



Rewarding Learning

General Certificate of Secondary Education
2013–2014

Science: Single Award

Unit 2 (Chemistry)

Higher Tier

[GSS22]



THURSDAY 14 NOVEMBER 2013, 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.



9016

Centre Number

71

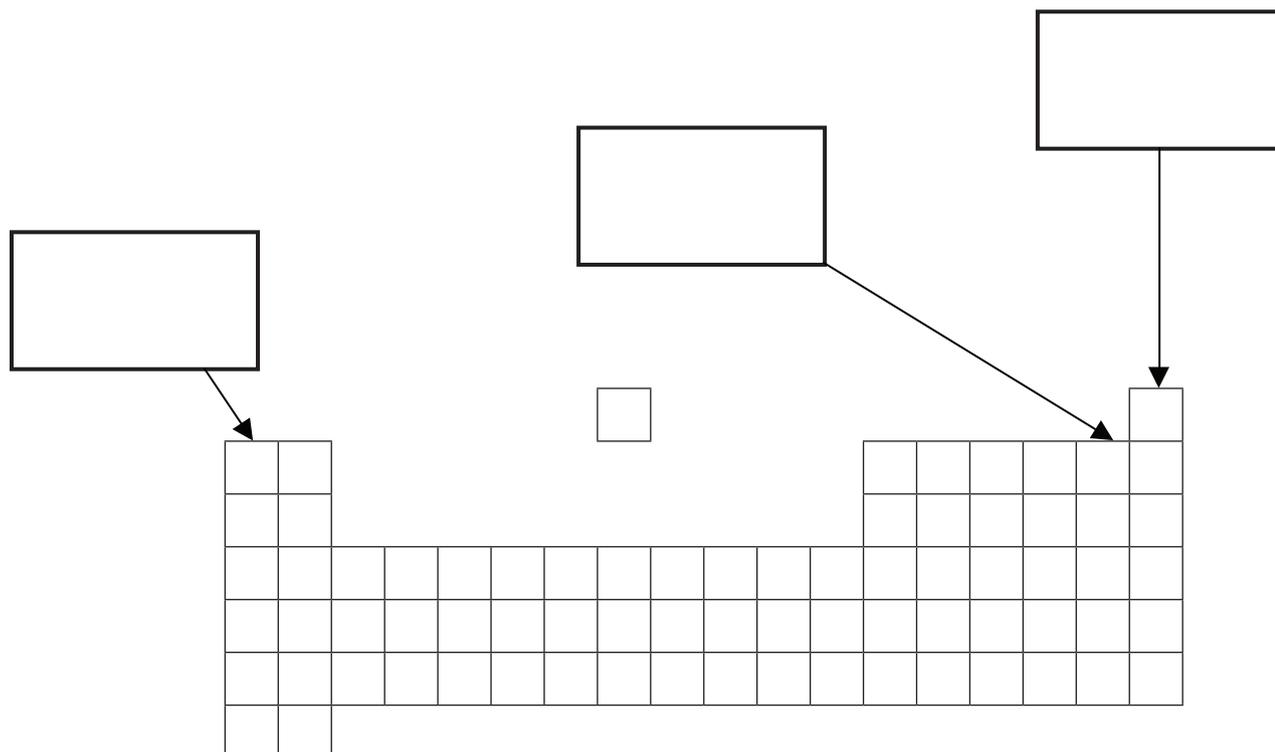
Candidate Number

For Examiner's use only	
Question Number	Marks
1	
2	
3	
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10	
11	

Total Marks

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1 Below is an outline of the Periodic Table.



(a) On the diagram above complete the three boxes to name the Groups of the Periodic Table shown.

Choose from:

alkaline earth metals : halogens : alkali metals : noble gases [3]

(b) Name the scientist who developed a Periodic Table most similar to the one outlined above.

_____ [1]

(c) Complete the following sentence to describe a **trend** in the Periodic Table.

The metallic character of the elements _____ from left to right across the Periodic Table. [1]

Examiner Only	
Marks	Remark

- 2 A student investigates the reactivity of four metals: iron, magnesium, zinc and tin.

