

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A**

A322/01

Unit 2: Modules C4 C5 C6 (Foundation Tier)

**Monday 28 June 2010
Morning**

Duration: 40 minutes

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

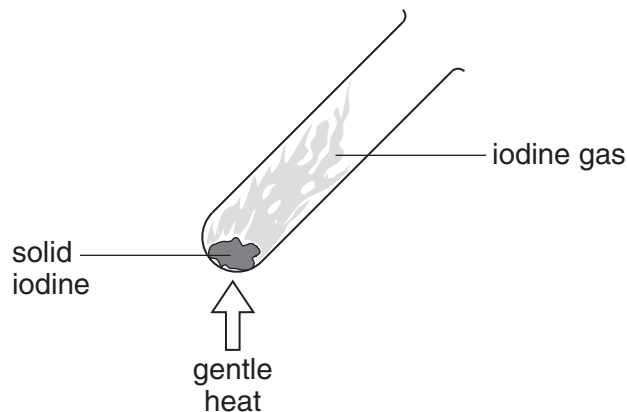
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.
- The Periodic Table is printed on the back page.

Answer **all** the questions.

- 1 Iodine is a halogen in Group 7 of the Periodic Table.

Marty warms a small crystal of iodine in a test tube.



- (a) What colour change will Marty see when solid iodine changes into iodine gas?

Put a tick (✓) in the box next to the correct answer.

- | | |
|---------------------|--------------------------|
| dark grey to orange | <input type="checkbox"/> |
| orange to yellow | <input type="checkbox"/> |
| dark grey to purple | <input type="checkbox"/> |
| green to brown | <input type="checkbox"/> |

[1]

- (b) The equation shows what happens when iodine changes from a solid to a gas.

Complete the symbol equation by filling in the missing formula and state symbols.

iodine solid → iodine gas



[2]

(c) Marty finds some information about other halogens in Group 7.

name of halogen	melting point in °C	boiling point in °C	reactivity	formula of potassium salt
fluorine	-220	-188	most reactive halogen
chlorine	-101	-35	less reactive than fluorine more reactive than bromine	KCl
bromine	-7	59	less reactive than chlorine more reactive than iodine	KBr

(i) Fill in the missing formula for potassium fluoride. [1]

(ii) Use information from the table to describe the trends in properties of the elements down Group 7.

.....

.....

.....

.....

..... [3]

(d) Astatine is another halogen. It is below iodine in Group 7.

Complete the sentences about astatine by putting a (ring) around the correct word in each sentence.

Astatine is a **metal** / **non-metal**.

The atomic mass of astatine is **bigger** / **smaller** than the atomic mass of iodine.

Astatine is **more** / **less** reactive than iodine. [2]

[Total: 9]

2 Lithium is in Group 1.

Alex watches a video about lithium.

The video shows a piece of lithium being cut with a knife.

(a) What does Alex see when the freshly cut surface of lithium comes in contact with air?

Put a tick (✓) in the box next to the correct answer.

It starts to fizz.

It expands.

It catches fire.

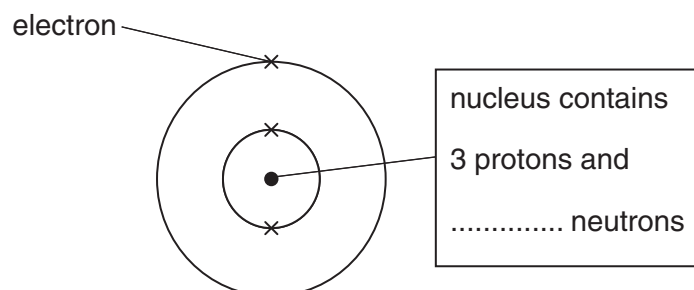
It goes from shiny to dull.

[1]

(b) The Periodic Table shows this information for lithium.

7
Li
lithium
3

The diagram shows an atom of lithium.

