

**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.

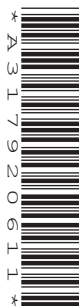
OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

**Wednesday 19 January 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**.
- The Periodic Table is printed on the back page.
- This document consists of **16** pages. Any blank pages are indicated.

2

Answer **all** the questions.

- 1 Gemma makes science films for schools.

She is making a film about the reactions of Group 1 elements.

- (a) Gemma wants to show the names and symbols of the Group 1 elements.

She includes this table in her film.

- (i) Complete the table by filling in the two bits of missing information.

name of element	proton number	symbol
.....	11	Na
potassium	19	K
rubidium	37	Rb
caesium	55	

[2]

- (ii) Give the name of another Group 1 element that is **not** shown in the table.

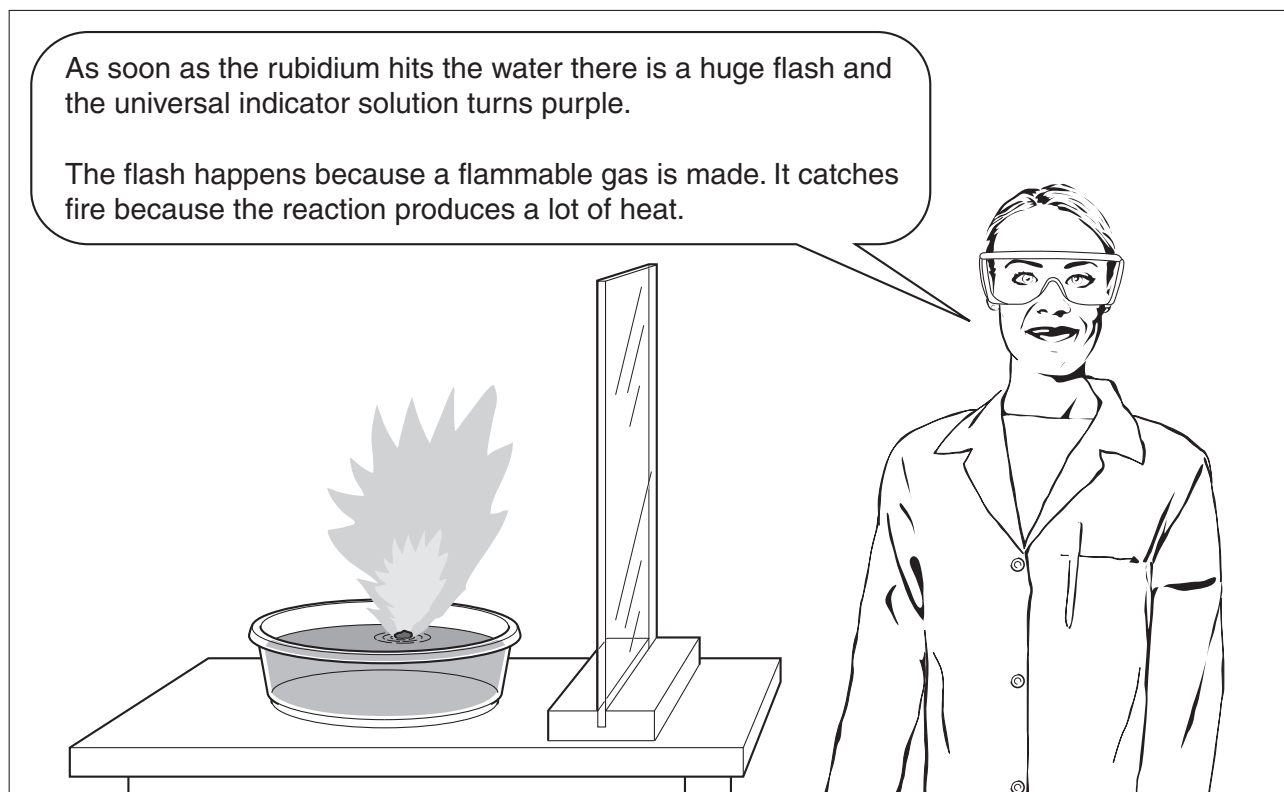
..... [1]

3

(b) Gemma films the reactions of Group 1 elements with water.

She adds universal indicator solution to a bowl of water.

The film shows what happens when she drops a small piece of rubidium into the water.



(i) What is the name of the gas that is formed in the reaction?

Put a ring around the correct answer.

carbon dioxide

hydrogen

nitrogen

sulfur dioxide

[1]

(ii) Why does the universal indicator solution turn purple?

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

The reaction makes an acid.

☐

The rubidium neutralises the water.

☐

An alkali is made.

☐

The temperature increases.

☐

[1]

4

- (c) Gemma makes another film. This time she adds caesium to the water instead of rubidium.

When caesium hits the water, there is an explosion and the glass bowl breaks.

Why do caesium and rubidium react differently with water?

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

Caesium is more reactive than rubidium.

☐

Caesium is not a metal.

☐

Rubidium reacts much faster than caesium.

☐

Caesium has a lower mass than rubidium.