He added 1 g of each powdered metal to equal volumes of copper sulfate solutions and measured the temperature rise. The larger the temperature rise the more reactive the metal.

The results are shown below.

Metal	Starting temperature/ °C	Highest temperature/ °C	Temperature rise/ °C
iron	20	52	32
magnesium	21		50
zinc	19	60	41
tin	20	41	21

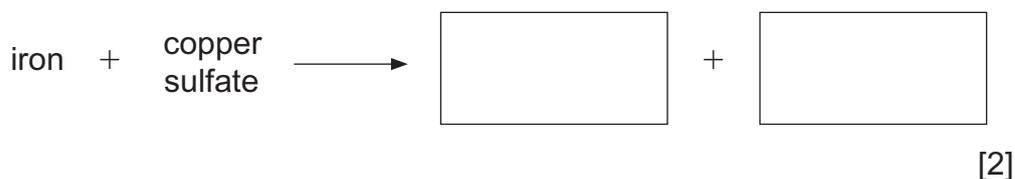
- (a) Calculate the highest temperature for the reaction with magnesium.

_____ °C [1]

- (b) Name the metal in the table that is the **least** reactive.

_____ [1]

- (c) (i) Complete the word equation for the reaction between iron and copper sulfate.



- (ii) What is the name given to this type of reaction?

_____ [1]

Examiner Only

Marks Remark

- (d) The student carried out the same experiment using 1 g of powdered silver metal. There was no temperature rise. Suggest a reason why there was no temperature rise.

_____ [1]

- (e) The chemical formula for copper sulfate is CuSO_4 .

- (i) How many elements are present in copper sulfate?

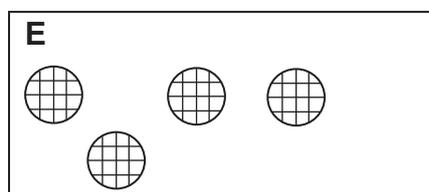
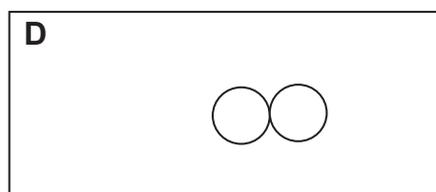
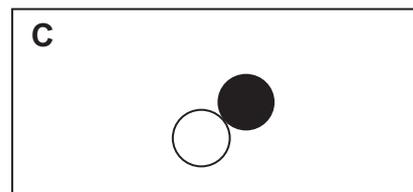
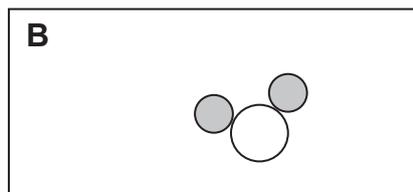
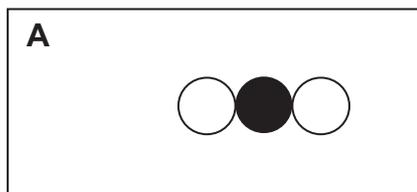
_____ [1]

- (ii) How many atoms are represented in this formula?

_____ [1]

Examiner Only	
Marks	Remark

4 Shown below are some particle diagrams that represent elements or compounds.



- (a) Which particle diagrams (**A**, **B**, **C**, **D** or **E**) show compounds? Explain your answer.

Diagrams _____

_____ [2]

- (b) Atoms of argon do not join with any other atoms. Which diagram (**A**, **B**, **C**, **D** or **E**) best represents argon?

_____ [1]

- (c) Carbon monoxide has the formula CO . Which diagram (**A**, **B**, **C**, **D** or **E**) best represents carbon monoxide?

_____ [1]

- (d) Hydrogen atoms are smaller than any other atoms. Which diagram (**A**, **B**, **C**, **D** or **E**) best represents water (H_2O)? Explain your answer.

 _____ [2]

Examiner Only

Marks	Remark

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5 A flame test can be carried out to identify some metal ions.



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(a) Describe fully how to carry out a flame test.

