



Rewarding Learning

**General Certificate of Secondary Education
2018**

Double Award Science: Chemistry

Unit C2

Higher Tier

[GSD52]

WEDNESDAY 13 JUNE 2018, 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:
 (pale) yellow
 brittle
 solid (at RTP)
 poor conductor of electricity
 insoluble (in water)
 low melting point
 (3 × [1]) [3]
- (b) (i) it (continues to) glow(s)/gives out heat [1]
 idea that a grey or black solid (**not** powder) is formed [1]
 i.e. idea of turning grey or black unless wrongly qualified;
not 'soot'; **not** 'powder'; **not** 'ash' Ignore reference to smell [2]
- (ii) $\text{Fe} + \text{S} \rightarrow \text{FeS}$
 LHS [1] RHS [1]
 If balancing wrong but formulae all correct award [1] [2]
- (c) (i) blue [1] [1]
- (ii) pungent [1] [1]
- (d) (i) idea that the spray reacts with/neutralises/removes the acidic
 substance [1] sulfur dioxide (unless wrongly qualified) [1] [2]
- (ii) Any **two** from:
 idea of burning less fossil fuels
 idea of using renewable energy sources
 idea of removing sulfur from fuels
 or other correct, e.g. legislation, electrostatic precipitation
 (2 × [1]) [2]

AVAILABLE
 MARKS

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- 2 (a) Indicative content:
Physical properties
- Colourless
 - Odourless
 - Tasteless
 - More dense than air
 - (Slightly) soluble in water
- (any three physical properties)

Reaction

- Reacts with water forming carbonic acid
- Turns limewater milky
- Idea that if excess carbon dioxide added the precipitate dissolves

Global warming

- Idea of CO₂ insulating heat on the earth's surface/CO₂ absorbs infrared radiation
- An effect of global warming
- A second effect of global warming, e.g. melting polar ice caps, sea levels rise, loss of habitat, climate change, weather change or other correct

Response	Marks
Candidates must use specialist terms throughout (7–9 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 (4–6 indicative points required). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates give 2–3 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]

- (b) Idea that living organisms evolved/idea of CO₂ absorbed by plants (for photosynthesis) [1]
Idea that carbon dioxide became “trapped” in carbonates/fossil fuels [1]
Idea that carbon dioxide dissolved in oceans/seas/lakes/rivers [1]
Max 2 × [1]

[2]

8

- 3 (a) (i) 126 [1]
(ii) 96 [1]
(b) ... in grams [1] is (known as) a/one mole (of the substance) [1] (second mark depends on first) [2]
(c) (i) 4 [1]
(ii) 160 [1]
(d) (i) 54 (g) [1]
(ii) 54.6 or 54.7 (g)
Award a method mark (if answer incorrect) for a recognition that 1 mole of NaOH was used **or** for the 3:1 ratio between sodium phosphate produced and sodium hydroxide used [2]

[2]

9

			AVAILABLE MARKS	
4	(a)	$\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$ RHS [1] Balancing – if RHS formulae correct [1]	[2]	
	(b)	x-axis labelled as Time/s [1] 6 or 7 points correct [2] 4 or 5 points correct [1] Correct curve not ruler drawn [1]	[4]	
	(c)	(i) idea that the reaction has finished	[1]	
		(ii) 9 cm^3 (+/-1) units needed	[1]	
	(d)	idea of increasing the surface area [1] idea that there will be more collisions [1] idea that there will be more successful collisions [1]	[3]	11
5	(a)	(i) from blue [1] to colourless [1]	[2]	
		(ii) idea that copper is displaced (not general idea of a reaction) Accept idea that zinc sulfate solution is colourless	[1]	
	(b)	$\text{Zn} + \text{H}_2\text{O} \rightarrow \text{ZnO} + \text{H}_2$ L.H.S. [1] R.H.S. [1] If wrongly balanced max mark [1]	[2]	
	(c)	(i) Any two from: (very) vigorous/violent/explosive ignites/burns/sparks/flame moves on surface/floats melts/forms a ball heat given out dissolves/disappears/solution forms colourless (solution) or other correct (2 × [1])	[2]	
		(ii) Caesium hydroxide [1] CsOH [1]	[2]	
	(d)	(i) electrolysis	[1]	
		(ii) Idea that it is a very reactive metal/cannot be extracted by reduction	[1]	11

