



General Certificate of Secondary Education  
2015–2016

Centre Number

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Candidate Number

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# Double Award Science: Chemistry

Unit C1  
Foundation Tier

[GSD21]

MV18

**THURSDAY 19 MAY 2016, 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 blue or black ink only.

Answer **all ten** 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 9.

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

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- 1 Many chemical compounds are white but some are not.  
Draw a line to match each chemical compound to its colour.  
[4 marks]

**chemical compound**

**colour**

hydrated copper sulfate

black

aluminium oxide

white

copper oxide

red

copper carbonate

green

blue

2 Sulfuric acid is a strong acid.

(a) What pH would you expect for sulfuric acid?

Circle the correct value. [1 mark]

1

5

7

9

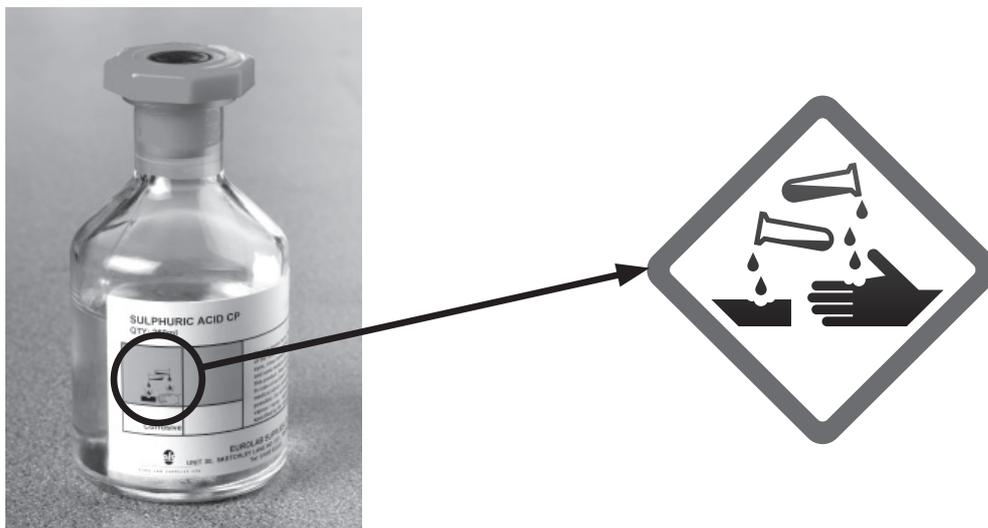
10

(b) Four drops of universal indicator are placed into a sample of sulfuric acid.

What colour will be seen? [1 mark]

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- (c) Bottles of sulfuric acid are labelled with the hazard symbol as shown in the photograph below.



- (i) Name the hazard symbol shown. [1 mark]

\_\_\_\_\_

- (ii) Give two reasons why hazard symbols are shown on bottles of chemicals. [2 marks]

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

\_\_\_\_\_

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

\_\_\_\_\_

- (d) A molecule of sulfuric acid contains 4 oxygen atoms, 2 hydrogen atoms and 1 sulfur atom. What is the formula for sulfuric acid? Circle the correct formula. [1 mark]



3 Four sets of apparatus, **A**, **B**, **C** and **D** are given below.

<b>A</b> beaker, stirring rod, thermometer	<b>B</b> filter paper, filter funnel, conical flask
<b>C</b> tripod stand, heatproof mat, wire gauze, evaporating dish	<b>D</b> separating funnel, retort stand, clamp

(a) Which set of apparatus, **A**, **B**, or **D**, would be used to separate sand from water? [1 mark]

---

(b) A student selects apparatus set **C** to evaporate water from a mixture of sand and water.

Name one other piece of apparatus which would be needed to make the evaporation happen quickly.

[1 mark]

---

(c) Water is a compound containing the elements hydrogen and oxygen.

(i) What is meant by the term **element**? [1 mark]

---

---

(ii) Why can water be described as a **compound**?

[2 marks]

---

---

(iii) Write the formula for water. [1 mark]

---

(d) Complete the sentence below which describes the test for carbon dioxide. [3 marks]

When carbon dioxide gas is bubbled through

\_\_\_\_\_, the solution

changes from \_\_\_\_\_ to a

\_\_\_\_\_ colour.

4 This question is about electrolysis.

Circle the correct answer to each part.

