**General Certificate of Secondary Education** 2014-2015

# **Science: Single Award**

Unit 2 (Chemistry)

**Higher Tier** 

[GSS22]

### **THURSDAY 13 NOVEMBER 2014, MORNING**

TIME

1 hour 15 minutes, plus your additional time allowance.

#### **INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page. Write your answers in the spaces provided in this question paper.

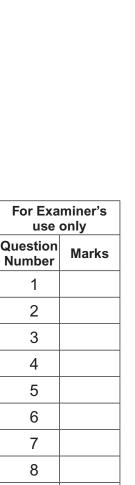
Answer all eleven questions.

#### INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Quality of written communication will be assessed in Questions 3 and 11.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question. A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.



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10 11

Total Marks

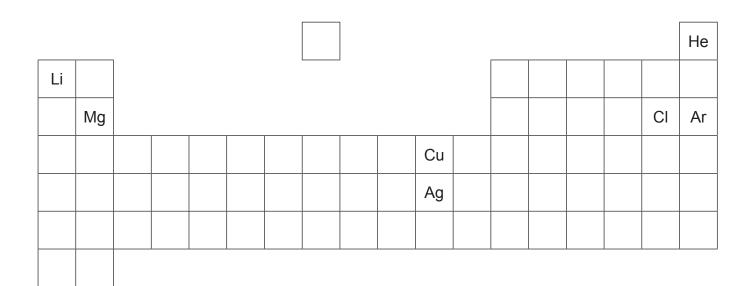
Ce	ntre Number
71	
Cano	lidate Number





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**1** Below is an outline of the modern Periodic Table.



				Examin	er Only
(a)		wer the questions below using only the elements shown above your own knowledge.		Marks	Remark
	(i)	Write down the symbol of an element that is in <b>Group 2</b> .	[4]		
			[1]		
	(ii)	Write down the name of <b>two</b> elements that are in the same <b>period</b> .			
		and	[1]		
	(iii)	Write down the name of the element that has <b>only one</b> electronits outer shell.	n in		
			[1]		
	(iv)	Write down the name of a gas shown on the Periodic Table above.			
			[1]		
(b)	Wha	at name is given to elements in Group 7?			
			[1]		
(c)		e the symbol for hydrogen in its correct position on the outline odic Table above.	[1]		

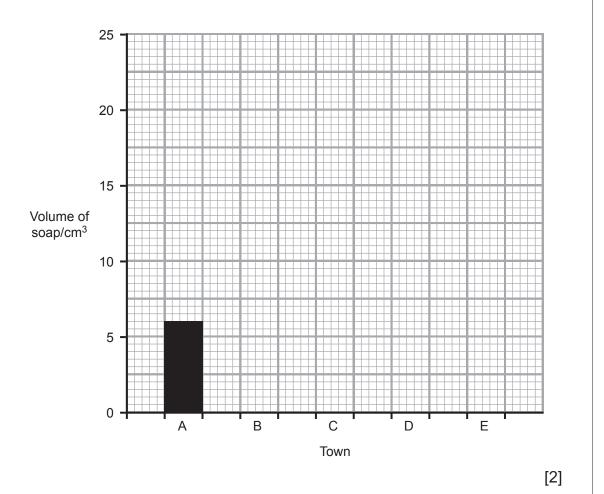
 2 (a) A scientist collected water samples from five towns (A, B, C, D and E). The table below gives the volume of soap solution needed to produce a lather with each of the samples.

Examiner Only

Marks Remark

Town	Volume of water/ cm <sup>3</sup>	Volume of soap/ cm <sup>3</sup>
А	50	6
В	50	17
С	50	24
D	50	20
E	50	11

(i) Use the information in the table to complete the bar chart below.