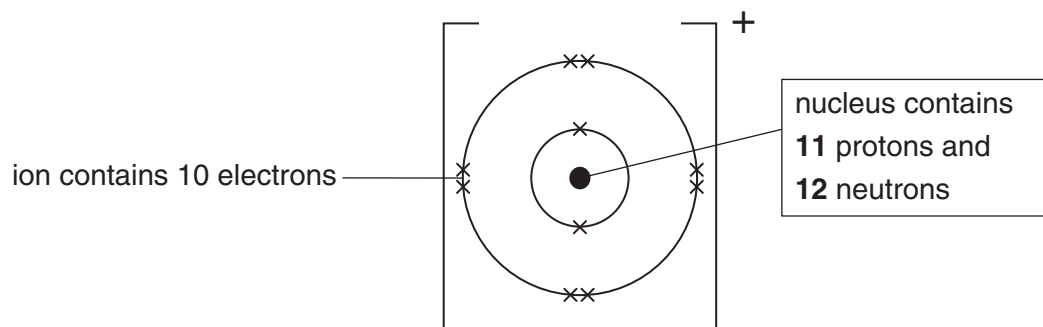


[1]

Complete the label on the diagram to show the number of neutrons in the nucleus of a lithium atom.

(c) Sodium is another element in Group 1.

The diagram shows a sodium **ion**.



Which one of the following statements about a sodium **ion** is correct?

Put a tick (✓) in the box next to the correct answer.

A sodium ion has more electrons than protons.

A sodium ion has a lower mass than a lithium atom.

A sodium ion has more protons than neutrons.

A sodium atom forms a sodium ion by losing one electron.

[1]

(d) Alex looks at lines in the spectra of lithium, sodium and potassium.

lithium



sodium



potassium



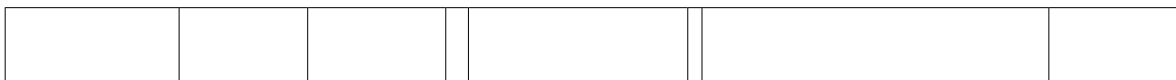
(i) How can you tell by looking at the spectra that these are three different elements?

..... [1]

(ii) 'Healthy Salt' is a type of table salt.

'Healthy Salt' contains compounds of more than one Group 1 element.

This is the line spectrum for 'Healthy Salt'.



Which two Group 1 elements does 'Healthy Salt' contain?

answer and [1]

[Total: 5]

3 Bauxite is an ore of aluminium.

Bauxite contains the ionic compound, aluminium oxide.

Aluminium is extracted from aluminium oxide by electrolysis.

(a) Solid aluminium oxide is heated until it melts.

What happens to the ions in aluminium oxide when it melts?

Put ticks (✓) in the boxes next to the **two** correct answers.

The ions become free to move.

The ions spread very far apart.

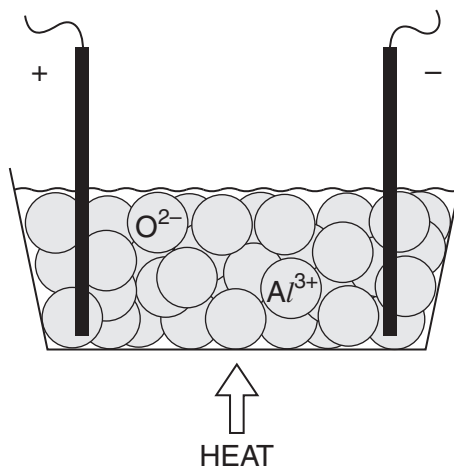
New bonds form between the ions.

The arrangement of ions becomes more random.

The ions move into a regular arrangement.

[2]

(b) The diagram shows how the electrolysis of aluminium oxide can be set up.



(i) The aluminium ions, Al^{3+} , move when the electrical current is switched on.

Draw an arrow on the diagram to show which way they move.

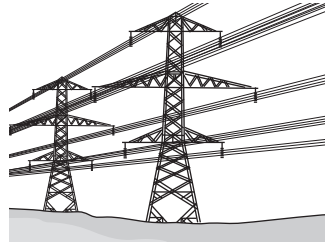
[1]

(ii) Aluminium is one product of the electrolysis.

What is the name of the **other** product?

..... [1]

(c) Aluminium is used to make overhead power cables.



Why is aluminium a good material to use to make overhead power cables?

Put ticks (✓) in the boxes next to the **two** best reasons.

Aluminium is a good conductor of heat.

Aluminium is less dense than other metals.

Aluminium has a lower melting point than some other metals.

Aluminium is a good electrical conductor.

