



Rewarding Learning  
General Certificate of Secondary Education  
2016–2017

Centre Number

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Candidate Number

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## Double Award Science: Chemistry

Unit C1  
Foundation Tier

[GSD21]

MV18

**THURSDAY 18 MAY 2017, MORNING**

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### 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 black ink only.

Answer **all eight** questions.

### Information for Candidates

The total mark for this paper is 70.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 6.

A Data Leaflet, which includes a Periodic Table of the elements is provided.

1 (a) The list below contains the names of six elements:

iron                      copper                      carbon  
chlorine                  magnesium                  sulfur

(i) Choose two **non-metals** from the list. [2 marks]

\_\_\_\_\_ and \_\_\_\_\_

(ii) Choose an element from the list above which can be used to make: [1 mark for each]

1. pipes for plumbing \_\_\_\_\_

2. bridges \_\_\_\_\_

3. alloys for aircraft \_\_\_\_\_

(iii) What is the chemical symbol for iron?  
Circle the correct answer. [1 mark]

I              Ir              F              Fr              Fe

(b) Choose **two** words from the list below to complete the sentence about elements. [2 marks]

atom    molecule    compound    substance    electron

An element cannot be broken down into a simpler \_\_\_\_\_ by chemical means because it consists of only one type of \_\_\_\_\_ .

(c) (i) A green solid can be broken down using heat to give a black solid and a colourless gas. Is the green solid a mixture, a compound or an element? [1 mark]

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(ii) A different solid conducts heat and electricity. Which **two** of the statements, from the list below, would you also expect for this solid?

Tick (✓) the correct boxes. [2 marks]

1. It will be malleable

2. It will be a white powder

3. It will be ductile

4. It will dissolve in water

2 Part of an **early** version of a Periodic Table is shown below.

H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe

(a) Complete the sentences below by circling the correct answers. [3 marks]

The law of 
 octaves  
 isotopes  
 elements
  was developed by 
 Mendeleev.  
 Newlands.  
 Dalton.

He arranged the elements by atomic 
 number.  
 mass.  
 size.

(b) Hydrogen is one of the elements present in this early version.

Describe a test for hydrogen gas. [2 marks]

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(c) Suggest one reason why hydrogen, fluorine and chlorine were all placed in the same group in this version of the Periodic Table. [1 mark]

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(d) (i) Give the symbol for the element in Group 6 of the **modern** Periodic Table which is also a gas. [1 mark]

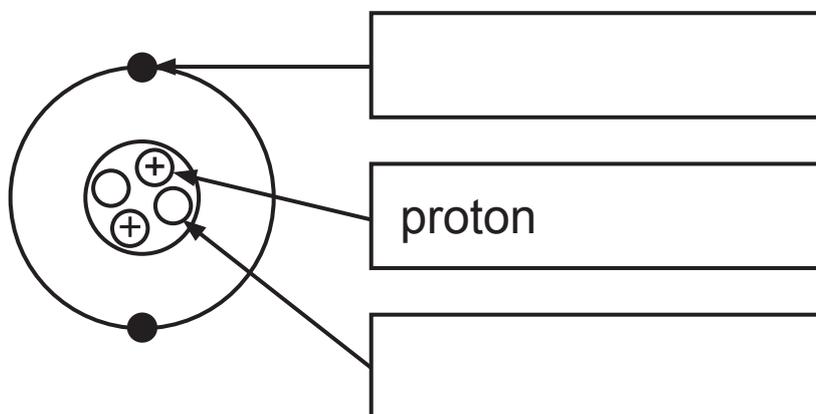
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(ii) Name an element which is in Period 1 of the **modern** Periodic Table. [1 mark]

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3 The diagram below represents an atom.

(a) (i) Complete the two missing labels on the atom.  
[2 marks]



(ii) What is the atomic number for this atom?  
Circle the correct answer. [1 mark]

