OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
CHEMISTRY A

A322/01

Unit 2: Modules C4 C5 C6 (Foundation Tier)

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)

Wednesday 27 January 2010
Afternoon

Duration: 40 minutes

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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.

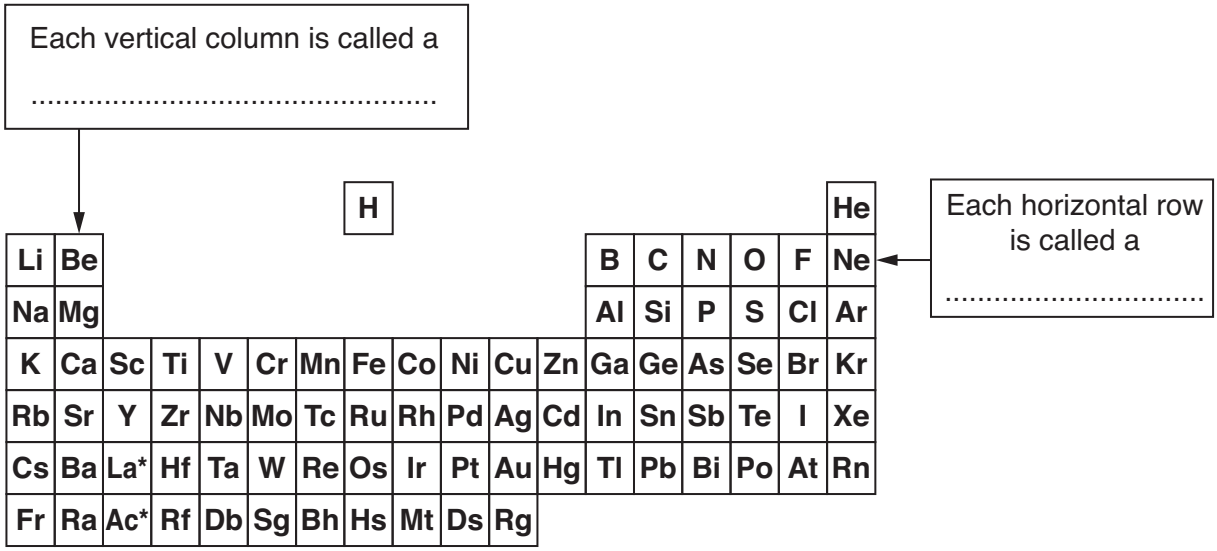
Answer **all** the questions.

1 **(a)** The diagram shows the Periodic Table.

Complete the labels on the diagram.

Choose words from this list.

element **group** **metal** **period** **series**



[1]

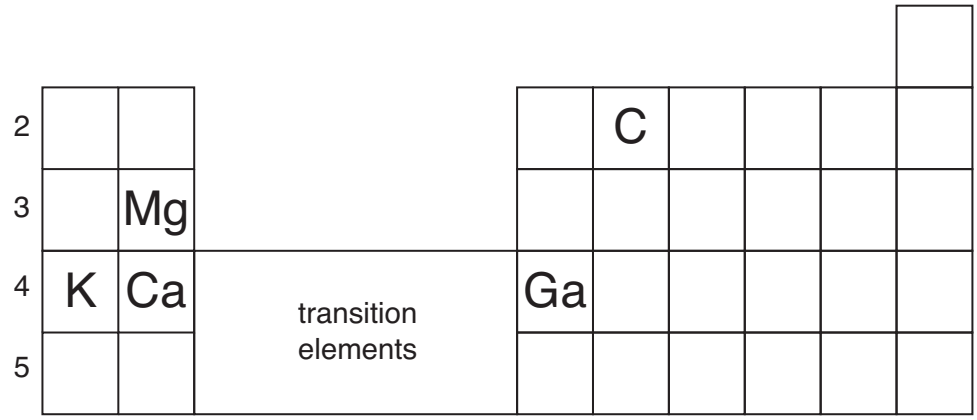
(b) Complete the information about calcium.

Use the Periodic Table on the back page to help you.

name	calcium
group	
symbol	Ca
atomic (proton) number	

[1]

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



(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.

Group 1

lithium Li
sodium Na
potassium K
rubidium Rb

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

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

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

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

.....

.....

