



Rewarding Learning

**General Certificate of Secondary Education
2016**

Double Award Science: Chemistry

Unit C2

Foundation Tier

[GSD51]

WEDNESDAY 15 JUNE 2016, AFTERNOON

**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) 1. Potassium
2. Sodium [1]
3. Calcium
4. Magnesium [1]
5. Aluminium
6. Zinc [1]
7. Iron
8. Copper [1]

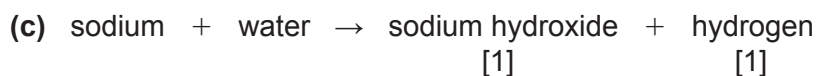
[4]

(b)

OBSERVATION	TICK
The metal moves about the surface	✓
The solution changes colour	
The metal sinks to the bottom and rises	
The reaction is vigorous	✓
A silver ball is formed	✓
A white solid is formed in the water	
The sodium disappears	✓

Each correct tick gains [1] mark but if more than 4 ticks then each error reduces maximum mark by 1, e.g. 5 ticks – 3 correct and 2 wrong would get [2] marks.

[4]



[2]

(d)

STATEMENT	TICK
It will react faster than sodium	
Bubbles of gas will be given off	✓ [1]
It will react more slowly than sodium	✓ [1]
No bubbles of gas will be given off	

[2]

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			AVAILABLE MARKS	
2	(a)	oxygen [1] hydrogen [1] (accept electrons)	[2]	
	(b)	Iron gates – painting Bicycle chain – oiling Coat hanger – plastic coating Bath tap – chrome plating 4 correct – [3], 2 or 3 correct [2], 1 correct [1]	[3]	
	(c)	(i) Use tongs to hold magnesium/place magnesium in crucible/on crucible lid/on gauze [1] Heat using a Bunsen burner/Bunsen [1] accept idea of heat using a flame. (Not just heat)	[2]	
		(ii) Any two of: use a fume cupboard/safety screen wear (safety) goggles idea of heating at arm's length use tongs idea of not looking directly at flame wear heat proof gloves not wear gloves any 2 × [1] not general answers such as tie hair back or clear the bench	[2]	
		(iii) Any two of: burns with a bright white flame/bright white light/bright light – unless wrongly qualified form a white powder/ash Accept colour as grey-white not grey idea of very vigorous idea of smoke produced unless wrongly qualified (not gas produced) or other correct any 2 × [1]	[2]	
	(d)	(i) Zinc oxide	[1]	
		(ii) solid	[1]	13
3	(a)	Any three of: heat (the reaction flask)/idea of increasing the temperature idea of using zinc powder/smaller pieces of zinc/increasing surface area of zinc (not just increasing surface area) add a catalyst idea of stirring, shaking or agitating or other correct any 3 × [1]	[3]	
	(b)	(i) accept answers in range 27–28cm ³ But not, e.g. 28 or 28 gas/cm ³ correct units needed [1]	[1]	
		(ii) 76 ± 1 s units not needed	[1]	
		(iii) Rate slows down/decreases	[1]	
	(c)	Steeper slope [1] Double volume of gas [1]	[2]	8

- 4 (a) (i) oxygen [1]
- (ii) carbon dioxide [1]
- (iii) carbon monoxide [1]
- (iv) not enough oxygen [1]
- (v) toxic/poisonous/silent killer [1] **not just 'kills'**
 no colour/smell/taste **or** idea of it combining/with haemoglobin/red blood cells [1]
or (alternative answer)
 idea of it combining/binding with haemoglobin/red blood cells [1]
 idea of this (combining) being in place of oxygen/reducing oxygen/being irreversible [1] [2]
- (b) Any **two** of:
 colourless
 odourless
 tasteless
 denser than air **or** heavier than air
 slightly soluble in water
 or other correct
 any 2 × [1] [2]
- (c) carbonic acid **or** H_2CO_3 [1]
- (d) (i) calcium carbonate [1] [1]
- (ii) calcium hydrogen carbonate (is formed) [1] i.e. temporary hardness is caused by calcium hydrogen carbonate
 explicit that calcium hydrogen carbonate/the **product** from the reaction is soluble/has dissolved [1]
Do not credit idea that "the precipitate"/"calcium carbonate" dissolves, i.e. the second marking point is dependent on recognising that the precipitate has reacted. [2]

