Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

GCSE

A322/01

TWENTY FIRST CENTURY SCIENCE CHEMISTRY A

Unit 2: Modules C4 C5 C6 (Foundation Tier)

WEDNESDAY 1 FEBRUARY 2012: 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

DC (AC/SW) 12MEP01122 55825/1

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.**
- **Use black ink. HB pencil may be used for graphs and diagrams only.**
- **Answer ALL the questions.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**
- **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

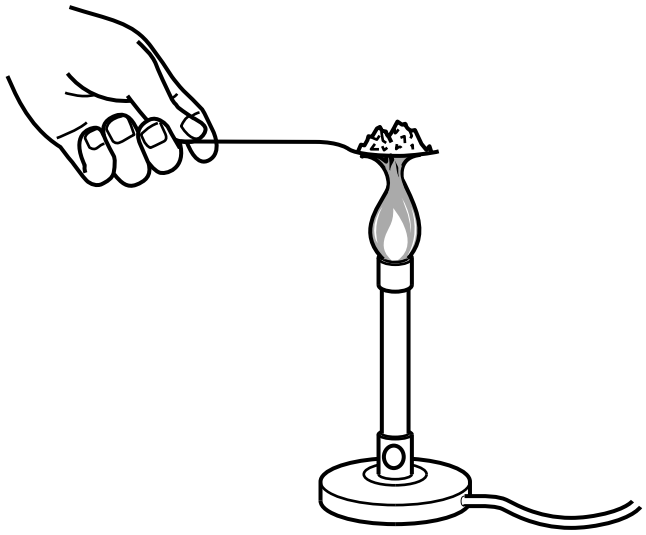
- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **The total number of marks for this paper is 42.**
- **The Periodic Table is provided.**

Answer ALL the questions.

1 Ben does some flame tests.

(a) He heats a SODIUM compound in the hot flame of a Bunsen burner.

He then carries out the same test using a POTASSIUM compound.



What will Ben SEE when he does the two tests?

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

The flames flash at different rates. ☐

The flames are different colours. ☐

The sodium compound burns much faster than the potassium compound. ☐

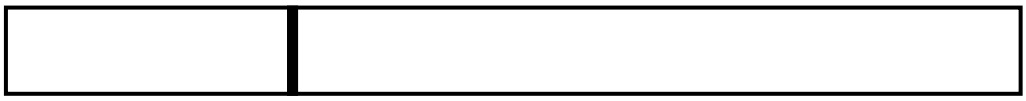
The heights of the flames are different in each test. ☐

[1]

(b) Ben looks at the flames from each compound using a spectroscope.

The diagrams show what he sees.

spectrum of sodium compound



spectrum of potassium compound

(i) How is the spectrum of the potassium compound DIFFERENT from the spectrum of the sodium compound?

_____

_____

_____ **[2]**

(ii) Ben does a flame test on some sea salt.

This is the spectrum from his test.

sea salt spectrum

How does this spectrum show that the sea salt contains both sodium and potassium compounds?

_____

_____

_____ **[2]**

(c) Ben thinks that different elements have different spectra because their atoms have different numbers of electrons.

The table shows the number and arrangement of electrons in some atoms.

ELEMENT	NUMBER OF ELECTRONS	ELECTRON ARRANGEMENT
_____	3	2.1
sodium (Na)	11	_____
potassium (K)	_____	2.8.8.1

Complete the table by filling in the gaps. [2]

[Total: 7]

2 Lithium is a Group 1 metal. Some batteries contain lithium.

Amy wants to find out what happens if air or water react with lithium.

(a) Amy cuts a fresh piece of lithium using a scalpel.

The fresh surface of the lithium reacts with oxygen in the air.

(i) What does Amy see when the surface reacts with oxygen?

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

The surface bubbles and fizzes. ☐

A flame appears. ☐

The surface changes from shiny to dull. ☐

The piece of lithium gets smaller. ☐

[1]

(ii) When lithium reacts with oxygen, LITHIUM OXIDE is made.

Write a word equation for this reaction.

_____ **[2]**

(b) Amy drops a freshly cut piece of lithium into a beaker of water.

(i) What does Amy see when the lithium reacts with the water?

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

The lithium moves around. ☐

The lithium sinks to the bottom of the water. ☐

The level of the water rises. ☐

The piece of lithium gets bigger. ☐

The lithium fizzes and bubbles form. ☐

[2]

(ii) A gas is made in the reaction.

