



Rewarding Learning

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.

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.

Centre Number

71

Candidate Number

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
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8	
9	
10	
11	

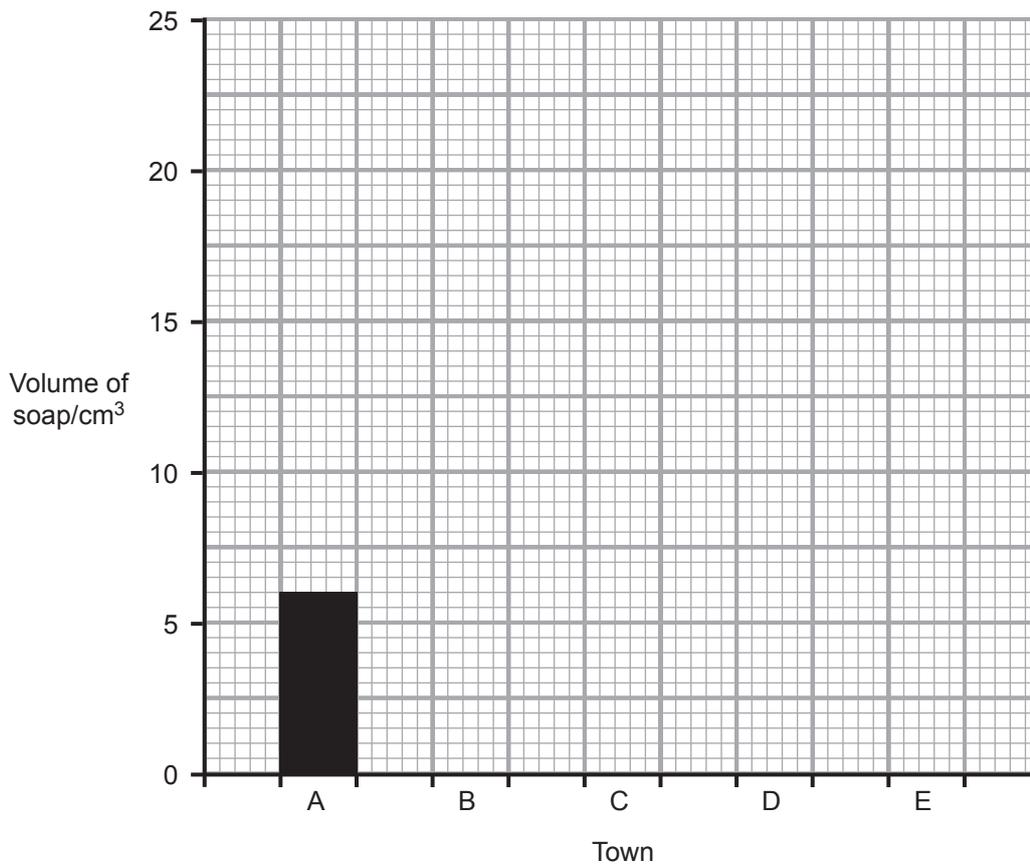
Total
Marks

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- 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.

Town	Volume of water/ cm^3	Volume of soap/ cm^3
A	50	6
B	50	17
C	50	24
D	50	20
E	50	11

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



[2]

Examiner Only	
Marks	Remark

- (ii) Which town (**A**, **B**, **C**, **D** or **E**) has the hardest water?
Explain your answer.

Town _____

Explanation _____

_____ [2]

- (iii) Scientists found that they needed 11 cm^3 of soap to produce a lather after shaking the water sample from **town E**.
Describe how they could continue their investigation to prove that the water is temporary hard water, including how the results should show this.

_____ [3]

- (b) (i) Name **two** metal ions that cause hard water.

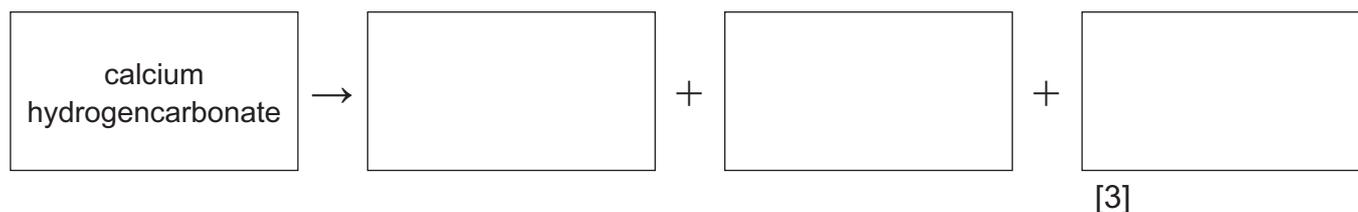
_____ and _____ [2]

- (ii) Apart from taste, give **one** advantage of drinking hard water.

_____ [1]

- (c) Hard water can cause undesirable deposits (fur) in kettles.

- (i) Complete the word equation to show how these undesirable deposits form in kettles.



