

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

A322/01

Unit 2 Modules C4 C5 C6
(Foundation Tier)

**Friday 23 January 2009
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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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, however additional paper may be used if necessary.

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**.
- The Periodic Table is printed on the back page.
- This document consists of **16** pages. Any blank pages are indicated.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	8	
2	6	
3	5	
4	6	
5	2	
6	10	
7	5	
TOTAL	42	

Answer **all** the questions.

- 1 Eve looks at a website about sodium. She watches a video of sodium reacting with water. The water contains universal indicator solution.

Sodium

Symbol

Appearance

Reaction with water

- (a) What will Eve see happen when the sodium is added to the water?

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

The piece of sodium sinks.

The universal indicator solution turns red.

The piece of sodium gets bigger.

The piece of sodium fizzes.

The piece of sodium moves around quickly.

The level of the water falls.

[2]

- (b) Why is it a good idea to watch a video of the reaction of sodium with water instead of doing it yourself?

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

The chemicals are very hazardous.

Sodium does not react with water very easily.

Sodium is too rare to use.

Sodium is too soft.

[1]

- (c) Eve clicks on the button to find out the symbol for sodium.

Put a ring around the correct symbol for sodium.

S

So

Na

NaCl

[1]

- (d) Eve clicks on the button to find out the appearance of sodium.

Which statements about the appearance of sodium are correct?

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

When sodium is cut it is very shiny.

Sodium looks like white crystals.

Sodium goes dull quickly in the air.

Sodium is a liquid at room temperature.

Sodium gives off a yellow vapour.

[2]

- (e) Eve looks at other elements on the website.

Join the boxes to connect each **element** with its correct **statement**.

potassium

is in the same group but is less reactive than sodium

lithium

has the symbol K

calcium

reacts with sodium to make salt

chlorine

is a metal and is in a different group to sodium

[2]

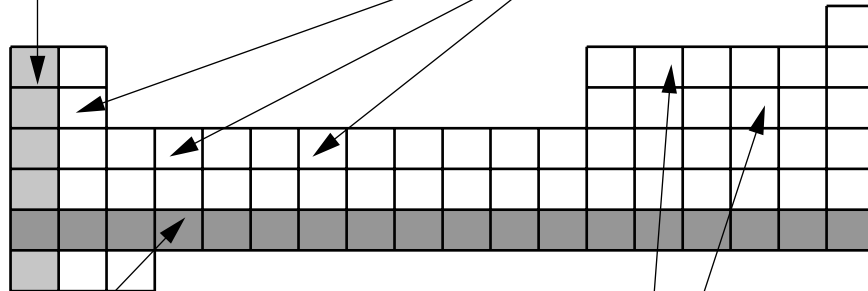
[Total: 8]

- 2 The diagram shows an outline of the Periodic Table.
 (a) Complete the labels by filling in the missing words.
 Choose words from this list.

liquid group period metal non-metal series

Each vertical column
is called a.....

Every element in this part of the table
is a



Each horizontal row is
called a

Every element in this part of the table
is a

[3]

- (b) Fluorine is an element in the Periodic Table.

Here is some information about fluorine atoms.

proton number	9
mass number	19
electron arrangement	2.7

Complete the sentences by filling in the gaps.

Choose words from this list.

seven nine nineteen two
electrons halogens neutrons

Fluorine atoms contain protons.

The outer shell contains electrons.

The nucleus of a fluorine atom also contains ten

[3]

[Total: 6]