AVAILABLE
MARKS

12

- 5 (a) Any **two** of:
 solid/powder
 yellow/pale yellow
 brittle/hard
 insoluble in water
 odourless/slight odour **not pungent**
 does not conduct heat/electricity
 or other correct, e.g. correct melting point 115° C
 any 2 × [1] [2]
- (b) (i) blue [1]
 (ii) pungent [1]
- (c) **Indicative points:**
 Effects of acid rain
- corrosion of (limestone) buildings/statues/metal (e.g. bridges/cars) **not** destroys or dissolves **not** rocks
 - kills fish/aquatic life (ignore references to animal habitats or animals)
 - idea of defoliation/damages trees **or** plants **or** crops/deforestation
 - specific economic reason (1)
 specific economic reason (2) **or** idea of causing respiratory problems/asthma – not just health
- Not** any answer relating to increasing global warming
- Preventing acid rain
- burn less fossil fuels/use alternative fuel/energy sources/limiting transportation
 - idea of removing sulfur dioxide from industrial/vehicle emissions
NB not removing sulfur
 - idea of desulfurization i.e. removing sulfur from fuels
 - idea of government legislation (clean air act)

Response	Marks
Candidates must use specialist terms throughout. (6–9 indicative points required). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use some specialist terms throughout (4–5 indicative points required). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates give 1–3 of the indicative points but not necessarily in a logical sequence. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1]–[2]
Response not worthy of credit. Candidates make no reference to the points above and offer no other suitable response.	[0]

[6]

10

			AVAILABLE MARKS	
6	(a)	Idea of using/shaking soap with water [1] idea that a lather is formed with soft water [1] second mark depends on first [2]	[2]	7
	(b)	Any three of: wastes soap (not doesn't lather with soap) produces (lime)scale (or fur) in pipes/boilers/kettles (allow blocks hot water pipes but not "blocks pipes") not scale on its own produces scum with soap one clear, explicit economic disadvantage, e.g. the need to buy dishwasher salt or need to replace kettles or other correct, e.g. idea of not being good for washing clothes/hair or "stains clothes" any 3 × [1] [3]	[3]	
	(c)	calcium chloride [1] magnesium sulfate [1] [2]	[2]	
7	(a) (i)	17 [1]	[1]	7
	(ii)	106 [1]	[1]	
	(iii)	58 [1]	[1]	
	(b)	The relative formula mass [1] of the substance in grams [1] second mark dependent on first. Do not give credit for the mass (in grams) divided by the relative formula mass or the relative formula mass divided by the mass, i.e. RFM must not be wrongly qualified Alternative answer 1: The mass of a substance which contains the same number of particles as there are in 12g of the carbon-12 (isotope) [2] Alternative answer 2: Idea that a mole contains 6×10^{23} particles [2] [2]	[2]	
	(c) (i)	38.4g [1]	[1]	
(ii)	5 [1]	[1]		
8	(a) (i)	white [1] to blue [1] [2]	[2]	8
	(ii)	exothermic [1]	[1]	
	(b)	released [1]	[1]	
	(c) (i)	copper carbonate → copper oxide [1] + carbon dioxide [1] [2]	[2]	
	(ii)	colour change from green [1] to black [1] [2]	[2]	

- 9 (a) A compound/substance made up of carbon and hydrogen atoms **only** (clearly implied) [2]
A compound/substance which contains carbon and hydrogen atoms [1] [2]

- (b) clear idea that crude oil is heated (to 400° C) [1]
idea that it undergoes a series of evaporations and condensations/vapours condense at different temperatures/idea that fractions condense or are collected at different levels in the column [1]
fractions are separated due to differences in boiling point [1] [3]

(c)

Name	Molecular Formula	Structural Formula
Ethane	C_2H_6 [1]	<pre> H H H — C — C — H H H </pre> [1]
Ethene	C_2H_4 [1]	<pre> H H \ / C = C / \ H H </pre> [1]

[4]

- (d) Landfill
Advantage: – local treatment of waste so less transport of waste needed
– land can be re-landscaped after use/makes use of disused quarries
– cheap option (**not** quick)
– uses different types of waste – can be used for variety of waste
or other correct [1]

Disadvantage: – wastes land
– eyesore
– polluting gases released
– local streams can be polluted
– damages/destroys habitats
or other correct [1]

Incineration
Advantage: – idea of getting rid of waste completely/permanently
– idea that waste does not remain for a long time
– accept idea of not being an eyesore
– heat energy can be harnessed to generate electricity
or other correct [1]

Disadvantage: – ash residue is toxic and specialised landfill needed
– expensive
– idea that gases produced are toxic or dangerous
– idea that greenhouse gases are produced
or other correct [1]

[4]

Total

13

90