9708.03 ML

	(ii)	Which town ( <b>A</b> , <b>B</b> , <b>C</b> , <b>D</b> or <b>E</b> ) has the hardest water? Explain your answer.	Examiner Only Marks Remark
		Town	
		Explanation	
		[2]	
	(iii)	Scientists found that they needed 11 cm <sup>3</sup> of soap to produce a lather after shaking the water sample from <b>town E</b> . Describe how they could continue their investigation to prove that the water is temporary hard water. Make sure you include how the results should show this.	
		[3]	
(b)	(i)	Write down the name of <b>two</b> metal ions that cause hard water.	
		and [2]	
	(ii)	Hard water has a better taste. Write down <b>one</b> other advantage of drinking hard water.	
		[1]	
(c)	Har	d water can cause undesirable deposits (fur) in kettles.	
	(i)	Complete the word equation to show how these undesirable deposits form in kettles.	
	alciu enca	rbonate → + +	
		[3]	

(ii) Write down **one** reason why these deposits cause problems in kettles.

Examiner Only Marks Remark

\_ [1]

5

The first racing cars were built using aluminium. Around 1990 this was replaced with glass fibre, a composite material.	Examiner On Marks Rem
replaced with glass libre, a composite material.	
© Kreatiw/iStock/Thinkstock	
Explain why the makers of modern Formula One cars choose glass fibrainstead of aluminium to make the car bodies.	e
Your answer should include:	
<ul> <li>a full explanation of what a composite material is</li> <li>the advantages of using glass fibre in Formula One car bodies</li> <li>a disadvantage of glass fibre.</li> </ul>	
In this question you will be assessed on your written communicati	on
skills including the use of specialist scientific terms.	
	_ [6]
	- [~]

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(Questions continue overleaf)

**4** Below there is information about the reactions of some metals.

Metal	Reaction with water	Reaction with hot water or steam	Reaction with air (when heated)
Zinc	No reaction	Reacts slowly giving off a gas	Burns slowly to form a white powder
Magnesium	Very slow reaction	Reacts readily giving off a gas	Burns with a bright white light
Potassium	Violent reaction. It floats on the water surface, burning with a coloured flame	Extremely violent reaction. Burns with a coloured flame	Burns violently with a coloured flame
Copper	No reaction	No reaction	Reacts very slowly
Lead	No reaction	Reacts very slowly	Reacts slowly

	formation to put the metals in order of decreated has been done for you.	asing reactivity.	Examiner On Marks Rem
	Potassium		
		[2]	
(b) What colou	ur is the flame produced by potassium in wa	ter? [1]	

[1]         (1)         (2)         (1)         (1)         (1)         (2)         (1)         (2)         (2)         (2)         (2)         (2)         (2)         (2)         (2)         (2)	rks Re
otassium + water →	
[2] Choose a metal from the table opposite that would be most suitable for making water pipes in houses. Explain your answer. [2] Recent nanotechnology research has found that nano-sized particles of copper can be used to remove bacteria from drinking water. Explain fully what is meant by the term 'nanotechnology'.	
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[2]	
[2]	

Below there are three statements made by pupils in a class discussion 5 Examiner Only about atoms. However, **one** of these statements is incorrect. Marks Remark An atom is always neutral Anne Protons, electrons and neutrons do not move in an atom Jane Most of the mass of an atom is in the nucleus Mark Write down the name of the pupil who gave the **incorrect** statement. Explain why this statement is incorrect. [2]

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(Questions continue overleaf)

Gas	Formula	Lifetime in upper atmosphere /years	Contribution to greenhouse effect/%	Source of gas
Carbon dioxide	CO <sub>2</sub>	7	50	Burning fossil fuels
CFC	CF <sub>2</sub> Cl <sub>2</sub>	100	14	Coolants in fridges
Methane	CH <sub>4</sub>	10	18	Breakdown of organic waste Cows
Nitrous oxide	N <sub>2</sub> O	170	6	Fertilisers Exhaust fumes Burning fossil fuels

Use the information in the table and your knowledge to answer the questions below.

(a) Write down the name of the gas that is a hydrocarbon.

