



Rewarding Learning

General Certificate of Secondary Education  
2014–2015

Centre Number

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Candidate Number

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## Science: Single Award

Unit 2 (Chemistry)  
Foundation Tier

MV18

[GSS21]

THURSDAY 14 MAY 2015, MORNING

### TIME

1 hour, 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.

**You must answer the questions in the spaces provided.**

Complete in blue or black ink only.

Answer **all eleven** questions.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 60.

Quality of written communication will be assessed in Question 11.

Figures in brackets printed at the end of each question 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.

1 Shown below are three hazard symbols and the names of chemicals they can be found on.



**Sulfuric acid**



**Propanol**



**Lead oxide**

(a) Use this information and your knowledge to answer the following questions.

(i) Name the chemical that is flammable. [1 mark]

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(ii) Name the chemical that is corrosive. [1 mark]

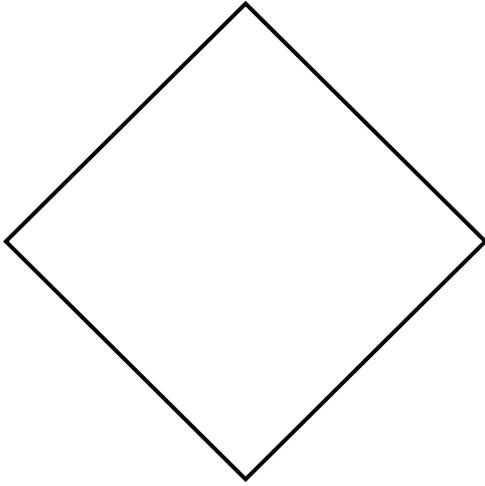
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(iii) Name the hazard symbol shown for lead oxide. [1 mark]

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**(b)** Fireworks are explosive.

Draw the hazard symbol below that you would expect to see on a box of fireworks. [1 mark]



2 (a) Complete the following sentences.

Choose from:

soil

temperature

colour

beetroot

neutralisation

distillation

Chemical indicators change \_\_\_\_\_ to show if a substance is an acid or an alkali.

Chemical indicators can be made from natural substances such as \_\_\_\_\_.

When an acid reacts with an alkali we call this a \_\_\_\_\_ reaction. [3 marks]

(b) Complete the table below about some common substances. [3 marks]

Substance	Acid or alkali	pH
vinegar		4
oven cleaner	alkali	
indigestion tablet	alkali	

- 3 A student investigated the hardness of rocks using the 'scratch test'. He rubbed each rock with three different objects. If the rock was **not** marked it meant that the rock is harder than the object.

Rock	Object used to rub the rock			Key
	metal fork	plastic fork	matchstick	
sandstone	✓	✓	✗	✓ Leaves a mark on the rock ✗ Does <b>not</b> leave a mark on the rock
slate	✓	✗	✗	
limestone	✓	✓	✓	
granite	✗	✗	✗	

- (a) Use this information to put the **rocks** in order of hardness. Start with the hardest rock. [2 marks]

\_\_\_\_\_ hardest

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ least hard

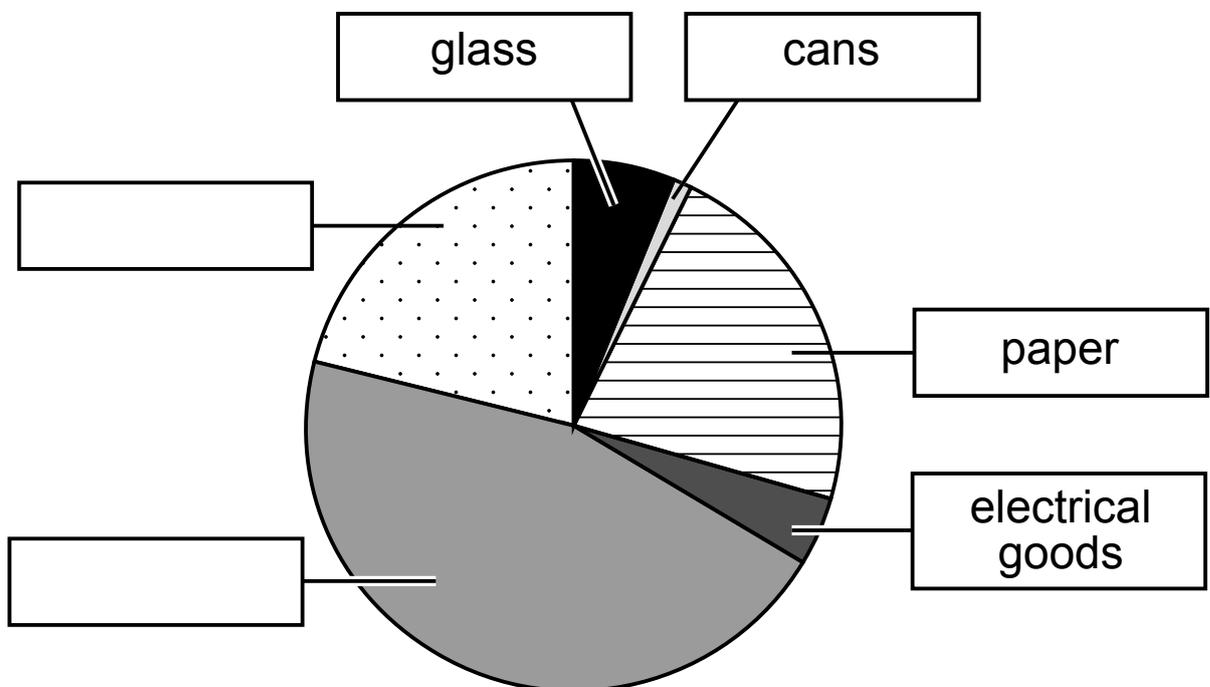
- (b) Complete the table below. [3 marks]