- (ii) Give **one** reason why these deposits cause problems in kettles.

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

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(Questions continue overleaf)

4 Given below 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

(a) Use the information to put the metals in order of decreasing reactivity. The first one has been done for you.

Potassium

[2]

(b) What colour is the flame produced by potassium in water?

_____ [1]

Examiner Only	
Marks	Remark

- 5 Shown below are three statements made by pupils in a class discussion about atoms. However, **one** is incorrect.



Anne

An atom is
always neutral



Jane

Protons, electrons
and neutrons do not
move in an atom



Mark

Most of the mass
of an atom is in
the nucleus

Name the pupil who gave the **incorrect** statement. Explain why this statement is incorrect.

[2]

Examiner Only

Marks

Remark

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(Questions continue overleaf)

6 Below is information about some gases that can pollute the atmosphere.

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

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

(a) Name the gas which is a hydrocarbon.

_____ [1]

(b) Name the gas that contains three elements.

_____ [1]

(c) Name the gas(es) with five atoms in their formula.

_____ [1]

Examiner Only

Marks Remark

8 The compounds below are all hydrocarbons.

butane

ethane

propene

propane

(a) Which of the above compounds is **not** an alkane?

_____ [1]

(b) Complete the table below about some hydrocarbons.

Name of hydrocarbon	Molecular formula	Structural formula
propane	C_3H_8	
ethene		$ \begin{array}{c} H & & H \\ & \diagdown & / \\ & C = C & \\ & / & \diagdown \\ H & & H \end{array} $
	C_4H_{10}	$ \begin{array}{cccc} H & H & H & H \\ & & & \\ H - C & - C & - C & - C - H \\ & & & \\ H & H & H & H \end{array} $

[3]

(c) Propene can undergo polymerisation to form polypropene. Explain what is meant by the term 'polymerisation'.

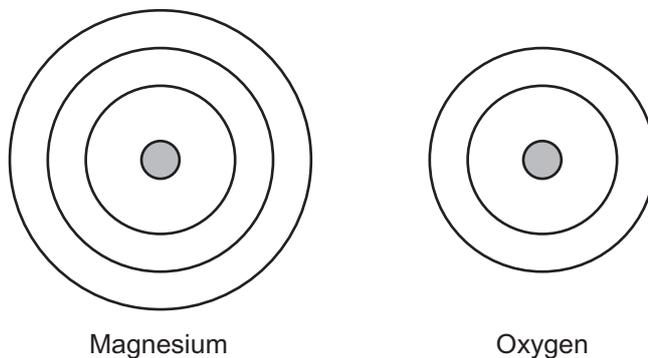
 _____ [2]

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Marks Remark

9 (a) Magnesium can react with oxygen to produce magnesium oxide.

(i) Complete the diagrams below to show the electronic structures of magnesium and oxygen.

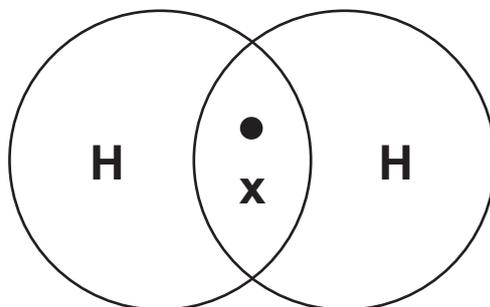


[2]

(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.

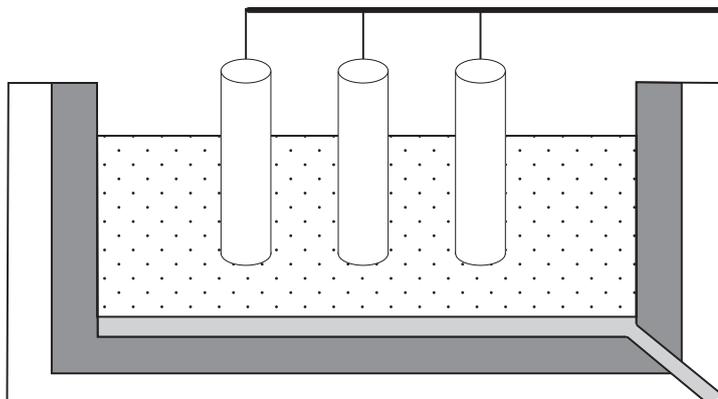


In terms of electrons, describe the bonding in a molecule of hydrogen.

[2]

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Marks	Remark

10 Aluminium can be extracted from aluminium oxide using electrolysis.

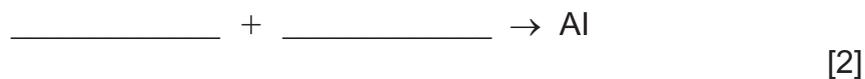


(a) On the diagram above, label the anode and cathode. [2]

(b) What is meant by the term 'electrolysis'?

 _____ [2]

(c) Aluminium is produced at the cathode. Complete the ionic equation for this reaction.



(d) Name the gas produced at the anode.

_____ [1]

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