\_\_\_\_\_ [1]

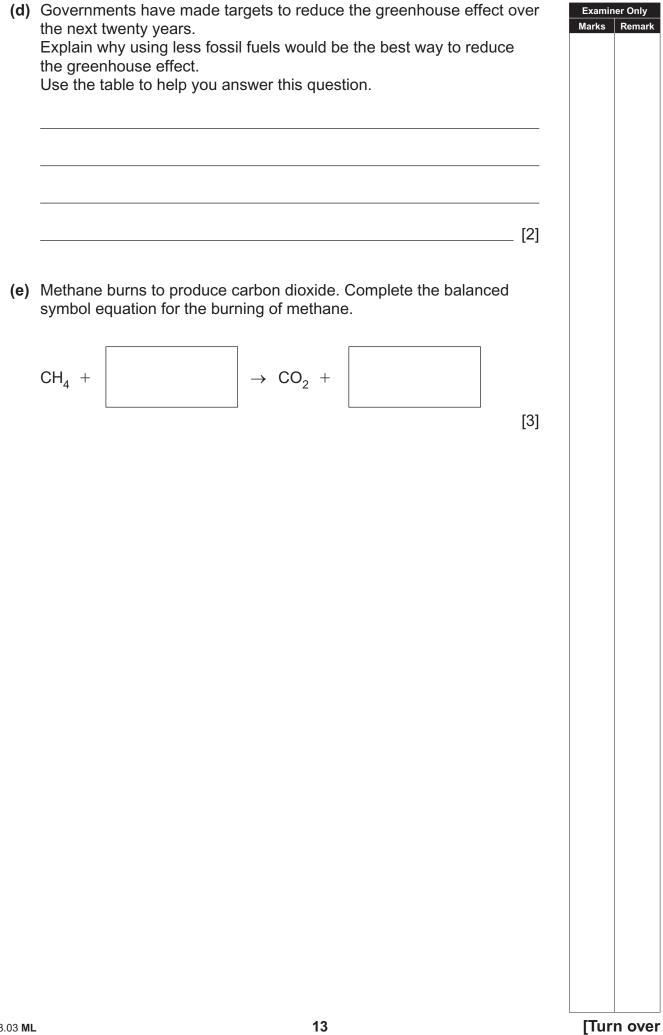
Examiner Only Marks Remark

(b) Write down the name of the gas that contains three elements.

\_\_\_\_\_ [1]

(c) Write down the name of the gas(es) with five atoms in their formula.

\_\_\_\_ [1]