Type of rock	Example
	granite
metamorphic	
	limestone

- 4 The table below shows the amount of different types of waste recycled in Northern Ireland in 2009.

Type of waste	Amount recycled/tonnes
glass	
cans	1200
paper	21 400
electrical goods	4000
green waste	44 000
other waste	20 200

- (a) Use the information in the table to complete the labels on the pie chart below. [1 mark]



(b) The total amount of waste recycled in Northern Ireland in 2009 was 96 800 tonnes.

(i) Calculate the amount of glass recycled. [2 marks]

(Show your working out.)

\_\_\_\_\_ tonnes

(ii) The total amount of waste produced in Northern Ireland in 2009 was 200 000 tonnes.

The Government needed to recycle **half** of this total to meet a target.

Calculate by how much they were under this target. [1 mark]

\_\_\_\_\_ tonnes

(c) One benefit of recycling is that it reduces the use of landfill sites. Give **one** reason why reducing the use of landfill sites is important. [1 mark]

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- 5 (a) Shown below is a forehead thermometer which uses a thermochromic smart material.



What is meant by the term 'smart material'? [2 marks]

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Many new sun creams contain nano-sized particles of titanium oxide. These sun creams have the advantage of leaving no white marks on the skin. Many scientists feel more work is required to find out the risks of using nanoparticles.

**(b)** What size is a nanoparticle? [1 mark]

Circle the correct answer.

$10^{-9}$  m

$10^{-19}$  m

$10^9$  m

**(c)** Silver can also be used in nanotechnology. Give **one** use of silver nanoparticles. [1 mark]

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**(d)** Why are some people concerned about using nanoparticles? [1 mark]

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- 6 George wanted to investigate the reactivity of three alkali metals with water. He added a piece of each metal to water in turn, and timed the reaction until it finished. The results are shown below.

<b>Alkali metal</b>	<b>Time taken to react with water/s</b>	<b>Observations</b>
lithium	80	no flame, bubbles of gas given off
sodium	20	yellow sparks, bubbles of gas given off
potassium	5	lilac flame, bubbles of gas given off

Use this information and your knowledge to answer the following questions.

(a) Suggest **one** way that George could have made this a fair test. [1 mark]

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(b) How would George know that the reaction had finished? [1 mark]

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(c) Alkali metals are found in Group One of the Periodic Table. Describe how the speed of their reaction with water changes as you go down the Group. [1 mark]

You may find your Data Leaflet helpful.

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(d) George wore safety goggles. Give **one** other safety precaution he should have taken. [1 mark]

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7 The table below shows some information about different metals.

Metal	Melting point/ °C	Density/ g/cm <sup>3</sup>	Strength	Cost
Aluminium	661	2.7	medium	medium
Copper	1083	9.0	medium	high
Gold	1065	19.3	medium	very high
Lead	328	11.4	very low	low
Iron	1535	7.9	very high	low
Tungsten	3407	19.4	very high	high

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

(a) Iron is used to make bridges. State **two** reasons why it is suitable for building bridges. [2 marks]

1. \_\_\_\_\_
2. \_\_\_\_\_

(b) Overhead power cables carry electricity from power stations to homes and factories.

overhead  
power cable



Gold is a very good conductor of electricity. Apart from cost, give **one** reason why gold is **not** used to make overhead power cables. Explain your answer. [2 marks]

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(c) Name a metal from the table that would be most suitable for making aeroplanes. Explain your choice, giving only the **most important** reason. [2 marks]

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- 8 The diagram on page 14 shows an outline of the modern Periodic Table. The letters **A**, **B**, **C**, **D** and **E** represent the positions of some elements.

You may find your Data Leaflet helpful.

- (a) On the outline on page 14 use the letter **X** to show **one** position of an element that is a halogen. [1 mark]

- (b) Which element **A**, **B**, **C**, **D** or **E** is:

(i) a noble gas? [1 mark] \_\_\_\_\_

(ii) hydrogen? [1 mark] \_\_\_\_\_

- (c) What is the atomic number of element **D**? [1 mark]

\_\_\_\_\_

- (d) Complete the following sentences. [2 marks]

There were two main scientists involved in developing the Periodic Table.