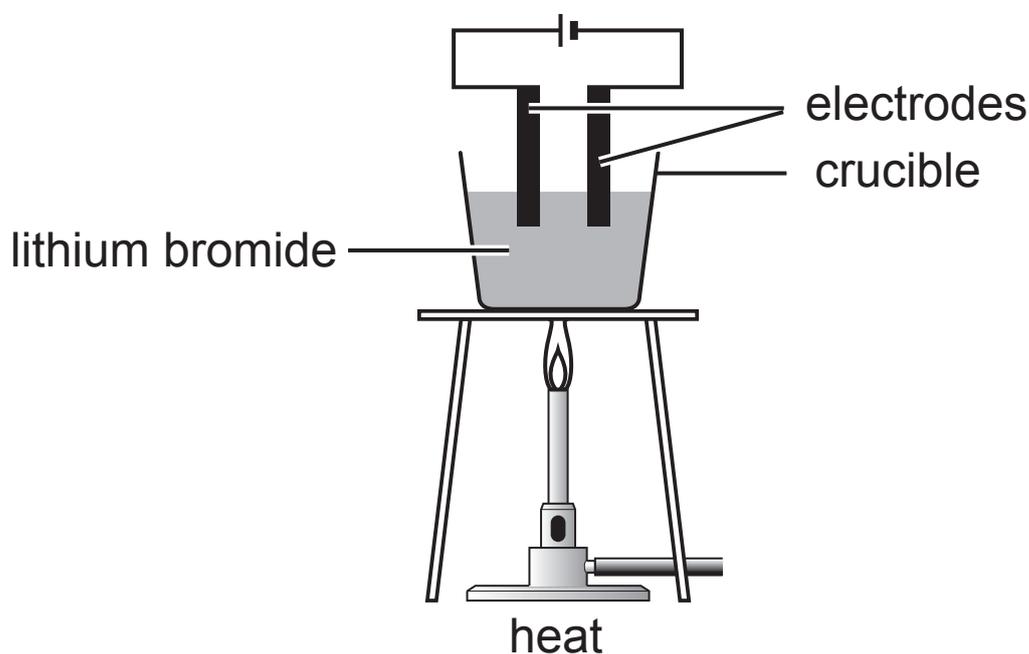
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6

- (b) Lithium bromide is a solid which can be broken down to its elements by electrolysis as shown in the diagram below.



- (i) Why is it necessary to heat the lithium bromide?  
[1 mark]
- 

- (ii) Lithium metal is formed at the negative electrode.  
Name the element formed at the positive electrode.  
[1 mark]
-

4 (a) Five substances are listed below:

sulfuric acid      ethanoic acid      ammonia

water                  sodium hydroxide

(i) How many of the substances in the list above would turn red litmus paper blue? [1 mark]

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(ii) Which substance, from the list, is a weak acid? [1 mark]

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(iii) Which of the units, listed below, is used to describe the concentration of sodium hydroxide solution? Circle the correct answer. [1 mark]

mol / dm

dm / mol

mol / dm<sup>3</sup>

dm<sup>3</sup> / mol

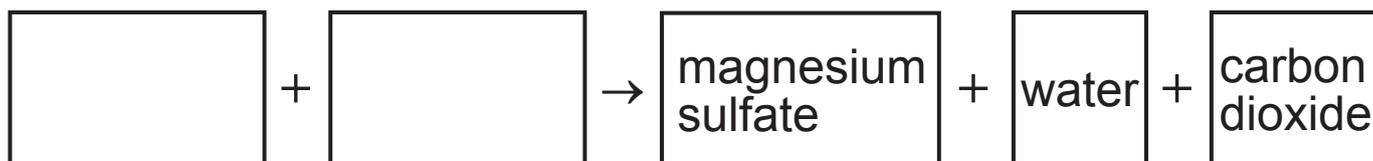
mol<sup>3</sup> / dm<sup>3</sup>

(b) The balanced symbol equation below shows how a salt may be formed.



(i) Complete the equation above by writing the correct state symbol (s, aq, l or g) for  $\text{CO}_2$  inside the brackets. [1 mark]

(ii) Complete the word equation to describe the reaction shown by the symbol equation above. [2 marks]



(iii) Describe the test for carbon dioxide. [2 marks]

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(c) Potassium chloride solution can be produced by the reaction shown below.

potassium hydroxide + hydrochloric acid →  
potassium chloride + water

(i) Write a balanced symbol equation to describe the reaction between potassium hydroxide and hydrochloric acid. [2 marks]

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(ii) What colour would you expect for potassium chloride solution? [1 mark]

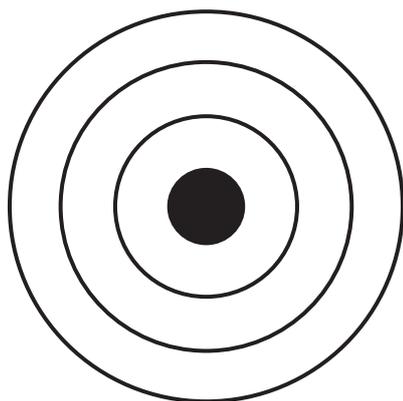
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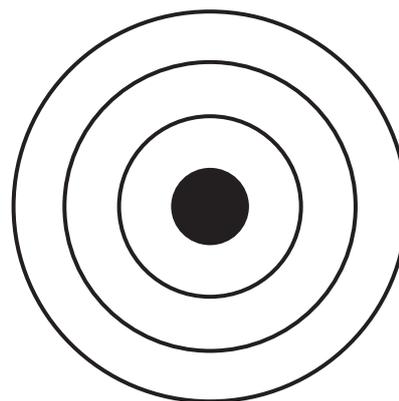
**(Questions continue overleaf)**

- 5 Chlorine gas has the chemical formula  $\text{Cl}_2$ .  
Chlorine reacts with magnesium to form the compound magnesium chloride.

