



*Rewarding Learning*

General Certificate of Secondary Education  
2015

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**Double Award Science: Chemistry**

Unit C2

Higher Tier

**[GSD52]**

TUESDAY 9 JUNE 2015, AFTERNOON

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**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)	C	[1]	
	(ii)	Let 3 nails remain for same time/same size of nail/same temperature/ same type of nail/same size of test tube <b>Ignore</b> 'bung' <b>or</b> idea of control	[1]	
	(iii)	To remove air or oxygen	[1]	
	(iv)	Air/oxygen and water/moisture (allow dampness, wetness)	[1]	
	(b) (i)	Zinc	[1]	
	(ii)	Zinc is more reactive (than iron) [1] Zinc reacts first/reacts in preference to iron (so iron does not rust) [1] <b>Not</b> zinc reacts quicker; <b>not</b> zinc rusts	[2]	
	(c) (i)	It continues to glow [1] Idea that a grey/black solid ( <b>not</b> powder) is formed [1] <b>Allow</b> idea of turning grey or black unless wrongly qualified, e.g. <b>not</b> soot; <b>not</b> pungent smell; <b>not</b> powder	[2]	
	(ii)	$\text{Fe} + \text{S} = \text{FeS}$ LHS [1]      RHS [1] If balancing wrong but formulae (all) correct award [1]	[2]	11
2	(a) (i)	Magnesium oxide [1] Hydrogen [1]	[2]	
	(ii)	Solid goes (from grey) to white or solid glows brightly <b>Allow</b> white light <b>not</b> white flame	[1]	
	(b) (i)	Any <b>two</b> of: (Blue) solution goes colourless or fades Magnesium dissolves/disappears Reddish-brown/pink/brown/orange/copper coloured <b>Not</b> red; <b>not</b> copper; <b>not</b> heat produced Or other correct – 2 × [1]	[2]	
	(ii)	Magnesium is more reactive (than copper) or vice-versa <b>Not</b> faster	[1]	
	(c)	Idea that both oxidation & reduction are happening together (i.e. redox definitions) [1] Oxidation is loss of electrons <b>and</b> reduction is gain of electrons [1] Magnesium (only) loses electrons [1] Copper ions (only) gain electrons [1] Any 3 × [1]	[3]	9

## 3 (a) Indicative Points

**Similarities**

All three gases are:

- colourless
- odourless
- not toxic
- tasteless
- all found in air

any other correct (for all three gases)

maximum 2 indicative points for similarities

**Testing**

- idea of testing in logical order, e.g. take **a** jar (not **the** gas jar) and test all three
- use a glowing splint/lit splint
- result: it relights/burns more brightly with oxygen
- add limewater
- result: it turns milky with carbon dioxide
- nitrogen identified by elimination

N.B. indicative points for results are dependent on correct tests

Response	Marks
Candidates must use specialist terms throughout to plan the experiment (7–8 indicative points required including the idea of testing in order). They use good spelling, punctuation and grammar and the form and style are of a high standard.	5–6
Candidates use some specialist terms to plan the experiment (4 to 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 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.	0

[6]

(b) idea of (intense) volcanic activity [1]

which released gases into the atmosphere [1]

N.B. For any credit volcanoes must be mentioned

Credit release of gases unless wrongly qualified, e.g. not toxic, dangerous,

SO<sub>2</sub>

[2]

(c) (i) oxygen

[1]

(ii) argon

[1]

(d) (i) N<sub>2</sub> + 3H<sub>2</sub> ⇌ 2NH<sub>3</sub>

LHS [1]                      RHS [1]      balancing (if LHS & RHS correct) [1]

N.B. **equilibrium** sign **not** essential

[3]

(ii) clear idea of addition/gain of hydrogen **to** nitrogen

[1]