☐

[1]

- (d) Gemma then adds a small piece of potassium to a bowl of water that contains universal indicator solution.

- (i) Describe what she will see.

Your answer should include

- how the reaction is similar to the reaction of the other Group 1 elements
- any differences between the reaction of potassium and the other Group 1 elements.

.....

.....

.....

..... [3]

- (ii) Gemma used a safety screen when she was carrying out these experiments.

Explain why this was necessary.

.....

.....

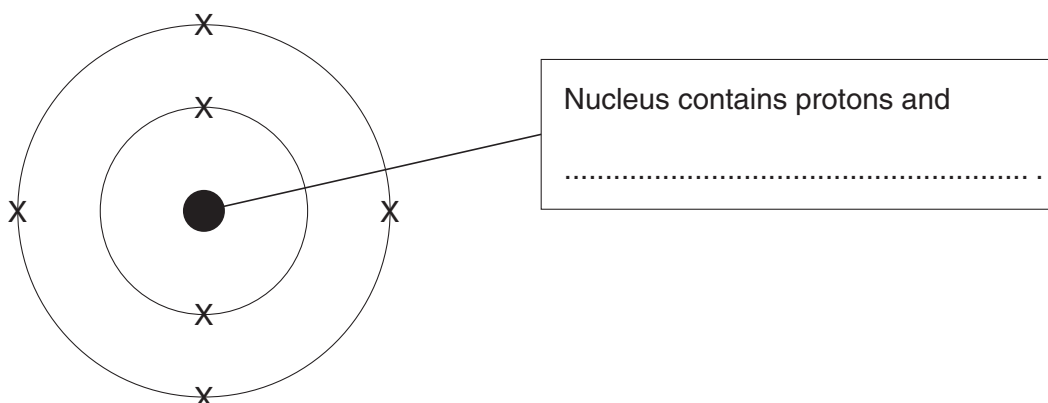
..... [2]

[Total: 11]

5

- 2 (a) The diagram shows the structure of an atom of an element in Group 4 of the Periodic Table.

- (i) Complete the label on the diagram by filling in the box.



[1]

- (ii) What is the electronic arrangement of the atom?

Put a ring around the correct answer.

6 4.2 2.4 2.2.2

[1]

- (iii) How many **protons** are in the nucleus of the atom?

Put a ring around the correct answer.

2 4 6 12

[1]

- (b) The atom contains electrons and protons.

Draw straight lines to join each type of **particle** to its correct **relative mass** and correct **charge**.

One line has been drawn for you.

relative mass	particle	charge
0	electron	-1
1	proton	0
2		+1

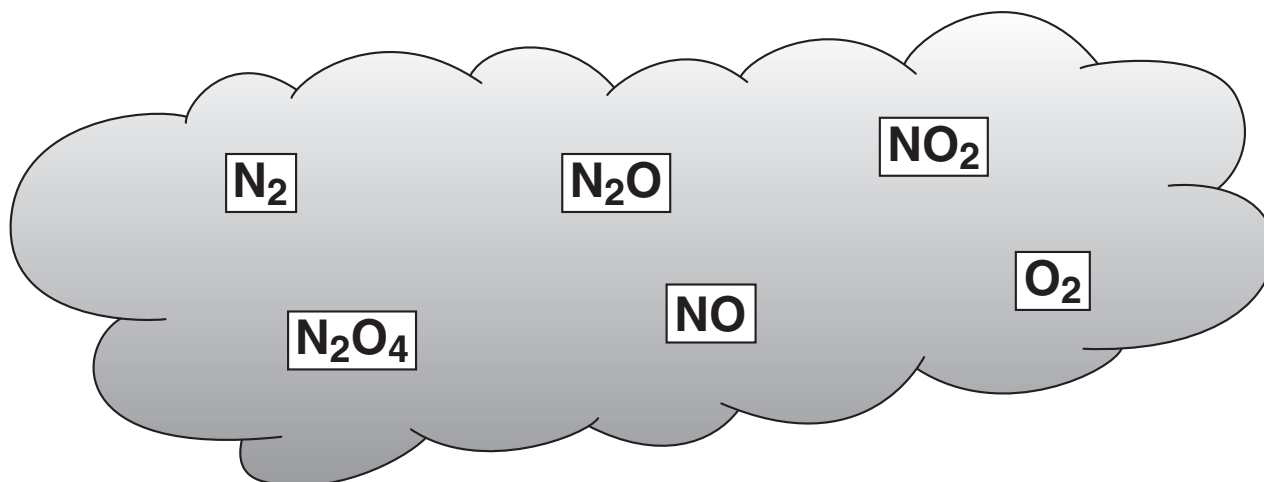
[1]

[Total: 4]

Turn over

- 3 Some gases in air contain nitrogen and oxygen atoms.

The formulae of these gases are shown in the boxes.



- (a) Which **two** gases are elements?

Put a ring around each correct answer.



[1]

- (b) Which gas molecule contains the largest number of atoms?

Put a ring around the correct answer.



[1]

- (c) Put a ring around the correct word to complete each of the following sentences.

The melting points of these gases are **above** / **below** room temperature.