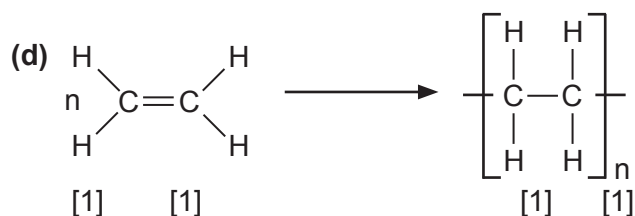
- 6 (a) A compound/substance/molecule made up of carbon and hydrogen atoms only (clearly implied) [2]
 if "made up of/consisting of ..." is stated then "only" is clearly implied
 If "only" is not clearly implied, e.g. "a substance containing carbon and hydrogen atoms" award [1] [2]

- (b) Clear idea that fractions have different boiling points [1]
 Idea that fractions condense at different temperatures/collect at different levels (in the column)/correct idea of a temperature gradient [1] [2]

(c)

Name	Molecular formula	Structural Formula	Physical state at room temperature
propane	C ₃ H ₈	$ \begin{array}{ccccc} & \text{H} & \text{H} & \text{H} & \\ & & & & \\ \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{H} \\ & & & & \\ & \text{H} & \text{H} & \text{H} & \end{array} $ [1]	Gas [1]
methanoic acid [1]	HCOOH or HCO ₂ H or CH ₂ O ₂ [1]	$ \begin{array}{c} \text{O} \\ \\ \text{H} - \text{C} - \text{OH} \end{array} $	liquid

[4]



indicating repeating unit (repeat can be brackets and n after or a min of 3 repeating units)
 must be equation (i.e. contain an arrow) if not 3 mark max. [4]

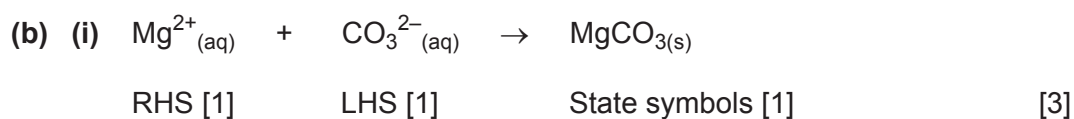
- (e) Any **two** from:
 bubbles (of gas)/fizzing/effervescence/gas given off (**not** just "gas", **not** gas produced)
 idea that the gas is colourless
 magnesium/solid dissolves/disappears
 colourless solution remains
 Idea that the reaction produces heat (**not** just "exothermic")
 Idea that reaction is slow(ish)
 (2 × [1]) [2]

- (f) (i) carboxylic acid [1]

- (ii) C [1]

- 7 (a) Bonds are broken in named reactants (propane and oxygen) [1]
 Energy is needed to break bonds/bond breaking is endothermic [1]
 Bonds are made in named products (carbon dioxide and water) [1]
 Energy is given out when bonds are made/bond making is exothermic [1]
 Clear idea that the reaction is exothermic because more energy is released
 (in bond making) than is needed (for bond breaking) * [1]
 * No credit for simply stating that reaction is exothermic because/energy is
 given out. [1]

The first and third marking points require named reactants and products
 to be given – if answer is a generic one then maximum is [3];
 if two of the four chemicals are appropriately referred to,
 i.e. both reactants or both products or one of each
 then maximum mark is [4];
 for all five marks **at least three** of the four chemicals
 must be explicitly referred to. [5]



- (ii) clear idea that (two) **soluble** ions/(two) **solutions** react/combine
 (accept mix) [1] to form/make/give an insoluble substance/product [1] [2]

AVAILABLE
 MARKS

10

8 (a) (i) Indicative content:

raw materials:

- (hot) air
- limestone/calcium carbonate
- coke/carbon

production of reducing agent

- coke/carbon reacts in air/oxygen
- carbon dioxide produced reacts with more carbon/coke
- carbon monoxide is produced/is reducing agents

removal of iron

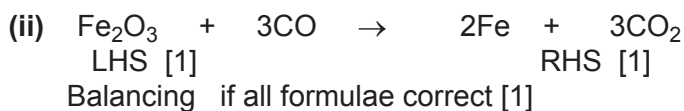
- idea that iron is tapped off/run off (implied liquid)

acidic impurities

- explicit idea that **limestone** decomposes/reacts to give calcium oxide
- calcium oxide reacts with acidic impurities/Si O₂
- calcium silicate/slag is **formed**
- calcium silicate/slag/product is run off/tapped off

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Candidates use some specialist terms throughout (6–8 indicative points required). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates give 2–5 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]



[3]

- (b) aluminium **ions** gain electrons **which is reduction** [1]
oxide/oxygen **ions** lose electron **which is oxidation** [1]
explicit that it is a redox reaction because both oxidation
and reduction are happening (simultaneously) [1]

[3]

Total

12

90

AVAILABLE
MARKS