- (a) (i) Complete the diagrams below to show **all** the electrons in a magnesium atom and a chlorine atom.  
[2 marks]



magnesium atom



chlorine atom

- (ii) Describe how the electronic arrangements of both atoms change when they form magnesium and chloride ions. [2 marks]

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- (iii) How are the ions held together in magnesium chloride? [1 mark]

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**(b) (i)** In the space below draw a dot and cross diagram to show the bonding in chlorine  $\text{Cl}_2$ . Only outer electrons are needed. [3 marks]

**(ii)** Name the type of bonding in a chlorine molecule. [1 mark]

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**(iii)** Chlorine is described as a diatomic gas. What does the term diatomic mean? [1 mark]

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- 6 Two bottles were found in a chemical store but the labels had fallen off.  
The teacher needed to find out which bottle contained **potassium** and which one contained **lithium**.

Describe how the teacher could **safely** react both of the metals with water and compare **similarities** and **differences** that would be observed between the two reactions. [6 marks]

**In this question you will be assessed on your written communication skills including the use of specialist scientific terms.**

Safety precautions needed in carrying out the reactions:

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Similarities observed:

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Differences observed:

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7 (a) What is meant by the term solubility? [4 marks]

Solubility is the mass of a solid required to \_\_\_\_\_

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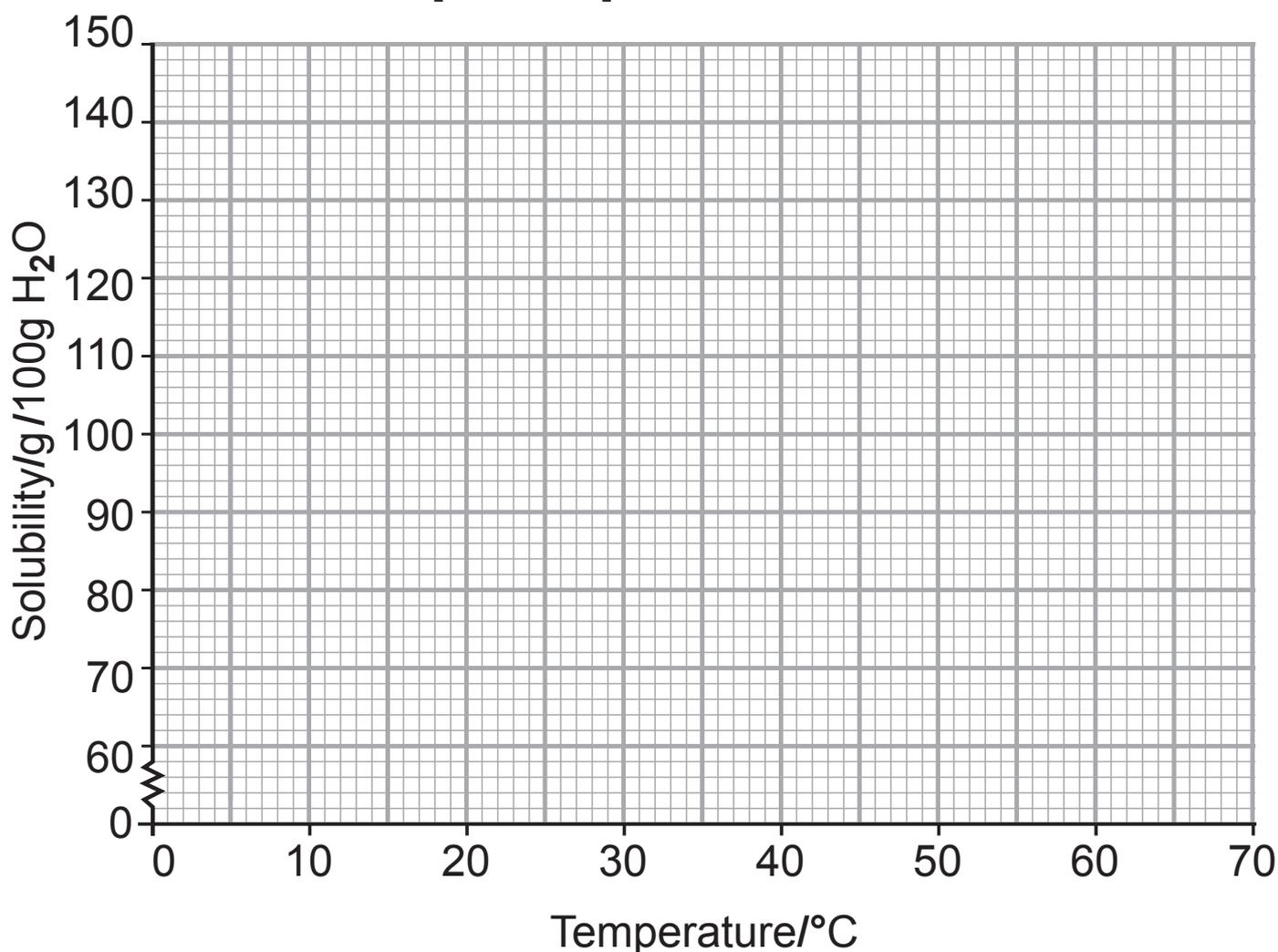