Aluminium is softer than most other metals.

[2]

(d) What type of bonding holds aluminium atoms together?

Put a (ring) around the correct answer.

atomic

covalent

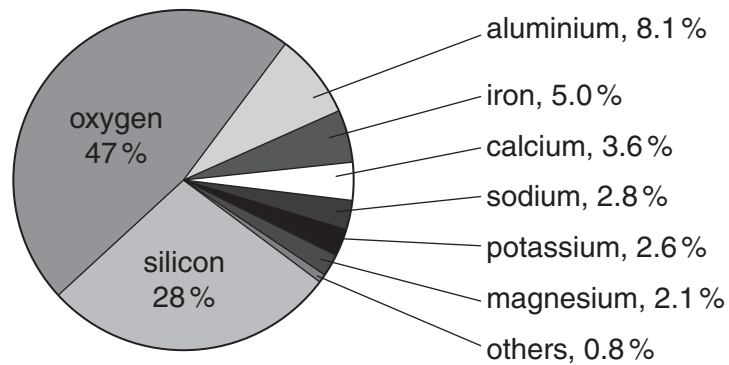
ionic

metallic

[1]

[Total: 7]

- 4 The pie chart shows the percentages of common elements found in the Earth's crust.

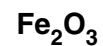


- (a) Three elements make up most of the Earth's crust.

The list below shows compounds found in the Earth's crust.

Which two compounds, when taken together, contain **all three** of these most common elements?

Put a **ring** around the **two** correct answers.



[2]

- (b) Sodium chloride, NaCl , is found in some parts of the Earth's crust.

Sodium chloride is left behind when sea water evaporates.

Sodium appears in the pie chart of common elements in the Earth's crust but chlorine does not.

Which of the following statements explain why?

Put ticks (✓) in the boxes next to the **two** best answers.

There is much less chlorine than sodium in the Earth's crust.

Chlorine is a gas.

Sodium occurs in other compounds, not only sodium chloride.

The pie chart only shows metals.

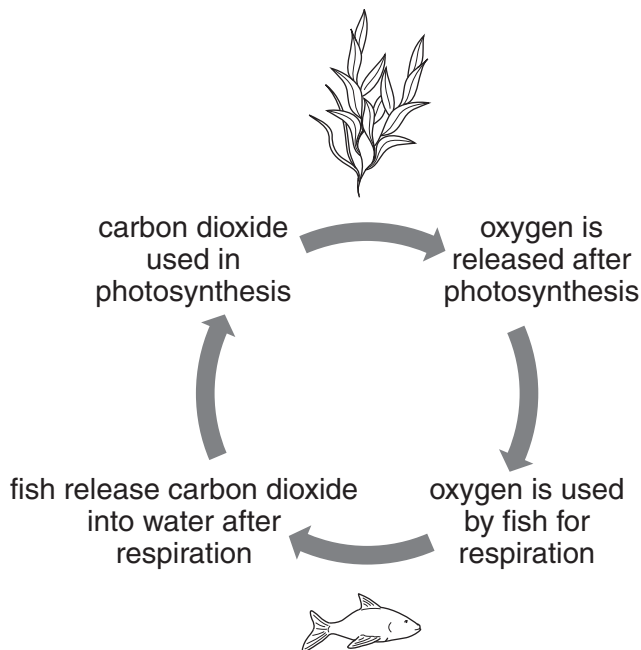
There is only a very small amount of chlorine in the sea.

[2]

[Total: 4]

5 A fish pond contains plants and fish.

The diagram shows how carbon dioxide and oxygen are involved in a cycle of changes in the fish pond.



(a) What effect do the **fish** have on the amount of carbon dioxide and oxygen in the fish pond?

Put a tick (✓) in the correct box in each row.

	increases	stays the same	decreases
amount of carbon dioxide in the water			
amount of oxygen in the water			

[1]

(b) The diagram below shows the structure of a carbon dioxide molecule and an oxygen molecule.



Explain why carbon dioxide is a **compound** but oxygen is an **element**.

.....