[3]

(b) Complete the table below.

Metal ion	Flame colour
Sodium	
	Lilac
Copper	

[3]

Examiner Only

Marks Remark

6 The table below gives information about three elements.

(a) Complete the table.

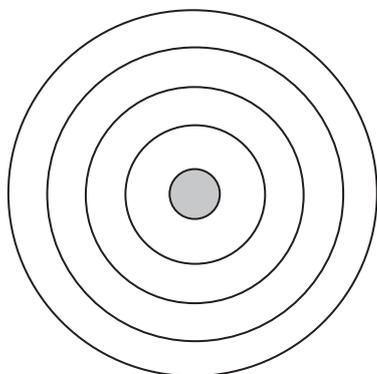
Element	Mass number	Number of protons	Number of electrons	Number of neutrons
Calcium	40	20		20
Carbon	12		6	6
Potassium	39	19	19	

[3]

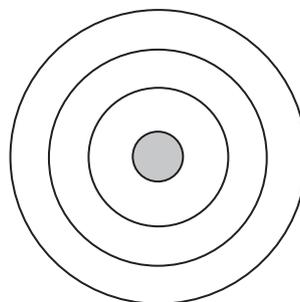
(b) What is meant by the term **mass number**?

[1]

(c) (i) Complete the diagrams below to show how the electrons are arranged in an atom of potassium and an atom of chlorine.
(You may find your Data Leaflet helpful.)



potassium



chlorine

[2]

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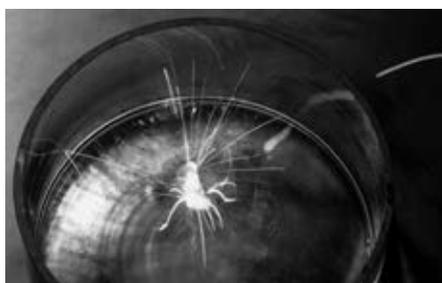
Marks Remark

- (ii) Potassium forms bonds with chlorine in the same way that sodium does when it makes sodium chloride (NaCl).

Explain fully in terms of electrons how potassium forms bonds with chlorine to form potassium chloride (KCl).

[3]

- (iii) Potassium is in Group One of the Periodic Table and reacts vigorously with water.



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Caesium is also a Group One element. Suggest how it will react with water compared to potassium and explain your answer.

[2]

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Marks Remark

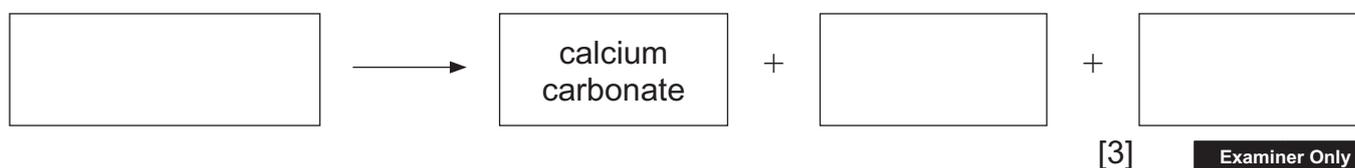
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7 Hard water can form undesirable deposits of calcium carbonate (fur) in kettles.



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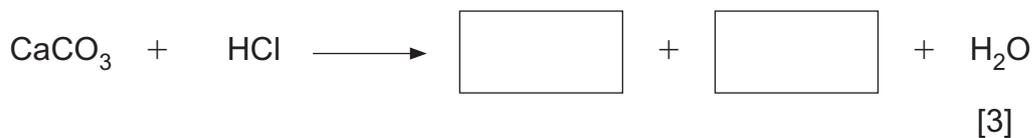
(a) Complete the word equation below for the formation of kettle fur.



(b) Suggest **one** reason why fur in kettles or water pipes is a problem.

_____ [1]

(c) Kettle fur can be removed by reacting with acid. Complete and balance the symbol equation below for this reaction.



(d) Give **one** method of softening permanent hard water.

_____ [1]

Examiner Only	
Marks	Remark

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- 8 Japan is a very tectonically active area and suffers about 20% of the world's earthquakes of magnitude 6 or greater.

