

**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.

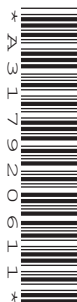
OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

**Tuesday 28 June 2011
Morning**

Duration: 40 minutes



Candidate forename		Candidate surname	
Centre number		Candidate number	

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. Pencil may be used for graphs and diagrams only.
- 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).
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

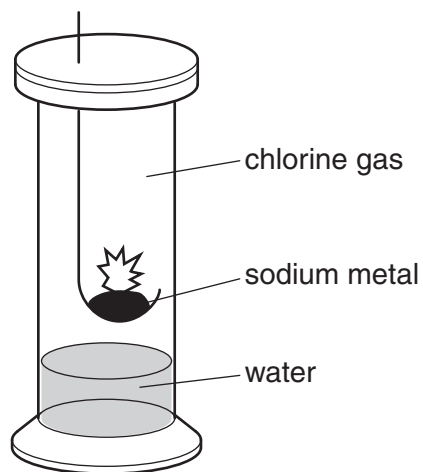
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.
- The Periodic Table is printed on the back page.

2

Answer **all** the questions.

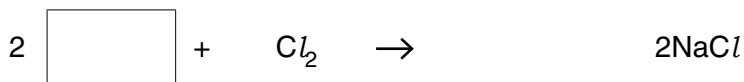
- 1 Hot sodium metal reacts with chlorine gas to make sodium chloride.

Eve does the reaction in a gas jar that contains a small amount of water.



- (a) Complete the word and symbol equations for the reaction by filling in the boxes.

sodium + chlorine →



[2]

- (b) Which one of the following statements about chlorine is true?

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

Chlorine gas has two atoms in each molecule.

☐

Chlorine is a brown gas.

☐

It is not necessary to take any safety precautions when handling chlorine gas.

☐

Chlorine is an alkali metal.

☐

[1]

3

- (c) Sodium chloride dissolves in water to make a solution.

What happens when sodium chloride dissolves in water?

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

The solid compound melts.

☐

The regular arrangement of ions breaks down.

☐

The ions get smaller.

☐

The ions move around in the water.

☐

The water changes colour.

☐

[2]

- (d) Eve repeats the experiment using bromine instead of chlorine.

At room temperature, bromine is a liquid.

Draw a straight line from the correct **state symbol** to **bromine liquid**.

Then draw a line from **bromine liquid** to the correct **formula**.

state symbol

formula

(s)

B₂

(l)

BR₂

bromine liquid

Be₂

(g)

Br₂

[2]

- (e) Suggest the name of the product of the reaction between sodium and bromine.

Put a ring around the correct answer.

sodium hydroxide

potassium bromide

sodium bromide

sodium chloride

[1]

[Total: 8]

2 This question is about Group 1 elements.

(a) Caesium is an element in Group 1.

Use the Periodic Table to find the **symbol** and **atomic number** for caesium.

The symbol for caesium is

The atomic number of caesium is [1]

(b) Lithium (atomic number 3) and potassium (atomic number 19) are also Group 1 elements.

Compare the **atomic structures** of a lithium atom and a potassium atom.

How are they different and how are they similar?

.....

.....

.....

.....

.....

..... [4]

(c) Dawn wants to find out whether a white compound contains lithium.

She carries out a flame test.

What should Dawn look for when she carries out her test?

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

How quickly the compound melts.

☐

The colour of the flame.

☐

Whether the compound burns.

☐

Whether a gas is given off.

☐

[1]

[Total: 6]

- 3 The compounds in the table can be used to improve soil for growing crops.

compound name	formula
sodium phosphate	Na_3PO_4
sodium nitrate	NaNO_3
calcium hydroxide	Ca(OH)_2
.....	K_2SO_4
potassium phosphate	K_3PO_4
calcium sulfate	CaSO_4

- (a) Complete the table by filling in the **name** of the compound with the formula K_2SO_4 . [1]
- (b) Sometimes compounds are mixed to give a fertiliser that supplies **nitrogen**, **phosphorus** and **potassium** to the soil.



Which two compounds could be used **together** to make a fertiliser that contains all three elements?

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

Na_3PO_4 NaNO_3 CaSO_4 Ca(OH)_2 K_2SO_4 K_3PO_4 [1]

- (c) Acidic compounds in the soil produce ions that make the soil water acidic.

- (i) Which ion is produced by all acids when they dissolve in water?

Put a ring around the correct answer.

Cl^- H^+ OH^- Na^+ SO_4^{2-} [1]

6

- (ii) One of the compounds given in the table is added to soil to neutralise acids. This compound dissolves in water to form an alkaline solution. Which compound dissolves to form an alkaline solution?

Put a ring around the correct answer.



[1]

- (d) Sam uses several steps to make some sodium nitrate crystals.

- (i) Here are five steps Sam uses to make the crystals. They are in the wrong order.