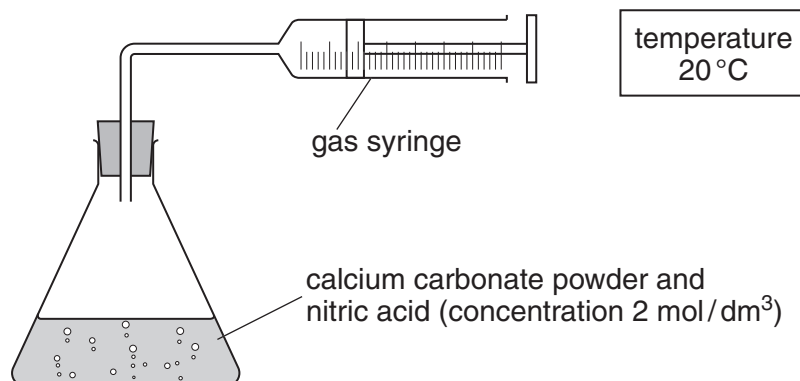
..... [2]

[Total: 3]

- (c) Joe carries out an experiment to find out how quickly nitric acid reacts with calcium carbonate.

He follows the rate of reaction by measuring the amount of gas given off every 30 s.

This is how he sets his experiment up.



- (i) The reaction happens too quickly for Joe to measure the volume of gas accurately.

Suggest **three** changes that Joe could make to his experiment so that the reaction happens more slowly.

1

2

3 [3]

- (ii) Joe decides to use another method of following the rate of reaction.

He puts the flask on a balance and measures the change in mass during the reaction.

The mass decreases.

Explain why.

..... [1]

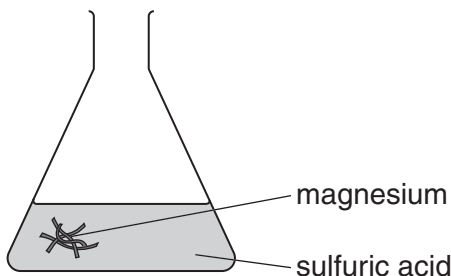
[Total: 8]

7 Jack works for a company that makes chemicals to make soil more fertile.

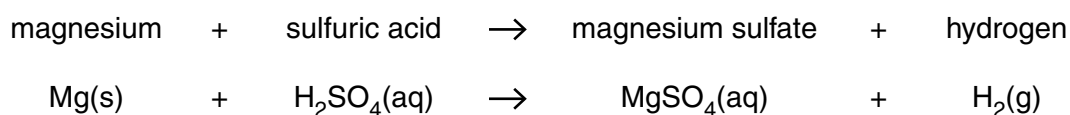
The company sells magnesium sulfate to treat soil that does not have enough magnesium.

Jack makes a small amount of magnesium sulfate to test.

He makes the magnesium sulfate by reacting magnesium metal with dilute sulfuric acid.



These are the word and symbol equations for the reaction.



(a) What will Jack **see** during the reaction?

.....

.....

..... [2]

(b) Jack keeps adding magnesium until the reaction finishes.

The sentences below show some steps he might carry out to make magnesium sulfate crystals.

They are in the wrong order.

- A** pat dry with filter paper
- B** leave to crystallise
- C** filter off unreacted magnesium
- D** evaporate some liquid by heating

Write the letters in the boxes to show the correct order of steps Jack needs to carry out.

The first one has been done for you.

correct order

C			
----------	--	--	--

[1]

(c) Jack works out the theoretical yield of magnesium sulfate for this reaction.

He measures the actual yield he has made.

The box shows his results.

theoretical yield:	2.5g
actual yield:	2.0g

What is Jack's **percentage yield**?

Put a (ring) around the correct answer.

0.5%

5%

20%

25%

80%

[1]

(d) Jack wants to make a **larger** amount of magnesium sulfate.

What **two** changes does he need to make to his experiment to make more magnesium sulfate?

Put ticks (✓) in the boxes next to the **two** correct answers.

use more acid

heat the reaction mixture to a higher temperature

use smaller pieces of magnesium

use a catalyst

use more magnesium

leave the reaction for a longer time

[2]

[Total: 6]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2	3	4	5	6	7	0										
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10									
23 Na sodium 11	24 Mg magnesium 12	27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18										
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	127 I iodine 53	131 Xe xenon 54	
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[210] At astatine 85	[222] Rn radon 86	
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

1 H hydrogen 1

relative atomic mass atomic symbol name atomic (proton) number

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.