What is the name of the gas?

Put a (ring) around the correct answer.

CARBON DIOXIDE

CHLORINE

HYDROGEN

OXYGEN

NITROGEN

[1]

(c) The next two elements in Group 1 are sodium and potassium.

Amy finds out some information about lithium, sodium and potassium.

ELEMENT	SYMBOL	MELTING POINT IN °C
lithium	Li	180
sodium	Na	
potassium	K	64

(i) Which of the following is most likely to be the melting point for sodium?

Put a (ring) around the correct answer.

40 °C

63 °C

97 °C

181 °C

200 °C

[1]

(ii) Which of these elements reacts most SLOWLY with water?

_____ **[1]**

[Total: 8]

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3 Fay is making a display about the Earth for a museum.

It will show different parts of the Earth, what the parts contain, and their scientific names.

(a) Draw straight lines to connect each PART OF THE EARTH to WHAT THE PART CONTAINS and its SCIENTIFIC NAME.

WHAT THE PART CONTAINS	PART OF THE EARTH	SCIENTIFIC NAME
compounds including carbohydrates, fats and proteins	the oceans	hydrosphere
mainly water with some dissolved ionic compounds	outer hard layer of the Earth	biosphere
a mixture of minerals	living things	lithosphere

[4]

(b) Fay wants to include some information about the gases in the air.

She finds some information on a website but she is not sure if it is true.

Which of the following statements about gases in the air are TRUE and which are FALSE?

Put a tick (✓) in one box in each row to show whether each statement is true or false.

	TRUE	FALSE
There are only very weak attractions between molecules in the air.		
Oxygen and nitrogen are non-metals.		
The air is our main source of minerals and metals.		
Carbon dioxide is an example of a gas in the air that is a compound.		

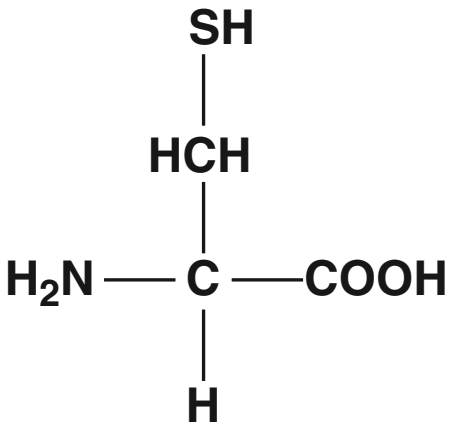
[2]

[Total: 6]

4 Sugars and amino acids are important molecules in living things.

The diagrams show the structure of a SUGAR and an AMINO ACID.

SUGAR



AMINO ACID

Describe the SIMILARITIES and DIFFERENCES between the two molecules.

_____

_____

_____

_____

_____

_____ **[4]**

[Total: 4]

5 Tom tests rocks for a company that extracts metals.

He finds out the percentages of some elements in a sample of rock.

The table shows his results.

ELEMENT	PERCENTAGE IN THE ROCK
silicon	36
oxygen	40
carbon	10
sulfur	4
aluminium	5
copper	0.02

He talks about the results.

TOM
I think the rock is mainly silicon dioxide. The aluminium and copper might be worth extracting but doing this will be very expensive.

(a) How do the data support Tom's idea that the rock is mainly silicon dioxide?

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

Lots of common rocks contain silicon dioxide. ☐

Silicon forms strong bonds with oxygen. ☐

Silicon and oxygen have the highest percentages in the table. ☐

The percentage of silicon is lower than that of oxygen. ☐

[1]

(b) Copper and aluminium are expensive to extract for different reasons.

Draw straight lines to join each METAL to one REASON WHY IT IS EXPENSIVE TO EXTRACT.

METAL	REASON WHY IT IS EXPENSIVE TO EXTRACT
	Very large amounts of rock have to be processed to produce a very small amount of metal.
copper	
	The demand for the metal is huge all over the world and this makes the cost of extraction higher.
	The metal can only be extracted by electrolysis which is very expensive.
aluminium	
	The metal has to be treated to stop it corroding.

[2]

[Total: 3]

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6 Rose does an experiment to make some zinc sulfate.

She reacts zinc metal with an acid.

