

Candidate Forename						Candidate Surname				
Centre Number						Candidate Number				

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

A322/01

**TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A**

Unit 2: Modules C4 C5 C6 (Foundation Tier)

WEDNESDAY 27 JANUARY 2010: Afternoon

DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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.**
- **A copy of the Periodic Table is provided.**

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Answer ALL the questions.

1 (a) The diagram on page 5 opposite shows the Periodic Table.

Complete the labels on the diagram.

Choose words from this list.

ELEMENT

GROUP

METAL

PERIOD

SERIES

[1]

(b) Complete the information about calcium.

Use the Periodic Table provided to help you.

NAME calcium

GROUP

SYMBOL

ATOMIC (PROTON) NUMBER

[1]

Each vertical column is called a

Each horizontal row is called a

(c) The diagram shows some of the elements in the Periodic Table.

2								
3	Mg							
4	K	Ca			Ga			
5			transition elements					

(i) Which element has properties that are MOST SIMILAR to calcium?

Put a ring around the correct answer.

CARBON

GALLIUM

MAGNESIUM

POTASSIUM

[1]

(ii) Which element is a non-metal?

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

CARBON

GALLIUM

MAGNESIUM

POTASSIUM

[1]

[Total: 4]

2 Liz makes some notes about the properties of some elements in Group 1, as shown on page 9 opposite.

(a) Explain how Liz could use her notes to predict the properties of potassium.

[2]

(b) Describe TWO patterns in the properties of Group 1 elements shown by the information.

[2]

Group 1

lithium
Li

sodium
Na

potassium
K

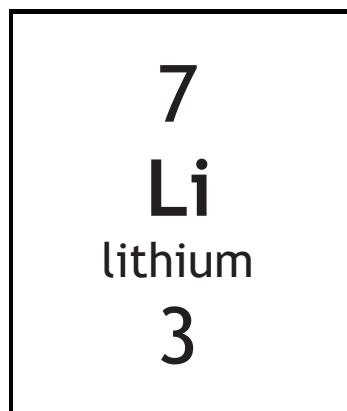
rubidium
Rb

Lithium
Atomic number: 3
Melting point : 181°C
Density: 0.53 g/cm^3

Sodium
Atomic number: 11
Melting point : 98°C
Density: 0.97 g/cm^3

Rubidium
Atomic number: 37
Melting point : 39°C
Density: 1.53 g/cm^3

(c) This is the information for lithium on the Periodic Table.



Complete the sentences about the structure of a lithium atom.

Choose words from this list.

ELEMENTS

IONS

MOLECULES

NEUTRONS

PROTONS

The shells around a lithium nucleus contain three

The central nucleus of the atom is made up of three

and four

[2]

[Total: 6]

3 Some types of car batteries contain metals such as lead.

(a) Lead can be extracted by heating lead oxide with carbon.

The equation shows what happens when lead oxide is heated with carbon.



(i) Which statement about the reaction is true?

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

The reaction involves only oxidation.

The reaction involves only reduction.

The reaction involves both oxidation and reduction.

The reaction does not involve either oxidation or reduction.

[1]

(ii) Which other metals can be extracted by heating their oxides with carbon?

Put a **ring** around each of the **TWO** correct answers.

ALUMINIUM

COPPER

POTASSIUM

SODIUM

ZINC

[2]

Some car batteries also contain small amounts of other metals including lithium and calcium.

(b) Lithium cannot be extracted by heating lithium oxide with carbon.

Which of the statements gives the BEST reason for this?

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

Lithium metal reacts with water.

Lithium oxide is ionic.

Lithium is very reactive.

Lithium oxide has a very high melting point.

[1]

(c) Calcium can be extracted using electrolysis.

Complete the passage about the extraction of calcium.

Choose words from this list.

ELECTRODES

EVAPORATES

IONS

MELTS

MOLECULES

NEGATIVE

NEUTRAL

POSITIVE

Calcium oxide is heated until it

This allows the _____ to move.