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(b) The table below gives the results of an investigation to find the solubility of sodium nitrate ( $\text{NaNO}_3$ ) at different temperatures.

Temperature/ $^{\circ}\text{C}$	10	20	30	40	50	60	70
Solubility/g/100g $\text{H}_2\text{O}$	80	88	96	105	114	124	135

(i) On the grid below plot a solubility curve for sodium nitrate. [3 marks]



- (ii) Use your solubility curve to find the solubility of sodium nitrate at 25 °C. [1 mark]
- 

- (c) (i) Describe the trend in solubility with temperature for sodium nitrate. [1 mark]
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- (ii) Complete the table below to show how solubility can be expected to change with temperature for the three substances.

Tick (✓) the three correct boxes. [3 marks]

<b>Substance</b>	<b>Solubility increases</b> with temperature increase	<b>Solubility decreases</b> with temperature increase
potassium chloride		
carbon dioxide		
copper(II) sulfate		

8 The table below gives data on some **atoms** and **ions**, which are labelled A, B and C.

(a) Use your knowledge and understanding of atomic structure to complete the gaps in the table. [3 marks]

atom/ion	mass number	number of protons	number of neutrons	number of electrons
A		11	12	11
B	16	8		10
C	7		4	2

(b) Work out which atoms or ions are represented by A and B.

Complete the table below. [4 marks]

atom/ion	chemical symbol/formula	charge
A		
B		

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

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	

<b>Total Marks</b>	
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Examiner Number

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## SYMBOLS OF SELECTED IONS

### Positive ions

Name	Symbol
Ammonium	$\text{NH}_4^+$
Chromium(III)	$\text{Cr}^{3+}$
Copper(II)	$\text{Cu}^{2+}$
Iron(II)	$\text{Fe}^{2+}$
Iron(III)	$\text{Fe}^{3+}$
Lead(II)	$\text{Pb}^{2+}$
Silver	$\text{Ag}^+$
Zinc	$\text{Zn}^{2+}$

### Negative ions

Name	Symbol
Carbonate	$\text{CO}_3^{2-}$
Dichromate	$\text{Cr}_2\text{O}_7^{2-}$
Ethanoate	$\text{CH}_3\text{COO}^-$
Hydrogen carbonate	$\text{HCO}_3^-$
Hydroxide	$\text{OH}^-$
Methanoate	$\text{HCOO}^-$
Nitrate	$\text{NO}_3^-$
Sulfate	$\text{SO}_4^{2-}$
Sulfite	$\text{SO}_3^{2-}$

## DATA LEAFLET

For the use of candidates taking  
 Science: Chemistry,  
 Science: Double Award  
 or Science: Single Award

**Copies must be free from notes or additions of any kind. No other type of data booklet or information sheet is authorised for use in the examinations.**

### SOLUBILITY IN COLD WATER OF COMMON SALTS, HYDROXIDES AND OXIDES

<b>Soluble</b>
All sodium, potassium and ammonium salts
All nitrates
Most chlorides, bromides and iodides EXCEPT silver and lead chlorides, bromides and iodides
Most sulfates EXCEPT lead and barium sulfates Calcium sulfate is slightly soluble
<b>Insoluble</b>
Most carbonates EXCEPT sodium, potassium and ammonium carbonates
Most hydroxides EXCEPT sodium, potassium and ammonium hydroxides
Most oxides EXCEPT sodium, potassium and calcium oxides which react with water

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# gcse . Science

## chemistry double award single award