3 The diagrams show the structures of some of the molecules in air.

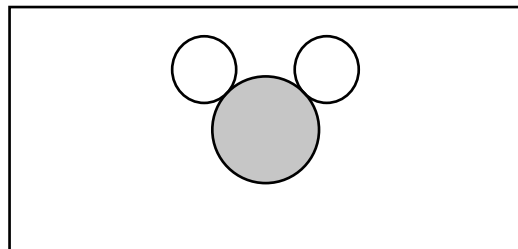
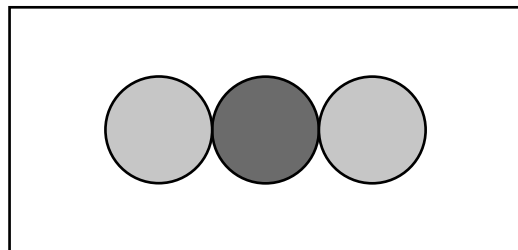
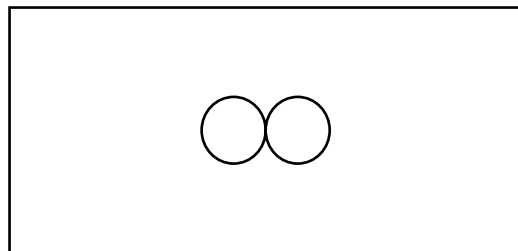
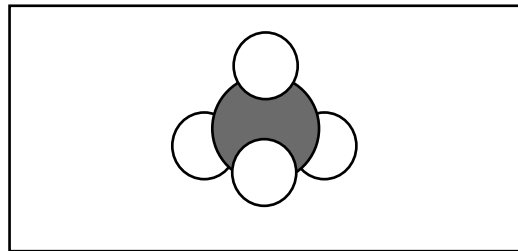
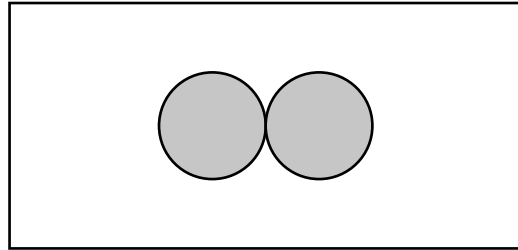
(a) Draw straight lines to join each **gas** to the correct **structure**.

methane
 CH_4

carbon dioxide
 CO_2

oxygen
 O_2

water
 H_2O



[3]

(b) Which of the statements about gases in the air are **true** and which are **false**?

Put ticks (✓) in the correct boxes.

statement	true	false
Gases are good conductors of electricity.		
Gases in the air are made of small molecules.		
There are very weak forces of attraction between gas molecules.		

[2]

[Total: 5]

4 Joe is working for a mining company.

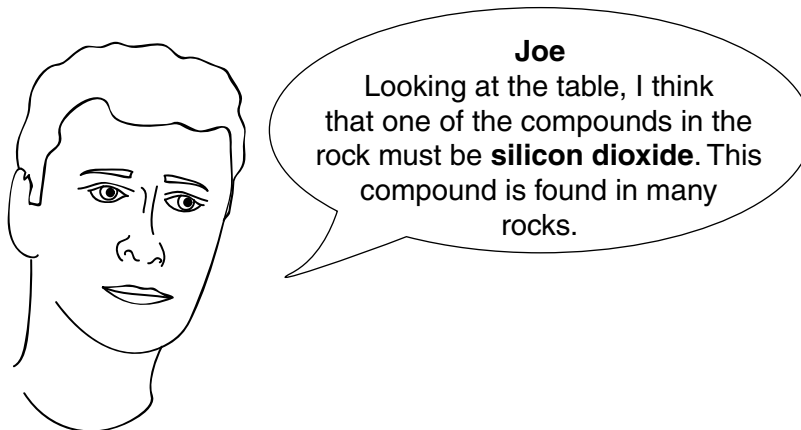
He carries out some tests on a sample of rock.
The table shows the elements he finds in the rock.

element	percentage (%)
silicon	35
oxygen	45
calcium	5
carbon	5
copper	0.5
other elements	

(a) What percentage of the rock is 'other elements'?

.....% [1]

(b) Joe thinks that the rock contains silicon dioxide.



(i) Why does Joe think that the rock contains silicon dioxide?

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

The rocks only contain silicon and oxygen.

Most silicon and oxygen in the Earth's crust is in the form of silicon dioxide.

The table shows that there are large amounts of silicon and oxygen in the rock.

[1]

- (ii) Joe says that silicon dioxide is very hard.
What other properties does silicon dioxide have?

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

high melting point

does not dissolve in water

turns into a liquid easily

grey and shiny like a metal

[2]

- (c) The rock contains 0.5% copper.
Joe thinks that extracting copper from this rock might harm the environment.
Which statement explains why?