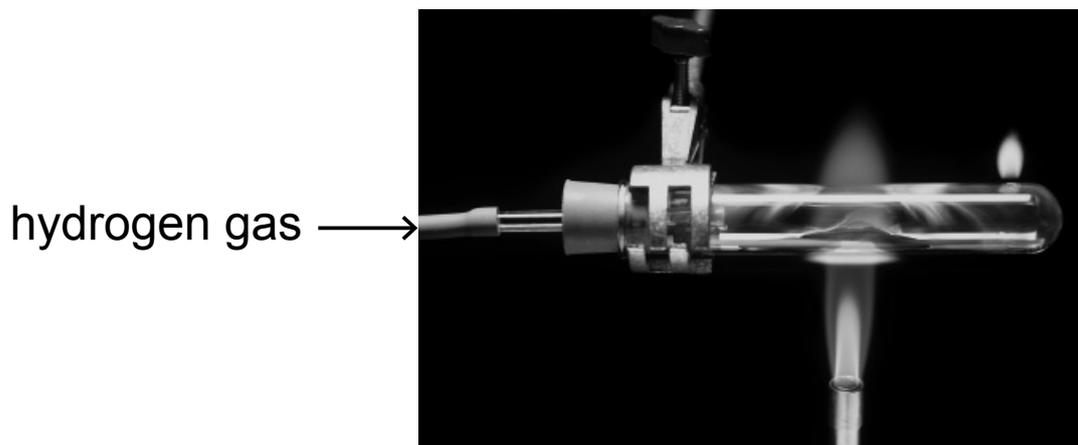
John Newlands was responsible for the law of

\_\_\_\_\_.

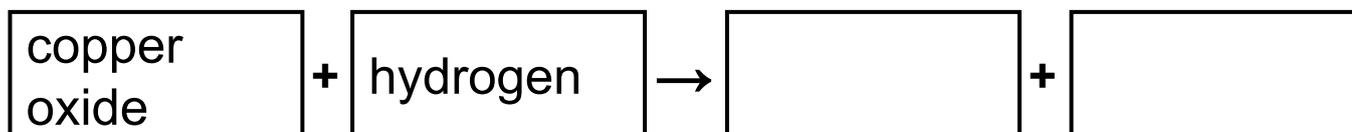
A scientist called \_\_\_\_\_ then

developed this work further. He left gaps for elements that were not known at that time.

- 9 (a) A student heated some copper oxide with hydrogen using the apparatus shown below.

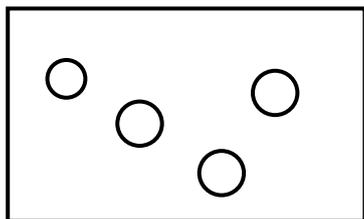
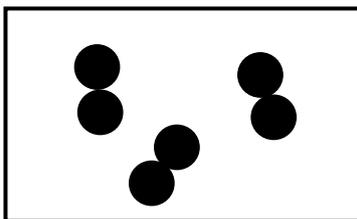
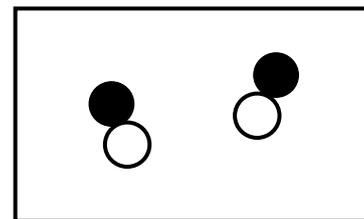


- (i) Complete the word equation for this reaction.  
[2 marks]



- (ii) What name is given to this type of reaction? [1 mark]
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(b) Shown below are some particle diagrams that represent elements or compounds.

**X****Y****Z**

Which diagram **X**, **Y** or **Z** represents hydrogen ( $H_2$ )?  
Explain your answer. [2 marks]

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(c) The chemical formula for potassium hydrogencarbonate is  $KHCO_3$ .

How many atoms are represented in this formula?  
[1 mark]

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**10 (a)** Bone is a natural composite material. It contains calcium phosphate, collagen and water. Calcium phosphate is hard but very brittle. Collagen is softer but more flexible.

Using bone as an example, explain what is meant by the term 'composite material'. [3 marks]

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- (b) (i)** Calcium phosphate contains two non-metal elements, phosphorus and oxygen.

Complete the table below showing the numbers of protons and neutrons in the atoms of each element.  
[2 marks]

You may find your Data Leaflet helpful.

<b>Element</b>	<b>Number of protons</b>	<b>Number of neutrons</b>
Phosphorus		16
Oxygen	8	

- (ii)** The electron is another particle in an atom.

Complete the following sentence. [2 marks]

An electron has a relative mass of \_\_\_\_\_ and a relative charge of \_\_\_\_\_.

**11** Flame tests can be used to identify the metal in a compound. Explain how you would carry out a flame test experiment on solid samples of copper sulfate and lithium chloride. [6 marks]

Your answer should include:

- a detailed description of your method
- the flame colours you would expect from copper and lithium.



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**THIS IS THE END OF THE QUESTION PAPER**

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Question Number	Marks
1	
2	
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<b>Total Marks</b>	

Examiner Number

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