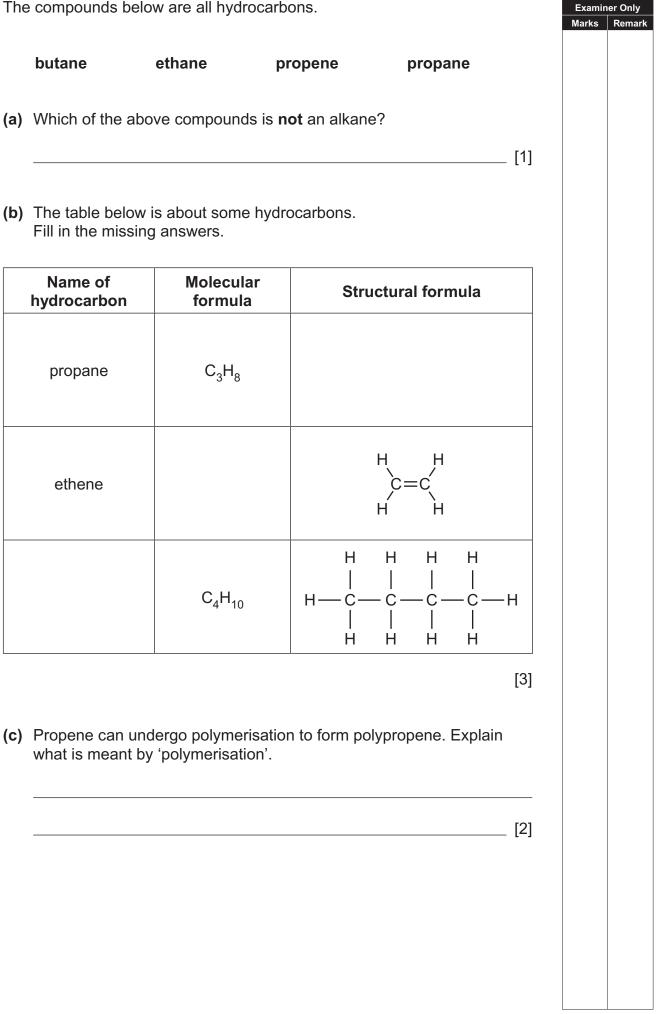


- 7 Below are the symbol equations for some chemical reactions.
  A HCl + NaOH → NaCl + H<sub>2</sub>O B Mg + CuSO<sub>4</sub> → MgSO<sub>4</sub> + Cu C CuO + H<sub>2</sub> → Cu + H<sub>2</sub>O D 2Mg + O<sub>2</sub> → 2MgO
  (a) Which reaction (A, B, C or D) represents a displacement reaction?
  \_\_\_\_\_\_\_[1]
  (b) Which reaction (A, B, C or D) represents a neutralisation reaction? Explain your answer.
  - (c) One of these reactions represents reduction. Explain what is meant by 'reduction'.

\_\_\_\_\_ [2]

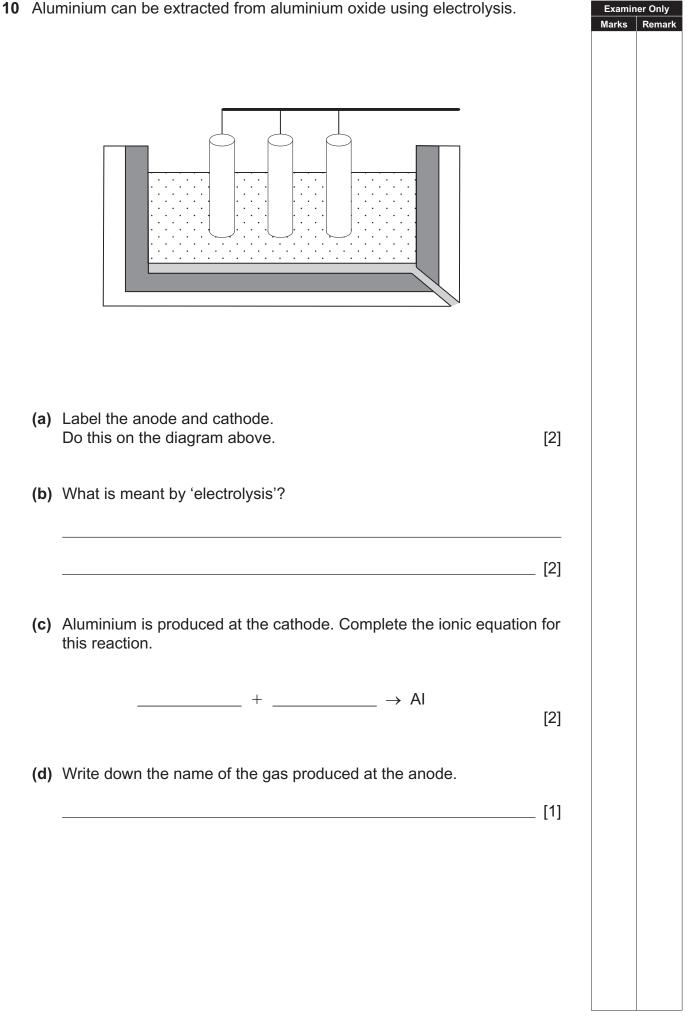
\_\_\_\_\_ [1]

Examiner Only Marks Remark 8 The compounds below are all hydrocarbons.



(a) Magnesium can react with oxygen to produce magnesium oxide. Examiner Only Marks Remark (i) Complete the diagrams below to show the electronic structures of magnesium and oxygen. Magnesium Oxygen [2] (ii) Draw arrows on the diagrams above to show how electrons are transferred when these atoms combine to form magnesium oxide. [2] (b) Below is a diagram of a hydrogen molecule. н н Х In terms of electrons, describe the bonding in a molecule of hydrogen. [2]

9



The <b>Greeks</b> were the first people to have the idea of elements. Early on the Periodic Table began in the 19th Century by an English chemiss alled <b>John Newlands</b> . It was further improved by a Russian chemist alled <b>Dmitri Mendeleev</b> .	st	Examin Marks
Vrite about the development of the modern Periodic Table. Start with arly ideas of the Greeks.	the	
n this question you will be assessed on your written communica kills including the use of specialist scientific terms.	tion	
	[6]	
THIS IS THE END OF THE QUESTION PAPER	-	

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