(a) (i) Give the NAME and FORMULA of the acid that reacts with zinc to make zinc sulfate.

name _____

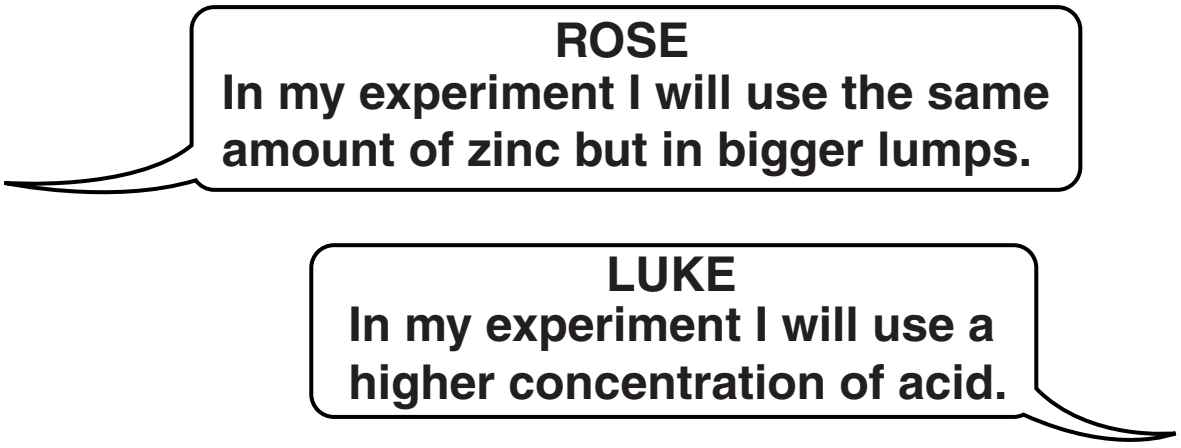
formula _____ [1]

(ii) Give the NAME and FORMULA of the gas that is made when zinc metal reacts with the acid.

name _____

formula _____ [1]

(b) Rose and Luke are discussing ways of changing the rate of the reaction.



(i) Describe how each of these ideas would affect the rate of reaction.

_____

_____

_____

_____ **[2]**

(ii) John talks about how to find the rate of the reaction.

JOHN
I am going to collect gas to find the rate of the reaction.

What measurements should John make to find the rate of the reaction?

_____

_____

_____

_____ **[2]**

(c) Rose wants to use a different solid instead of zinc metal.

Which of these solids react with the acid to make zinc sulfate?

Put (rings) around the THREE correct answers.

ZINC CHLORIDE

ZINC CARBONATE

ZINC NITRATE

ZINC OXIDE

ZINC HYDROXIDE

[2]

[Total: 8]

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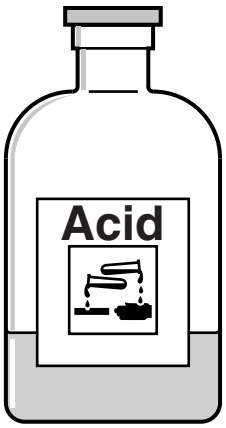
7 Liz reads some information from a book about acids.

ACIDS



Acids are not all alike – they can have very different states. For example, pure acidic compounds can be solids (eg citric acid) or liquids (eg sulfuric acid) or even gases (eg hydrogen chloride).

Dilute acids (eg dilute nitric acid) are all solutions of acids dissolved in water.

(a) The hazard symbol on a bottle of an acid looks like this.

What does this hazard symbol mean?

Put a (ring) around the correct answer.

CORROSIVE

FLAMMABLE

IRRITANT

HARMFUL

TOXIC

[1]

(b) The book gives information about how different acids have different states.

Draw straight lines to connect each TYPE OF ACID with the correct STATE SYMBOL.

TYPE OF ACID	STATE SYMBOL
citric acid SOLID	(*l*)
sulfuric acid LIQUID	(g)
hydrogen chloride GAS	(s)
dilute acid DISSOLVED IN WATER	(aq)

[2]

(c) Use straight lines to connect each ACID to its correct FORMULA.

ACID	FORMULA
	CH_3COOH
hydrochloric acid	
	HNO_3
nitric acid	
	HC*l*

[2]

(d) All acids react with alkalis.

What is the name for the type of reaction that happens when an acid reacts with an alkali?

Put a (ring) around the correct answer.

COMBUSTION

ELECTROLYSIS

NEUTRALISATION

OXIDATION

REDUCTION

[1]

[Total: 6]

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.