(a) In electrolysis the electrodes are sometimes made out of: [1 mark]

**graphite**

**polythene**

**sulfur**

(b) Electrodes need to be inert. This means that they are: [1 mark]

**light**

**colourless**

**unreactive**

(c) In electrolysis the particles which move and carry the charge are called: [1 mark]

**ions**

**electrons**

**atoms**

(d) When molten lithium chloride undergoes electrolysis the products are lithium and: [1 mark]

**chloride**

**chlorine**

**water**

(e) When aluminium is extracted by electrolysis the metal forms at: [1 mark]

**the anode**

**the cathode**

**both electrodes**

5 This question is about atomic structure.

(a) Complete the table below to show the relative charge and mass of the different particles found in an atom and whether or not each particle is found in the nucleus.

[6 marks]

Particle	Relative Charge	Relative Mass	Found in nucleus Yes or No?
electron	-1		
neutron			Yes
proton		1	

(b) Complete the table below about the atomic structure of three elements, by filling in the missing information. You may find your Data Leaflet helpful. [4 marks]

Element	Number of protons	Number of neutrons	Number of electrons	Electronic configuration
carbon	6	6		2,4
	11	12	11	
aluminium		14	13	2,8,3

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6 Many chemists contributed to the modern Periodic Table including Newlands and Mendeleev.

(a) Complete the table below to show the contribution of each chemist.

Place a tick (✓) in each correct box. [4 marks]

Contribution	Newlands <b>only</b>	Mendeleev <b>only</b>	<b>Both</b> Newlands and Mendeleev	<b>Neither</b> Newlands nor Mendeleev
stated the Law of Octaves				
arranged elements in order of relative atomic mass				
included noble gases				
left gaps for undiscovered elements				

(b) A student is given a Periodic Table.

Column B



hydrogen 1 <b>H</b> 1.0079
-------------------------------------

Column A



lithium 3 <b>Li</b> 6.941	beryllium 4 <b>Be</b> 9.0122	boron 5 <b>B</b> 10.811	carbon 6 <b>C</b> 12.011	nitrogen 7 <b>N</b> 14.007	oxygen 8 <b>O</b> 15.999	fluorine 9 <b>F</b> 18.998	helium 2 <b>He</b> 4.0026
sodium 11 <b>Na</b> 22.990	magnesium 12 <b>Mg</b> 24.305	aluminum 13 <b>Al</b> 26.982	silicon 14 <b>Si</b> 28.086	phosphorus 15 <b>P</b> 30.974	sulfur 16 <b>S</b> 32.065	chlorine 17 <b>Cl</b> 35.453	neon 10 <b>Ne</b> 20.180
potassium 19 <b>K</b> 39.098	calcium 20 <b>Ca</b> 40.078	gallium 31 <b>Ga</b> 69.723	germanium 32 <b>Ge</b> 72.64	arsenic 33 <b>As</b> 74.922	selenium 34 <b>Se</b> 78.96	bromine 35 <b>Br</b> 79.904	argon 18 <b>Ar</b> 39.948
rubidium 37 <b>Rb</b> 85.468	strontium 38 <b>Sr</b> 87.62	indium 49 <b>In</b> 114.82	tin 50 <b>Sn</b> 118.71	antimony 51 <b>Sb</b> 121.76	tellurium 52 <b>Te</b> 127.60	iodine 53 <b>I</b> 126.90	krypton 36 <b>Kr</b> 83.798
cesium 55 <b>Cs</b> 132.91	barium 56 <b>Ba</b> 137.33	thallium 81 <b>Tl</b> 204.38	lead 82 <b>Pb</b> 207.2	bismuth 83 <b>Bi</b> 208.98	polonium 84 <b>Po</b> 209	astatine 85 <b>At</b> 210	xenon 54 <b>Xe</b> 131.29
francium 87 <b>Fr</b> 223	radium 88 <b>Ra</b> 226	mercury 80 <b>Hg</b> 200.59	copper 29 <b>Cu</b> 63.546	silver 47 <b>Ag</b> 107.87	gold 79 <b>Au</b> 196.97	roentgenium 111 <b>Rg</b> 272	radon 86 <b>Rn</b> 222
		zinc 30 <b>Zn</b> 65.38	nickel 28 <b>Ni</b> 58.693	palladium 46 <b>Pd</b> 106.42	platinum 78 <b>Pt</b> 195.08	darmstadtium 110 <b>Ds</b> 271	
		cobalt 27 <b>Co</b> 58.933	rhodium 45 <b>Rh</b> 102.91	iridium 77 <b>Ir</b> 192.22	meitnerium 109 <b>Mt</b> 268		
		iron 26 <b>Fe</b> 55.845	ruthenium 44 <b>Ru</b> 101.07	osmium 76 <b>Os</b> 190.23	hassium 108 <b>Hs</b> 277		
		manganese 25 <b>Mn</b> 54.938	technetium 43 <b>Tc</b> [98]	rhenium 75 <b>Re</b> 186.21	bohrium 107 <b>Bh</b> 264		
		chromium 24 <b>Cr</b> 51.996	molybdenum 42 <b>Mo</b> 95.96	tungsten 74 <b>W</b> 183.84	seaborgium 106 <b>Sg</b> 266		
		vanadium 23 <b>V</b> 50.942	niobium 41 <b>Nb</b> 92.906	tantalum 73 <b>Ta</b> 180.95	dubnium 105 <b>Db</b> 262		
		titanium 22 <b>Ti</b> 47.867	zirconium 40 <b>Zr</b> 91.224	hafnium 72 <b>Hf</b> 178.49	rutherfordium 104 <b>Rf</b> 261		
		scandium 21 <b>Sc</b> 44.956	yttrium 39 <b>Y</b> 88.906	lanthanum 57 <b>La</b> 138.91	actinium 89 <b>Ac</b> 227		