..... **[2]**

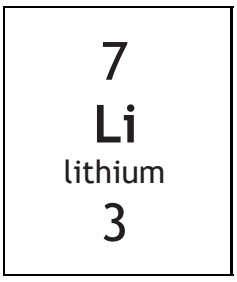
(b) Describe **two** patterns in the properties of Group 1 elements shown by the information.

.....

.....

..... **[2]**

(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.

electrons **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.

$$PbO + C \longrightarrow Pb + CO$$

(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.

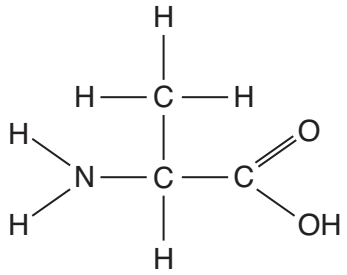
Oxygen gas is made at the ..... electrode.

[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.

name of gas	element	compound
carbon dioxide	☐	☐
nitrogen	☐	☐
argon	☐	☐
oxygen	☐	☐

[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%.

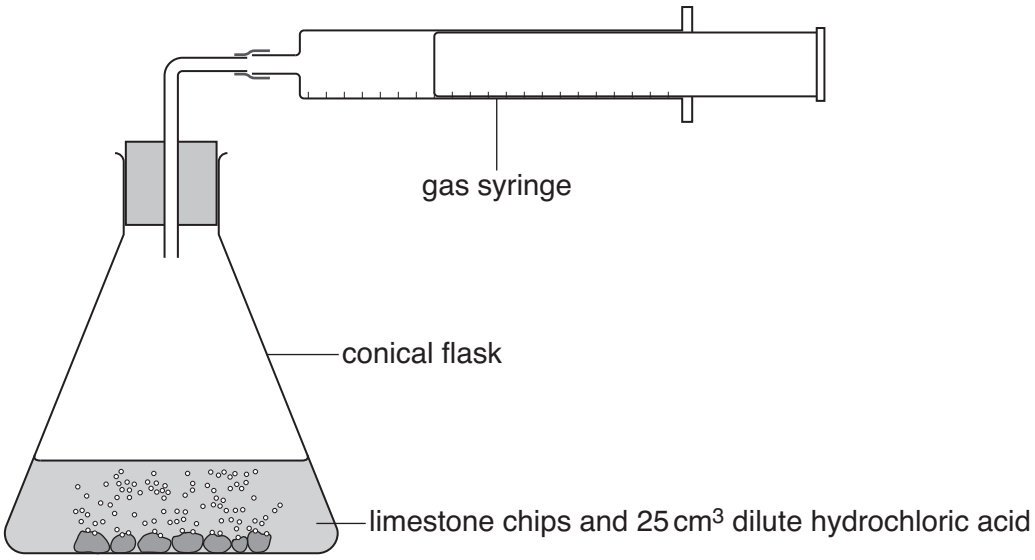
Suggest a reason why.

.....

..... **[1]**

[Total: 7]

6 Eve carries out an experiment.
She adds 25 cm^3 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	$CaCO_3$
calcium carbonate	H_2O
hydrochloric acid	$CaCl_2$
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.

$$Ca(OH)_2 + 2HCl \longrightarrow CaCl_2 + 2H_2O$$

(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 $Ca(OH)_2$ = 74

relative formula mass of $CaCl_2$ = ...

[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** **$CaCl_2$**

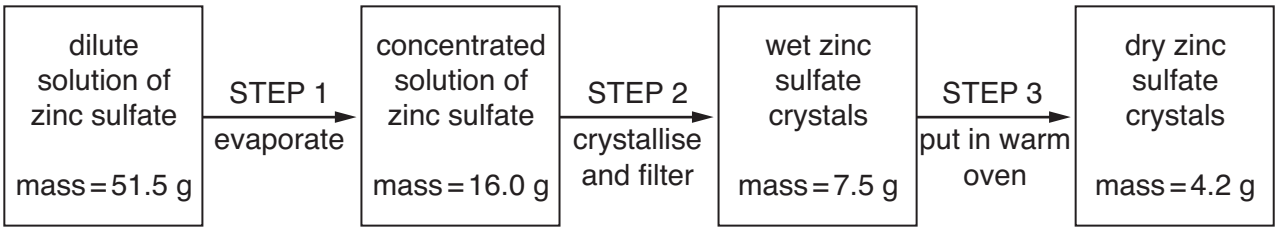
[ ] + [ ] → [ ]

[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 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											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	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	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						

Key

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.