During electrolysis calcium metal collects at the

_____ electrode.

Oxygen gas is made at the

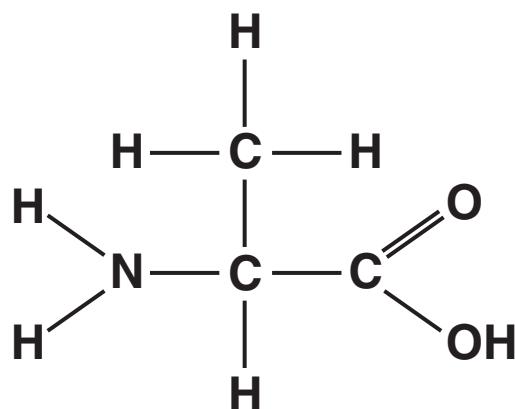
_____ electrode.

[3]

[Total: 7]

4 Proteins in the human body are formed from amino acids.

The diagram shows the structure of an amino acid.



The table below shows some information about the elements in the amino acid.

Complete the table by filling in the three empty boxes.

NAME OF ELEMENT	NUMBER OF ATOMS IN MOLECULE	PERCENTAGE (%) BY MASS
carbon	3	40
oxygen	2	36
_____	1	16
hydrogen	_____	_____

[3]

[Total: 3]

5 Space probes have gathered data about the atmosphere on Mars.

The table compares the gases in the atmosphere on Mars and on Earth.

NAME OF GAS	PERCENTAGE (%) IN ATMOSPHERE ON MARS	PERCENTAGE (%) IN ATMOSPHERE ON EARTH
carbon dioxide	95.3	less than 1.0
nitrogen	2.7	78.0
argon	1.6	0.9
oxygen	0.2	20.7

(a) Put ticks (✓) in the correct boxes to show whether each gas is an element or a compound.

<u>NAME OF GAS</u>	<u>ELEMENT</u>	<u>COMPOUND</u>
carbon dioxide	<input type="checkbox"/>	<input type="checkbox"/>
nitrogen	<input type="checkbox"/>	<input type="checkbox"/>
argon	<input type="checkbox"/>	<input type="checkbox"/>
oxygen	<input type="checkbox"/>	<input type="checkbox"/>

[2]

(b) Look at the table.

Describe two ways that the atmospheres of Mars and Earth are SIMILAR and two ways that they are DIFFERENT.

[4]

(c) The percentages in the table for gases on Mars do not add up to 100%.

Suggest a reason why.