For each of the five questions below three answers are given. Only one is correct. Circle the correct answer.

(i) The elements in **Column A** are: [1 mark]

**alkali metals**

**Group 2**

**Period 2**

(ii) The physical state at room temperature of all the elements in **Column B** is: [1 mark]

**solid**

**liquid**

**gas**

(iii) The elements N, O, F, Cl, Br and I are all: [1 mark]

**gases**

**diatomic**

**inert**

(iv) The elements in **Column B** all have: [1 mark]

**only**

**3 electrons**

**3 electrons**

**3 electrons**

**in outer shell**

**in first shell**

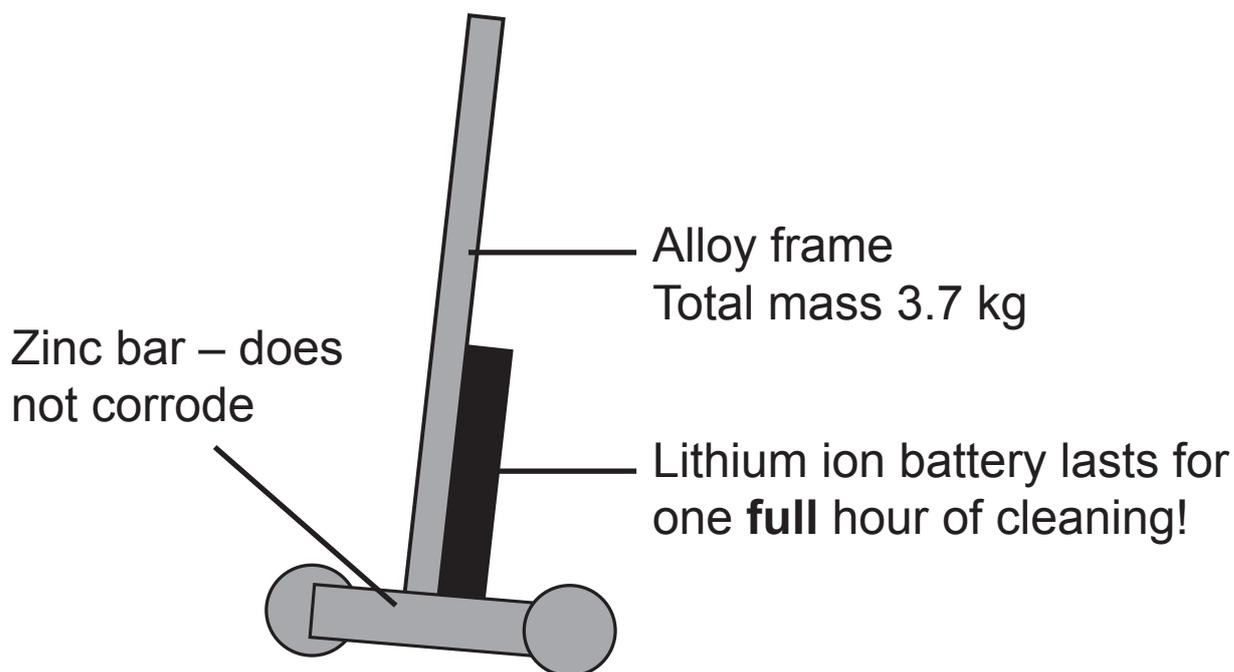
(v) The solid black line separates: [1 mark]