- A carry out a risk assessment
- B crystallise
- C dry in an oven
- D react chemicals together
- E heat to evaporate some water

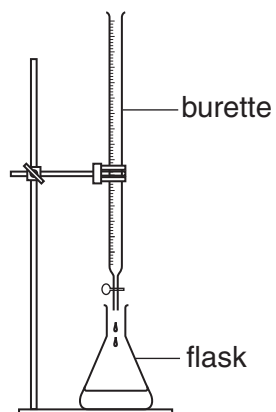
Put the letters for the steps in the boxes below to show the correct order.

--	--	--	--	--

[2]

7

(ii) Sam uses this apparatus to react the chemicals together.



What is the name for this method?

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

filtration

☐

concentration

☐

oxidation

☐

titration

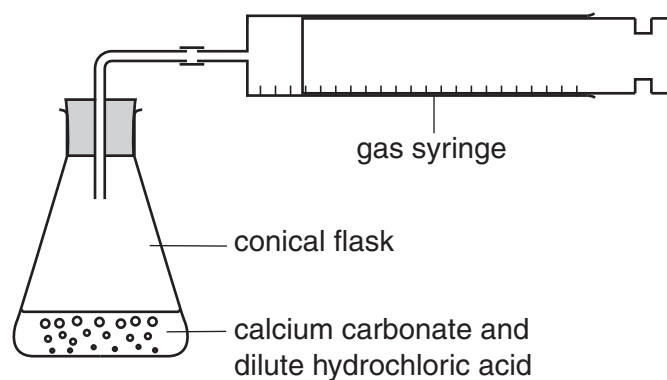
☐

[1]

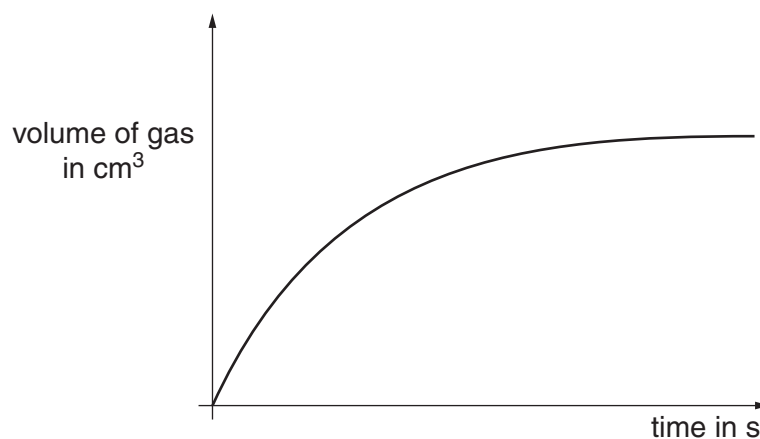
[Total: 7]

8

- 4 Jake carries out an experiment to investigate the rate of reaction between calcium carbonate and dilute hydrochloric acid.



This is a graph of Jake's results.



- (a) What happens to the **rate** of the reaction during the experiment?

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

slows down then speeds up

☐

stays constant all the time

☐

starts fast and slows down

☐

keeps getting faster

☐

[1]

- (b) Jake uses these conditions for his first experiment.

conditions for experiment 1

acid: dilute hydrochloric acid

calcium carbonate: 5 g, large pieces

temperature: 20 °C

Jake does the experiment again. He wants to make the reaction happen faster.
He does not want to change the volume of acid or the mass of calcium carbonate.

Suggest **two** ways that Jake could change the conditions to make the reaction faster.

.....

.....

.....

..... [2]

- (c) Jake uses universal indicator to measure the pH of the acid at the start of the experiment.
Write instructions to tell Jake how to use universal indicator to measure pH.

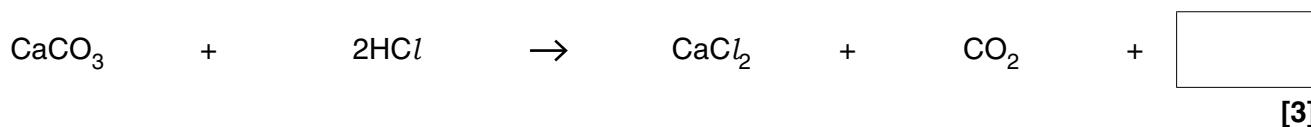
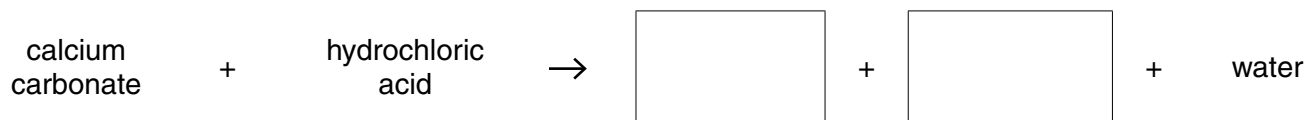
.....

.....

..... [2]

- (d) Jake writes word and symbol equations for the reaction of calcium carbonate with hydrochloric acid.

Complete the equations by filling in the boxes.