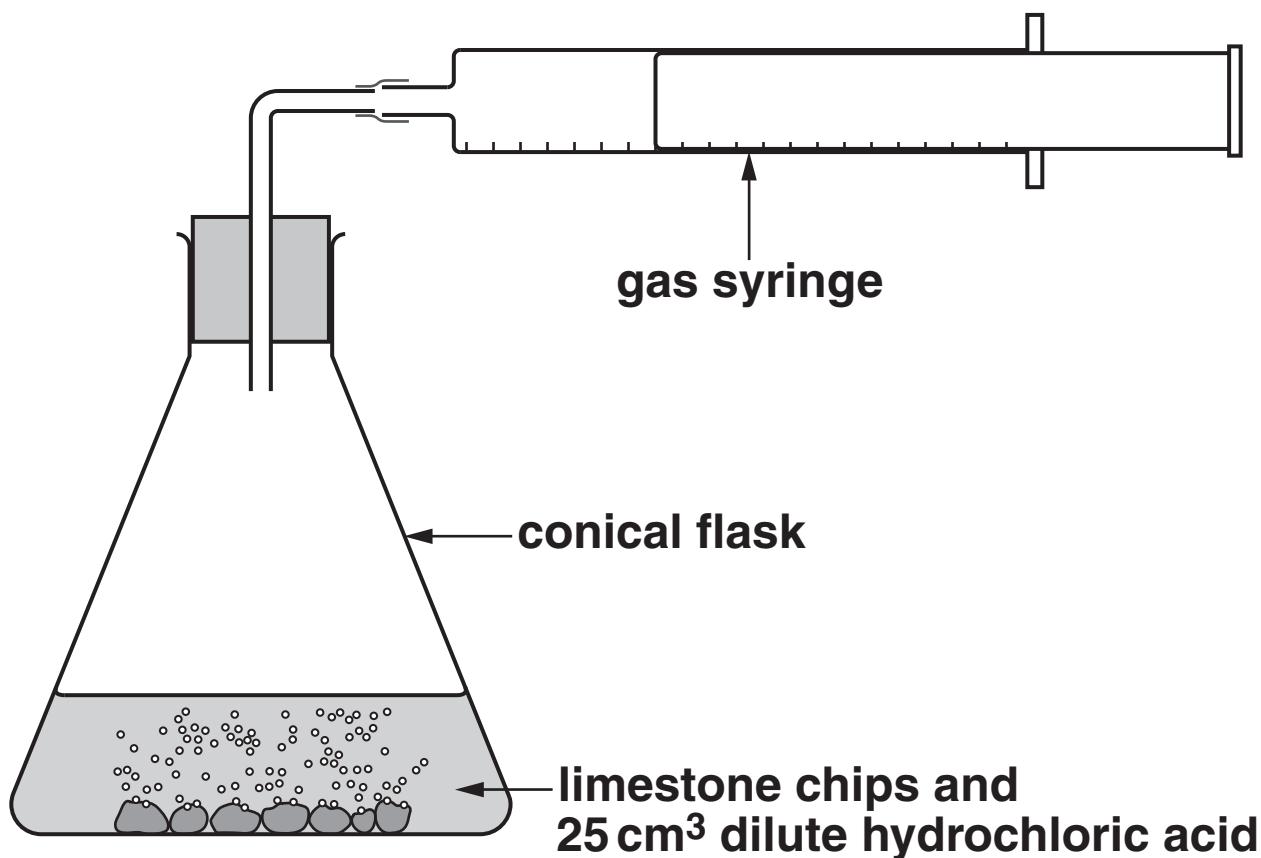
[1]

[Total: 7]

6 Eve carries out an experiment.

She adds 25 cm³ of dilute hydrochloric acid to limestone chips (calcium carbonate).

Once every 30 seconds she records the total volume of gas that has been given off.



The table shows her results.

TIME IN s	TOTAL VOLUME OF GAS IN cm ³
0	0
30	80
60	120
90	140
120	150
150	150

(a) (i) How long does it take for the reaction to finish?

answer _____ **s [1]**

(ii) When the reaction ends, lumps of limestone are left in the flask.

Why does the reaction stop?

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

The temperature cools during the reaction.

All the gas has been used up.

All the acid has been used up.

The limestone chips become unreactive.

[1]

(b) During the reaction, solid calcium carbonate reacts with dilute hydrochloric acid and the gas syringe fills with a gas.

At the end of the experiment the flask contains a solution of calcium chloride in water.

(i) What is the name of the gas made during the reaction?

Put a ring around the correct answer.

CARBON DIOXIDE

CARBON MONOXIDE

HYDROGEN

NITROGEN

OXYGEN

[1]

(ii) Draw a line from each CHEMICAL to the correct STATE symbol.

CHEMICAL

STATE SYMBOL

water

(s)

calcium carbonate

(g)

gas made in the reaction

(aq)

calcium chloride solution

(l)

[2]

(iii) Draw a line from each CHEMICAL to the correct FORMULA.

