

Wednesday 1 February 2012 – Afternoon

**GCSE 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)

Duration: 40 minutes



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. 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).
- Do **not** write in the bar codes.

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 Ben does some flame tests.

(a) He heats a **sodium** compound in a hot flame.

He then carries out the same test using a **potassium** compound.

What would Ben expect to **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.

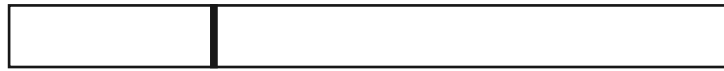
The heights of the flames are different in each test.

[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]

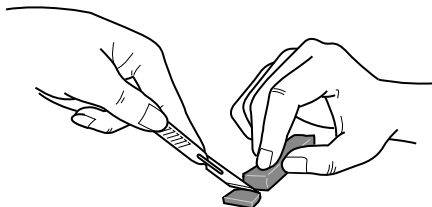
[Total: 7]

Turn over

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.



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]

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.

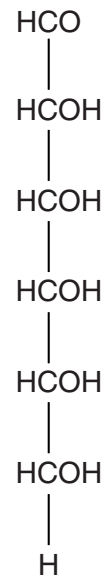
	true	false
There are only very weak attractions between molecules in the air.		
Oxygen and nitrogen are non-metals.		
The air is our main source of minerals and metals.		
Carbon dioxide is an example of a gas in the air that is a compound.		

[2]

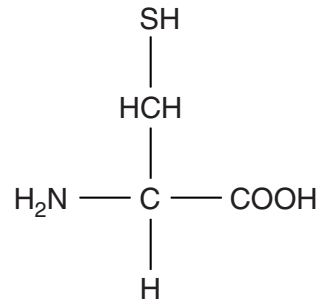
[Total: 6]

- 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]

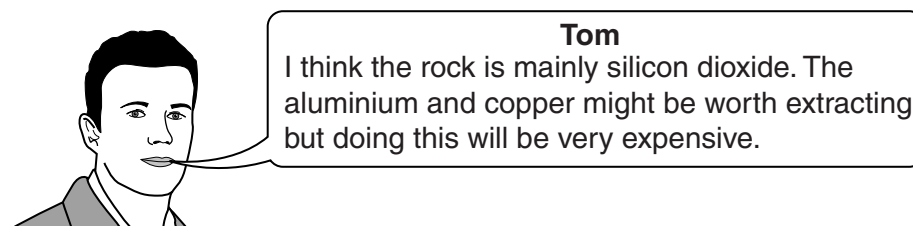
5 Tom tests rocks for a company that extracts metals.

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.



(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

copper

Very large amounts of rock have to be processed to produce a very small amount of metal.

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]

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]

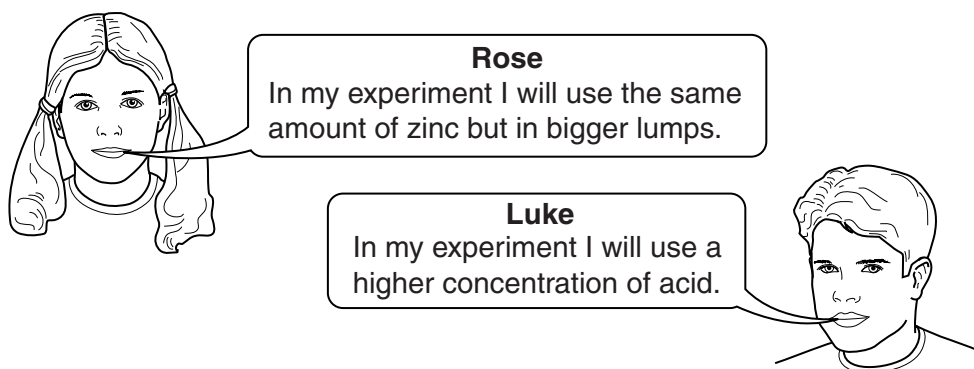
(ii) Give the **name** and **formula** of the gas that is made when zinc metal reacts with the acid.

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.

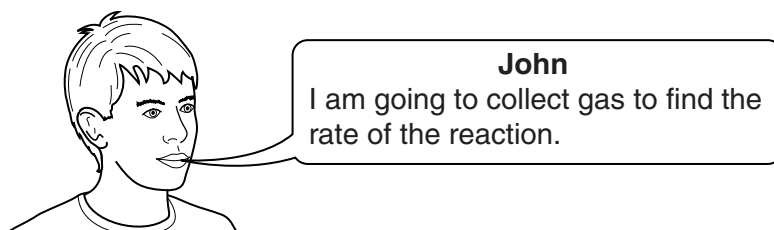
.....

.....

.....

..... [2]

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



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?

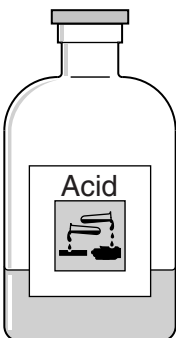
Put rings around the **three** correct answers.

- zinc chloride zinc carbonate zinc nitrate zinc oxide zinc hydroxide [2]

[Total: 8]

- 7 Liz reads some information from a book about acids.

ACIDS



The image shows a glass bottle with a grey cap. The bottle is partially filled with a grey liquid. On the front of the bottle is a white rectangular label with the word 'Acid' written in black. Below the word 'Acid' is a smaller square containing a black hazard symbol: a test tube pouring liquid onto a hand and a surface.

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
hydrochloric acid	CH_3COOH
nitric acid	HNO_3
	HCl

[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

14
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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	15 O oxygen 8	16 F fluorine 9	17 Ne neon 10
23 Si silicon 14	24 Mg magnesium 12	27 P phosphorus 15	28 S sulfur 16	31 Cl chlorine 17	32 Ar argon 18	35.5 K potassium 19	36 Ca calcium 20	40 Sc scandium 21
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
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
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
[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
[209] Po polonium 84	[207] Pb lead 82	[204] Tl thallium 81	204 Hg mercury 80	197 Au gold 79	195 Pt platinum 78	192 Os osmium 76	186 Re rhenium 75	184 W tungsten 74
[210] At astatine 85	[209] Po polonium 84	209 Bi bismuth 83	201 Hg mercury 80	197 Au gold 79	195 Pt platinum 78	192 Ir iridium 77	190 Os osmium 76	186 Re rhenium 75
[222] Rn radon 86	[209] Po polonium 84	209 Bi bismuth 83	201 Hg mercury 80	197 Au gold 79	195 Pt platinum 78	192 Ir iridium 77	190 Os osmium 76	186 Re rhenium 75
131 Xe xenon 54	128 Te tellurium 52	122 Sb antimony 51	112 Cd cadmium 48	108 Ag silver 47	106 Pd palladium 46	103 Rh rhodium 45	101 Ru ruthenium 44	100 Rh rhodium 45
84 Kr krypton 36	79 Se selenium 34	75 As arsenic 33	73 Ge germanium 32	65 Zn zinc 30	59 Ni nickel 28	59 Co cobalt 27	56 Fe iron 26	55 Mn manganese 25
40 Ar argon 18	32 S sulfur 16	31 P phosphorus 15	28 Si silicon 14	27 Al aluminium 13	24 Cr chromium 24	23 V vanadium 23	22 Ti titanium 22	21 Sc scandium 21
20 Ne neon 10	16 O oxygen 8	14 N nitrogen 7	12 C carbon 6	11 B boron 5	9 Be beryllium 4	9 Li lithium 3	7 Li lithium 3	4 He helium 2

16

1 H hydrogen 1

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.