**metals and  
gases**

**solids and  
liquids**

**metals and  
non-metals**

- 7 A labelled diagram, used in an advertisement for a cordless vacuum cleaner, is shown below.



- (a) Give the symbol for a lithium ion. [1 mark]

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- (b) What is an alloy? [2 marks]

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- (c) Give one property needed for the alloy used in the frame of the vacuum cleaner. [1 mark]

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**(Questions continue overleaf)**

8 Water has a melting point of  $0^{\circ}\text{C}$  and is an excellent solvent.

(a) What is meant by the chemical terms:

(i) solvent? [1 mark]

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(ii) melting point? [2 marks]

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(b) Give two physical properties of water apart from the fact that it has a melting point of  $0^{\circ}\text{C}$  and is an excellent solvent. [2 marks]

1. 

---
2. 

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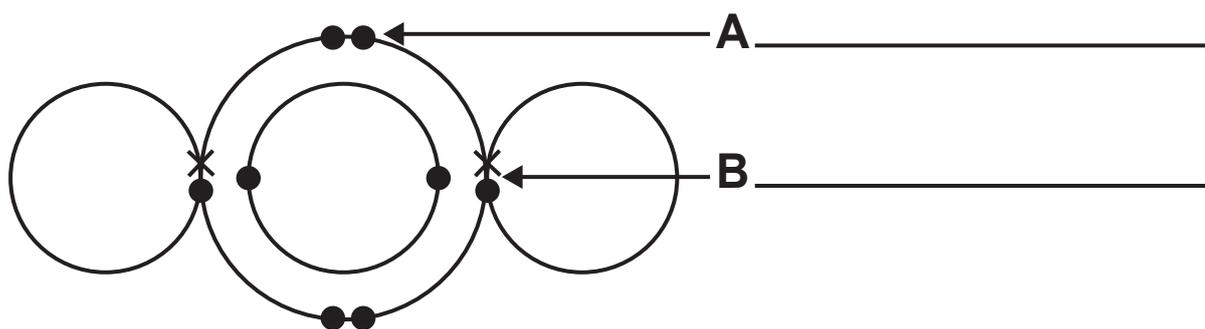
Compound A is soluble in water. It has a solubility of  $2.9\text{g}/100\text{g}$  of water at  $20^{\circ}\text{C}$ .

(c) Why must the temperature be stated when giving the solubility of a substance in water? [1 mark]

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(d) A dot and cross diagram of the bonding in water is shown below.



(i) Fill in the correct labels for the pairs of electrons labelled **A** and **B**. [2 marks]

(ii) Name the type of bonding in water. [1 mark]

---

(iii) Choose two compounds from the list below which have the same type of bonding as water.

Tick (✓) the two correct boxes. [2 marks]

potassium iodide

carbon dioxide

copper sulfate

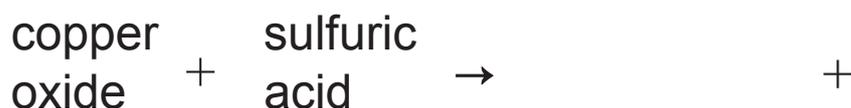
calcium carbonate

hydrogen sulfide



**10** Metal oxides and metal carbonates will react with acids to form salts.

**(a)** Complete the word equation for the reaction between copper oxide and sulfuric acid. [2 marks]



**(b)** Balance the symbol equation below. [1 mark]



**(c)** Write a balanced symbol equation for the reaction between copper carbonate and hydrochloric acid. [3 marks]

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

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**SOURCES**

Q2(c) Image - a bottle of sulfuric acid, © Martyn F. Chillmaid / Science Photo Library

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

<b>Total Marks</b>	
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Examiner Number

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