AVAILABLE  
MARKS

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			AVAILABLE MARKS	
4	(a)	Average mass of an <b>atom</b> (of an element) [1] compared with that of a carbon-12 isotope [1] which has mass of exactly (clearly implied) 12 [1]	[3]	10
	(b)	(i) sodium sulfate 142	[1]	
		(ii) aluminium hydroxide 78	[1]	
	(c)	(i) 0.2 moles allow <b>one</b> method mark for either 33.1 g = 0.1 moles (lead nitrate) <b>or</b> recognition of 1:2 lead nitrate : potassium iodide ratio. For 33.1/166 method give no credit	[2]	
		(ii) 46.1 g allow one method mark for explicit recognition of 1:1 ratio	[2]	
		(iii) 0.1 moles	[1]	
5	(a)	(i) water which does not lather (easily) <b>with soap</b>	[1]	
		(ii) (Dissolved) $\text{Ca}^{2+}$ or $\text{Mg}^{2+}$ <b>ions</b>	[1]	
		(iii) Idea that temporary hardness can be removed by boiling or idea that permanent hardness cannot be removed by boiling	[1]	
	(b)	dissolved $\text{Ca}^{2+}$ ions react [1] with $\text{CO}_3^{2-}$ ions (from $\text{Na}_2\text{CO}_3$ ) [1] form $\text{CaCO}_3$ [1] clear idea that product is insoluble [1] unless wrongly qualified this removes the $\text{Ca}^{2+}$ ions and (therefore) softens the water [1] Any 4 × [1]	[4]	7

- 6 (a) 8–9 points [2] 5–7 points [1] appropriate hand drawn curve [1] [3]
- (b) (i) 140s or 140 seconds – units needed [1]
- (ii) 0.64 [1] cm<sup>3</sup>/s [1] apply CM [2]
- (c) **Indicative Points**
- Concentration
- Explicit idea of more particles/H<sup>+</sup> ions (in the same volume) (**not** molecules or atoms)
  - Idea of more collisions/more successful collisions
- Temperature
- idea that particles H<sup>+</sup> ions have more energy
  - move faster
  - Idea of **more energetic** collisions/more successful collisions
- Accept more **kinetic energy** as first 2 indicative points
- Particle size
- Idea of larger surface area
  - More (chance of) collisions

Response	Marks
Candidates must use specialist terms throughout. (6–7 indicative points covering <b>all three</b> areas 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.	0

[6]

12

			AVAILABLE MARKS	
7	(a) (i)	provides jobs (for local people) helps local economy/idea of financial benefits improvement in roads infrastructure quarries can be used for landfill <b>or</b> other correct Any 2 × [1]	[2]	
	(ii)	Noise pollution disturbing animal habitats idea of poor air quality (due to dust and lorry fumes) increased traffic eyesore qualified danger <b>or</b> other correct Any 2 × [1]	[2]	
	(b) (i)	$\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ LHS [1]                  RHS [1]                  if incorrect balancing max is [1]	[2]	
	(ii)	Idea that (alkaline) CaO <b>reacts</b> with (acidic) SiO <sub>2</sub> [1] Producing calcium silicate CaSiO <sub>3</sub> /slag [1] Idea of tapped off at the bottom of the furnace (as slag) [1]	[3]	9

- 8 (a) (i) Any **three** of:  
 water pollution  
 damages beaches  
 kills or damages birds  
 kills or damages sea life  
 destroys habitats/breeding grounds  
 destroys marine plant life  
 idea of effect of light on sea life can stay a long time  
**Ignore** eyesore  
**Not** defoliates trees; **not** animals except reference to habitats;  
**not** cost of cleaning  
 or other correct  
 Any 3 × [1] [3]
- (ii) Oil spillages are cleaned up by spraying them with detergents/  
 idea of physical removal/dispersants/bacteria or other correct  
**Not** burning; **not** filtering; **not** neutralising [1]
- (b) (i) alkane [1]
- (ii)  $C_nH_{2n+2}$  [1]
- (iii)  $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$   
 LHS [1] RHS [1] balancing (if LHS & RHS correct) [1] [3]
- (c) (i) Methanoic acid [1]
- (ii)
- $$\begin{array}{c}
 \text{H} \\
 | \\
 \text{H} - \text{C} - \text{C} \begin{array}{l} \text{// O} \\ \text{\ / O-H} \end{array} \\
 | \\
 \text{H}
 \end{array}$$
- If one error allow [1]; don't differentiate between -OH and -O-H,  
 e.g. for propanoic acid drawn out award [1] [2]
- (d) (i) Any answer in range pH 3 – pH 6 [1]
- (ii) food flavouring/vinegar/food preservation or other correct,  
 e.g. cleaning; **not** industrial; **not** disinfectant  
**allow** used for **wasp** stings, not **bee** stings [1]
- (e) (i) Any **three** of:  
 effervescence/bubbles/fizzing/gas given off  
 idea that gas is colourless  
 solid dissolves/disappears  
 blue solution formed  
 heat evolved  
 or other correct  
 Any 3 × [1] [3]
- (ii) Magnesium/zinc/aluminium/iron or other correct  
**Not** potassium, sodium, lithium, calcium, copper, gold etc. [1]

AVAILABLE  
MARKS

Total

18

90