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

copper is found in other rocks

copper is a Group 1 element

there would be a lot of waste rock left over

the rock contains calcium

[1]

- (d) The rock contains copper oxide.
Copper metal can be extracted from copper oxide by heating with carbon.
What type of chemical reaction happens to the copper oxide during the extraction?

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

combustion

neutralisation

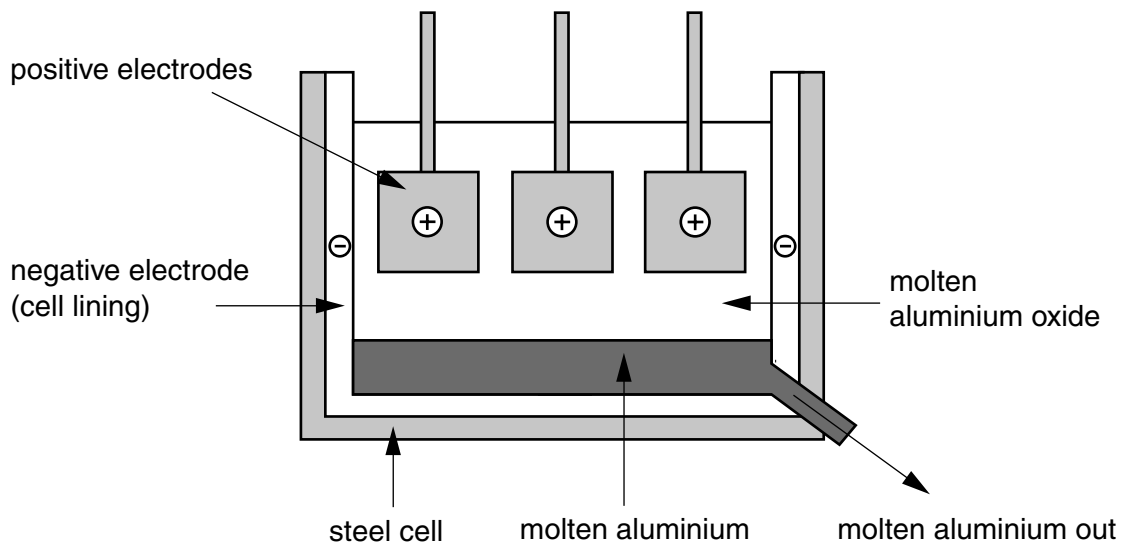
oxidation

reduction

[1]

[Total: 6]

5 This diagram shows the electrolysis of aluminium oxide.



These sentences describe what happens during the electrolysis. Complete the sentences.

Choose words from this list.

electricity heat hydrogen negative oxygen positive

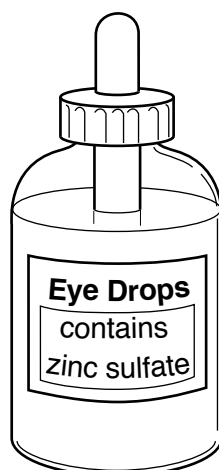
The aluminium oxide must be melted so that it conducts

Aluminium ions (Al^{3+}) are positively charged. They turn into aluminium metal at the electrode.

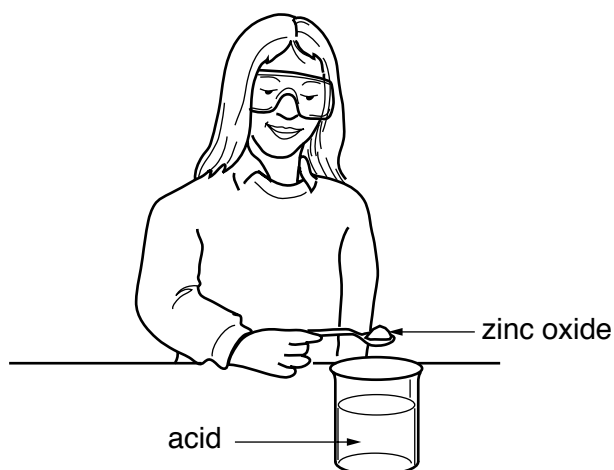
At the other electrode, a gas called forms. [2]

[Total: 2]

6 Zinc sulfate is a salt used in eye drops.



(a) Liz makes some zinc sulfate by adding large lumps of zinc oxide to an acid.



