



*Rewarding Learning*

**General Certificate of Secondary Education  
2015–2016**

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**Science: Single Award**

Unit 2 (Chemistry)

Higher Tier

**[GSS22]**

**THURSDAY 19 MAY 2016, MORNING**

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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.

**1 Indicative content:**

- **tectonic** plate (theory)
- earthquakes happen at plate **boundaries**
- earthquakes are caused by a **build-up** of pressure
- earthquakes are caused by **sudden** movement of plates
- earthquakes can happen as plates move past each other/collide
- the **Richter scale** (measures the size of earthquakes)
- the larger the Richter scale value the more intense the earthquake is

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe earthquakes using <b>six or seven</b> of the points above, in a logical sequence including the term plate tectonics. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to describe earthquakes using <b>four or five</b> of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe earthquakes using <b>one to three</b> of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

6

**2 (a) A and C [1]**

they only contain one **type of atom** [1]

[2]

**(b) D**

[1]

3

**3 (a) (i) 5100**

[1]

**(ii) 52**

[1]

**(iii) As the number of carbon atoms increases the boiling point increases** [1]

**(b) Oxygen**

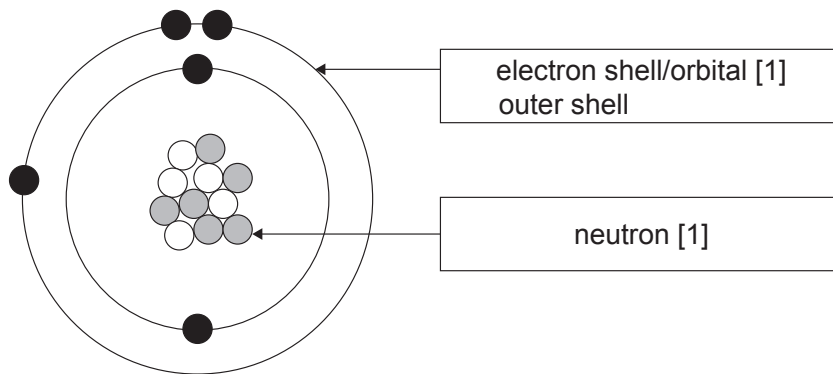
[1]

4

AVAILABLE  
MARKS

			AVAILABLE MARKS	
4	(a)	Purple [1] yellow [1]	[2]	8
	(b)	(i) Neutralisation	[1]	
		(ii) None of the indicators <b>change colour at pH7</b> /point of neutralisation [1] they remain the same colour in <b>pH8 and pH7</b> [1]	[2]	
(c)	(Cut up the cabbage) and <b>add water</b> [1] <b>boil/heat</b> until (water changes colour) [1] (filter/decant) the coloured <b>solution</b> to use <b>as the indicator</b> [1]	[3]		
5	(a)	Smooth curve drawn, ignoring anomalous point	[1]	8
	(b)	At the start the mass of the flask and contents decreased with time [1] from 5.5 minutes the mass of the flask and contents remained constant [1]	[2]	
	(c)	Calcium chloride [1] water [1] (either order)	[2]	
	(d)	(i) Limewater	[1]	
(ii) Turns from <b>colourless</b> [1] to <b>cloudy/milky</b> [1]		[2]		
6	(a)	(i) Using electricity [1] to break down a substance [1]	[2]	7
		(ii) Oxide [1] cathode [1] electrons [1]	[3]	
	(b)	(i) Aluminium, oxygen and hydrogen (any order)	[1]	
		(ii) 7	[1]	

7 (a)



[2]

(b) Boron

[1]

(c)

Particle	Relative charge	Relative mass
proton	+1	1
electron	-1	$\frac{1}{1840}$ / 0
neutron	0	1

(half mark each, round down)

[3]

(d) (i) Correct electron arrangement drawn for sodium 2.8.1 [1]  
 correct electron arrangement drawn for chlorine 2.8.7 [1]

[2]

(ii) Similarity: same number of shells/both have two **inner** shells filled [1]  
 difference: different number of **electrons** in the **outer shell** [1]

[2]

(iii) Sodium loses **one** electron [1]  
 chlorine gains one electron [1]  
 correct direction of transfer [1]

[3]

(iv)  $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$   
 LHS [1]                      RHS [1]    Correct balancing [1]

[3]

16

8 (a) Hard water is water that is difficult to get a lather **with soap**

[1]

(b) (i)  $\text{CaCO}_3$  [1]  
 $\text{H}_2\text{O} + \text{CO}_2$  [1]  
 (Any order)

[2]

(ii) **Calcium** ions react with **carbonate** ions (from the washing soda) [1]  
 (this forms) insoluble calcium carbonate [1]  
 removes calcium **ions** from the water/only sodium **ions** left in the  
 (water therefore the water is no longer hard) [1]

[3]

AVAILABLE  
MARKS

- (c) (i) All bars correct [2]  
 (3 bars correct [1])  
 Incorrect/no shading [-1]
- (ii) **Temporary hard water** [1]  
 more lather produced after boiling than before [1] [2]

AVAILABLE  
MARKS

10

**9 Indicative content:**

- a smart material changes its **properties**
- because of a change in its surroundings
- thermochromic materials change **colour** due to a change in temperature
- photochromic materials change **colour** due to a change in **light**

Any **two** from:

- sunglass lenses are a photochromic material and **darken** when exposed to sunlight
- forehead thermometers are thermochromic; they **change colour** depending on the **person's temperature**
- baby feeding spoons are thermochromic they **change colour** if the food is too hot

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe smart materials using <b>at least five</b> of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to describe smart materials using <b>three or four</b> of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe smart materials using <b>one or two</b> of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

6

- 10 (a)** A compound that contains carbon and hydrogen **only** [1]
- (b) (i) Correct structure drawn for propane, C<sub>3</sub>H<sub>8</sub> [1]
- (ii) Alkanes [1]

(c) (i) Polymerisation	[1]	<b>AVAILABLE MARKS</b>
(ii) Double bond breaks [1] forming a single bond and allowing [1] <b>many</b> monomers/styrene molecules to join together [1]	[3]	7
<b>Total</b>		<b>75</b>