to carbon monoxide or carbon gains oxygen [1] explicit idea that redox is when oxidation and reduction are both happening [1] [3]</p> <p>(iii) Silica/silicon dioxide [1]</p> <p>(iv) Calcium silicate/slag [1] idea of being tapped off/run off (at the bottom) [1] [2]</p> <p>(b) temperature [1] and pressure [1] [2]</p> <p>(c) Rates of forward and reverse reaction are equal [1] Amounts of reactants and products remain constant [1] [2]</p>	<p>[1]</p> <p>[3]</p> <p>[1]</p> <p>[2]</p> <p>[2]</p> <p>[2]</p>	11
4	<p>(a) Any three of: The same general formula Show similar chemical properties Show a gradation in their physical properties Differ by a CH_2 unit not molecule, not atom (3 × [1]) [3]</p> <p>(b) carbon monoxide combines with haemoglobin [1] Idea that this reduces the capacity of haemoglobin/red blood cells/ blood to carry oxygen [1] [2]</p> <p>(c) (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]</p> <p>(ii) calcium carbonate [1]</p> <p>(d) 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]</p>	<p>[3]</p> <p>[2]</p> <p>[2]</p> <p>[1]</p> <p>[3]</p>	11

Name	Molecular Formula	Structural Formula	Physical state at Room temperature
but-1-ene	C ₄ H ₈ [1]	$ \begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\ & & & \\ \text{C} & = & \text{C} & - & \text{C} & - & \text{C} & - & \text{H} \\ & & & & & & & & \\ \text{H} & & \text{H} & & \text{H} & & & & \end{array} $	Gas [1]
Propan-1-ol	C ₃ H ₇ OH or C ₃ H ₈ O [1]	$ \begin{array}{cccc} & \text{H} & \text{H} & \text{H} \\ & & & \\ \text{H} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{OH} \\ & & & & & & & & \\ & \text{H} & \text{H} & \text{H} & & & & & \end{array} $	liquid [1]

[4]

- (b) (i) C₂H₆ [1]
- (ii) C₂H₅OH/ethanol [1]
- (iii) Addition [1]

- (c) Correct repeating unit [1]
brackets in correct place and "n" in correct place [1]



[2]

9

- 6 (a) (i) HO [1]
- (ii) CH₂O apply ecf [1]
- (iii) C₃H₈ [1]
- (b) (i) 120 [1]
- (ii) 246
Allow 1 method mark for $M_r = \frac{120 \times 100}{48.8}$ (or equivalent) apply ecf [2]
- (iii) 7 [2]
Allow 1 method mark for $\frac{(\text{b)(ii) answer} - (\text{b)(i) answer}}{18}$
apply ecf

8

7 (a) (i) bauxite [1]

(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 costs

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) $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$ **or** $2\text{O}^{2-} - 4\text{e}^- \rightarrow \text{O}_2$
 [1] for reactants [1] for products [1] for balancing
 (Balancing dependent on correct reactants and products) [3]

(iv) 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]

ecf if **both** products correct but wrong way round [2]

AVAILABLE
MARKS

15

- 8 (a) the **minimum** energy needed [1] for a reaction to occur [1] [2]
- (b) (i) A = reactants/energy of reactants [1]
 B = activation energy [1]
 C = energy change/energy released/energy given out [1] [3]
- (ii) exothermic reaction [1]
- (iii) -100 kJ [1]
- (iv) activation energy [1]

Total**AVAILABLE
MARKS**

8

80