[Total: 8]

10

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- 5 The tables give information about the elements in the air and in the Earth's crust.

elements in the air		elements in the Earth's crust	
element	percentage	elements	percentage
nitrogen	78 %	silicon	47 %
oxygen	21 %	oxygen	28 %
other gases (including carbon dioxide)	1 %	aluminium	8 %
		all other elements (including iron)	 %

- (a) (i) Complete the table to show the percentage of all other elements in the Earth's crust. [1]
- (ii) Which of the following statements are **true** and which are **false**?
Use information from the tables to help you.

Put a tick (✓) in one box in each row.

statement	true	false
There is more oxygen than nitrogen in the air.		
There is more oxygen than nitrogen in the Earth's crust.		
None of the elements in the air are also in the Earth's crust.		
Some of the elements in the Earth's crust are metals.		

[2]

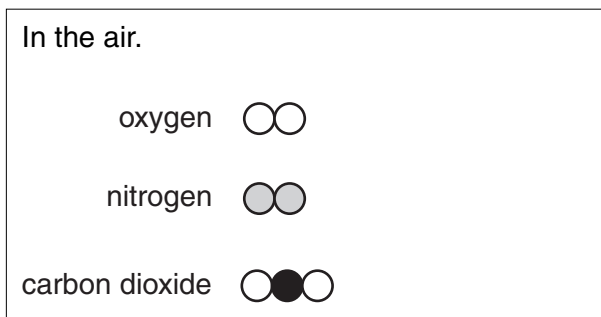
- (b) Which of the chemicals in the table below are elements and which are compounds?

Put ticks (✓) in the correct boxes.

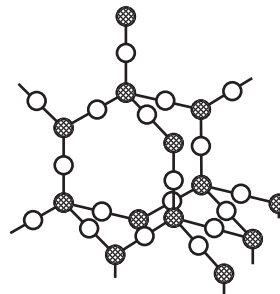
chemicals	formula	element	compound
oxygen	O ₂		
nitrogen	N ₂		
carbon dioxide	CO ₂		
silicon dioxide	SiO ₂		

[2]

- (c) The boxes show how atoms are arranged in some of the chemicals in the air and in the Earth's crust.



In the Earth's crust silicon and oxygen are mainly found as silicon dioxide.



- (i) Draw straight lines from **oxygen** to show its **type of bonding** and its **structure**.

type of bonding

ionic

covalent

metallic

oxygen

structure

atoms held together in a lattice

small molecules

ions with opposite charges attracted to each other

[1]

- (ii) Draw straight lines from **silicon dioxide** to show its **type of bonding** and its **structure**.

type of bonding

ionic

covalent

metallic

silicon dioxide

structure

atoms held together in a lattice

small molecules

ions with opposite charges attracted to each other

[1]

13

(iii) Complete the sentences about the properties of silicon dioxide.

Put a ring around the correct word in each line.

Silicon dioxide has a **high** / **low** melting point.

Silicon dioxide is very **hard** / **soft**.

Silicon dioxide is a **good** / **poor** electrical conductor.

Silicon dioxide **dissolves** / **does not dissolve** in water.

[2]

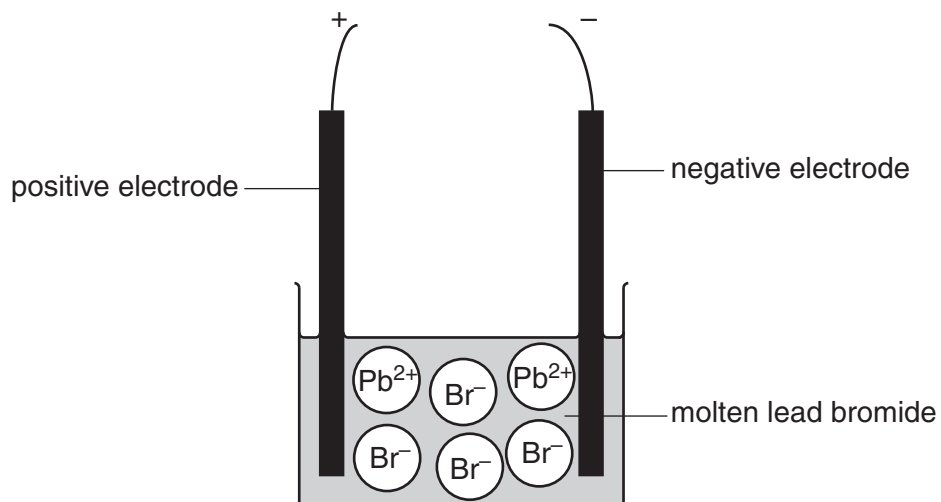
[Total: 9]

14

6 Joe does an electrolysis experiment.

He heats some solid lead bromide until it melts.

The diagram shows lead ions and bromide ions.



(a) Joe switches on the electric current.

What happens to the lead ions and the bromide ions?

.....

.....

.....

.....

..... [3]

(b) Lead metal is made during the electrolysis of lead bromide.

What other product is made at the same time?

Put a ring around the correct answer.

acid

bromine

hydrogen

oxygen

water

[1]

[Total: 4]

END OF QUESTION PAPER

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*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.