Complete the equation by filling in the **name** and **formula** of the acid Liz uses.



[2]

- (b) Liz tests the pH of the acid before she adds the zinc oxide. Which of the following would **not** show the pH of the acid?

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

Universal Indicator paper	<input type="checkbox"/>
pH probe	<input type="checkbox"/>
Universal Indicator solution	<input type="checkbox"/>
litmus paper	<input type="checkbox"/>

[1]

- (c) Liz thinks that the reaction is too slow. She decides to use powdered zinc oxide and to change the temperature. The sentences below explain what happens.

Put a **ring** around the correct word in each sentence.

Using powdered zinc oxide makes the surface area **smaller / larger**.

This makes the reaction happen **faster / slower**.

The reaction will be faster if the temperature is **lower / higher**.

Another way of making the reaction faster is to use acid that is **more / less** concentrated.

[2]

- (d) (i) Liz works out the relative formula mass of zinc sulfate. She uses these relative atomic masses.

$$\text{Zn} = 65 \quad \text{S} = 32 \quad \text{O} = 16$$

Complete the table to show the relative formula mass of zinc oxide, ZnO.

	zinc oxide ZnO	zinc sulfate ZnSO₄
relative formula mass		161

[1]

- (ii) Liz calculates what her yield should be by working out how much zinc sulfate should be made from the amount of acid she started with.
This is her theoretical yield.
She wants to calculate her **percentage** yield.

These are the figures she uses.

Mass of zinc sulfate I made in my experiment	=	15 g
My theoretical yield	=	60 g

What is the percentage yield for Liz's experiment?

Put a **ring** around the correct answer.

10% 25% 50% 400% 900%

[1]

- (e) Liz thinks her yield is too low.
What might have caused a low yield?

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

Liz spilt some of her product out of the beaker.

Liz heated up her mixture.

Liz left the chemicals too long to react.

Liz did not check the temperature of the acid.

Liz did not measure out enough acid.

[2]

- (f) Liz knows that the zinc sulfate that she has made cannot be used for making eye drops.

Why is her zinc sulfate not suitable?

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

She should have carried out a titration.

The product has not been purified.

She did not check the pH of the zinc oxide.

She has not controlled the rate of reaction.

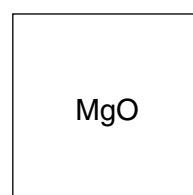
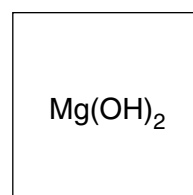
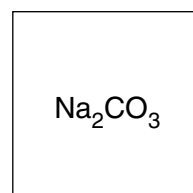
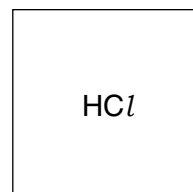
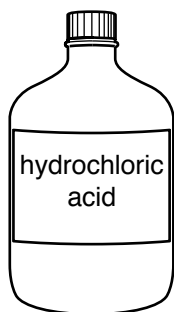
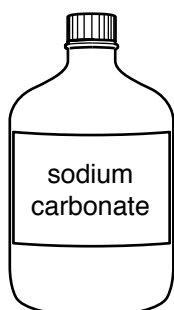
[1]

[Total: 10]

7 Rose works as a laboratory technician.

She is writing labels for some chemicals.

- (a) Which formula should Rose write on each label?
Draw a straight line to connect each **chemical** to its correct **formula**.



[3]

(b) The label on the bottle of hydrochloric acid has this hazard warning.



What should Rose do when she uses the acid?

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

wear goggles

keep it away from naked flames

be careful because it is poisonous

handle carefully because it might explode

make sure she does not get splashes on her skin

[2]

[Total: 5]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

The Periodic Table of the Elements

	1	2	3	4	5	6	7	0										
	7 Li lithium 3	9 Be beryllium 4						19 F fluorine 9	4 He helium 2									
	23 Na sodium 11	24 Mg magnesium 12						16 O oxygen 8	20 Ne neon 10									
	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	128 Te tellurium 52	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	[209] Po polonium 84	[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	1
	hydrogen	

relative atomic mass
atomic symbol
name
atomic (proton) number

Key

* 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.