In March 2012 a major earthquake killed over one thousand people and destroyed an area of several hundred square kilometres.

The table below shows how the Richter scale is used to compare the size of earthquakes.

Richter scale value	Effect of earthquake
Less than 3	People do not feel the earthquake.
3.0–5.1	People feel the earthquake but the earthquake rarely causes damage to buildings.
5.2–6.4	People feel the earthquake and the earthquake causes minor damage to a few buildings.
6.5–7.0	Shaking of the ground and major damage to some buildings.
7.1–8.5	Violent shaking of the ground over large areas and many buildings destroyed.
8.6–10	Very violent shaking of the ground and most buildings destroyed. Can cause damage to areas of several hundred square kilometres.

- (a) Suggest the Richter scale value for the 2012 earthquake in Japan.

[1]

Below is an extract from a Japanese newspaper about the 2012 earthquake.

Half the country was without power and major roads were severely damaged by very violent shaking of the ground.

Rescue efforts were hampered by at least 50 reported aftershocks, including a 6.6 magnitude tremor which hit Tokyo.

The earthquake did not come as a surprise to scientists who predicted the earthquake a week earlier. The Government and people ignored the prediction.

- (b) What damage would the aftershocks in Tokyo cause?

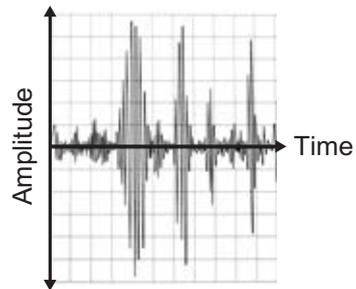
_____ [1]

Examiner Only	
Marks	Remark

- (c) Governments and people in Japan have often ignored scientists' predictions of an earthquake. Suggest a reason why.

_____ [1]

- (d) Below is a printout from a seismometer that is used to produce a Richter scale value for an earthquake.



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- (i) On the printout label the major **earthquake** with the letter **X**. [1]

- (ii) Give **two** pieces of information about the earthquake that can be obtained from the printout.

1. _____
2. _____ [2]

- (e) During the twentieth century many scientists put forward ideas about the cause of earthquakes. In 1915 Alfred Wegener proposed the idea of continental drift.

- (i) Describe Wegener's theory of **continental drift**.

_____ [2]

- (ii) Give **one** piece of evidence that supports Wegener's theory.

_____ [1]

Examiner Only	
Marks	Remark

9 Below is a table showing some properties of four polymers.

Polymer	Strength N/mm ²	Melting point °C	Density g/cm ³	Maximum continued use temperature °C	Cost £/kg
polypropene	1.5–1.7	160	0.91	80	1.00
low density polyethene	0.2–0.4	110	0.93	65	1.25
high density polyethene	0.2–0.4	126	0.97	65	1.25
silicone	11.0–13.0	420	1.29	300	7.30

Use the information in the table to answer the following questions.

- (a) Explain why polypropene would be better than high density polyethene for making garden furniture.

[2]

- (b) Some polymers can now be used to make cupcake moulds for baking buns.



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Which polymer in the table would be most suitable for this use?
Explain your answer.

[2]

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Marks Remark

- (c) Traditionally cake moulds were made from steel. Some properties of steel are shown below.

	Strength N/mm ²	Melting point °C	Density g/cm ³	Cost £/kg
Steel	135.5–175.0	1510	7.85	0.55

Using the information provided, explain fully why steel is still the most popular choice for making cake moulds.

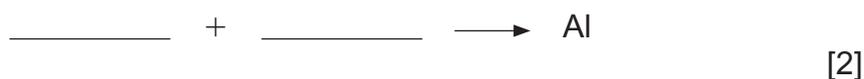
[2]

- 10 Aluminium is produced by the electrolysis of bauxite (aluminium oxide).

- (a) What is the meaning of the term **electrolysis**?

[2]

- (b) The aluminium is formed at the cathode. Complete the **ionic** equation for the reaction at the cathode.



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