CHEMICAL

FORMULA

water

CaCO3

calcium carbonate

H2O

hydrochloric acid

CaCl2

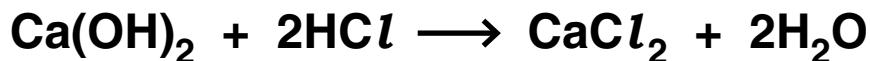
calcium chloride

HCl

[2]

[Total: 7]

7 Joe carries out an experiment to make a salt. He makes calcium chloride by reacting calcium hydroxide with dilute hydrochloric acid.



(a) Joe works out what mass of calcium chloride he can make.

The box below shows some of Joe's working.

Complete Joe's working by filling in the gaps.

RELATIVE ATOMIC MASS	
Ca	_____
O	_____
H	_____
Cl	35.5

relative formula mass of $\text{Ca(OH)}_2 = 74$

relative formula mass of $\text{CaCl}_2 =$

[2]

(b) The reaction between calcium hydroxide and hydrochloric acid is a neutralisation reaction.

Which ion is always present in a solution of an alkali?

Put a **ring** around the correct answer in this list.

Ca^{2+} Cl^- H^+ O^{2-} OH^-

[1]

(c) Write the general equation for a neutralisation reaction by filling in the boxes.

Choose from the formulae in this list.

Ca^{2+} Cl^- H^+ HCl

O^{2-} OH^- H_2O CaCl_2



[1]

[Total: 4]

8 Sam works for a medicine company.
The company makes zinc sulfate for use in medicines.
She makes some zinc sulfate crystals from zinc sulfate solution.
She measures the mass after each step.

The flow chart on page 25 opposite shows what she does.

(a) What happens to the mass of zinc sulfate solution during STEP 1?
Explain why.

[2]

(b) Suggest why the crystals were put in a warm oven.

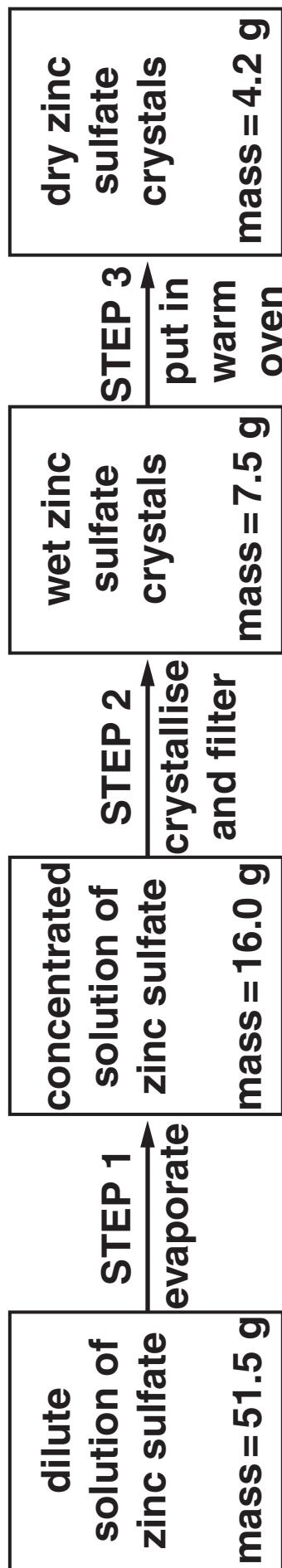
[1]

(c) What is the actual yield from the experiment?

answer _____ g [1]

[Total: 4]

END OF QUESTION PAPER



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The Periodic Table of the Elements

1	2	Key													
7 Li lithium 3	9 Be beryllium 4	<table border="1"> <tr> <td>relative atomic mass</td></tr> <tr> <td>atomic symbol</td></tr> <tr> <td>name</td></tr> <tr> <td>atomic (proton) number</td></tr> </table>										relative atomic mass	atomic symbol	name	atomic (proton) number
relative atomic mass															
atomic symbol															
name															
atomic (proton) number															
23 Na sodium 11	24 Mg magnesium 12	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				
39 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			
133 Cs cesium 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			
[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	[268] Hs hassium 108	[277] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated				

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