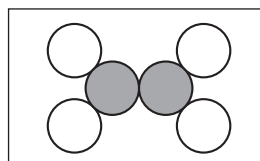
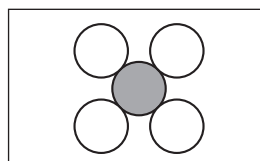
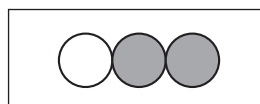
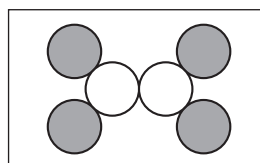
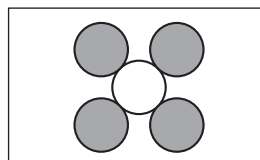
Their boiling points are **above** / **below** room temperature.

Gases in the air have **molecular** / **ionic** structures.

They have **strong** / **weak** forces between their molecules.

[2]

7

(d) Look at this diagram of a molecule of NO₂.Draw straight lines to join each **formula** to the correct **diagram**.**formula****diagram**

[2]

[Total: 6]

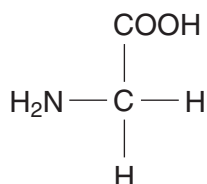
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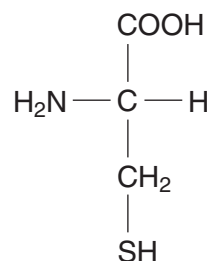
4 Read the information in the box.

Molecules in living things

Molecule **A** and molecule **B** are both amino acids. You can see how similar they are by looking at the atoms in their molecules.



molecule A



molecule B

(a) The formula for molecule **B** is **C₃H₇NO₂S**.

What is the formula for **molecule A**?

..... [2]

(b) Look at the **elements** in molecules **A** and **B**.

(i) In what ways are molecules **A** and **B** typical of those that come from living things?

.....
 [2]

(ii) Write down two **differences** between molecule **A** and molecule **B**.

.....
 [2]

(c) Which of the following chemicals are made by living things?

Put a (ring) around each of the **two** correct answers.

carbohydrates

minerals

proteins

quartz

silicon

[2]

[Total: 8]

5 Joe investigates vinegar.

(a) Joe knows that vinegar is an acid.

One way of showing that vinegar is an acid is by using an indicator.

What else can Joe use to show that vinegar is an acid?

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

iodine

☐

a pH meter

☐

a lighted splint

☐

a burette

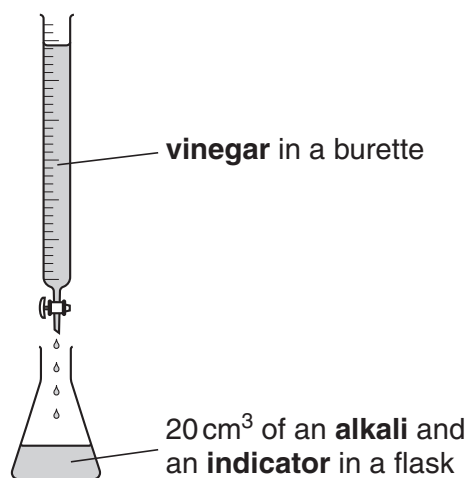
☐

limewater

☐

[1]

(b) Joe does a titration to find the concentration of acid in the vinegar.



(i) What chemical could be used as the alkali in the flask?

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

calcium carbonate

☐

sodium chloride

☐

sulfuric acid

☐

sodium hydroxide

☐

[1]

11

- (ii) Write down a set of instructions to tell Joe how to do the titration.

.....

.....

.....

.....

..... [3]

- (c) Joe tests vinegar that he collects from different places.

Here is a table showing his results.

	chip shop vinegar	supermarket vinegar	cafe vinegar	canteen vinegar
volume of vinegar that reacts with 20 cm ³ alkali	15 cm ³	21 cm ³	19 cm ³	25 cm ³

- (i) Which vinegar contains the highest concentration of acid?

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

chip shop vinegar	☐
supermarket vinegar	☐
cafe vinegar	☐
canteen vinegar	☐

[1]

12

- (ii) Joe calculates the concentration of acid in each vinegar.

His first step is to work out the relative formula mass of the acid in the vinegar.

Complete Joe's working to find the relative formula mass of the acid.

Use the Periodic Table to help you to find the missing relative atomic masses.

formula of acid compound			CH_3COOH
relative atomic masses	carbon, C	=	12
	hydrogen, H	=	
	oxygen, O	=	
relative formula mass of CH_3COOH			=

[2]

- (iii) What other information does Joe need to work out the concentration of the acid in the vinegar?

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

an equation for the reaction

☐

the cost of each bottle of vinegar

☐

the concentration of alkali used

☐

the temperature of the room

☐

the rate of the reaction

☐

[1]

[Total: 9]

- 6 Old copper coins are often covered with a layer of corrosion.



The corrosion contains copper carbonate.

Sulfuric acid can be used to clean the coin.

- (a) Sulfuric acid reacts with copper carbonate to form a salt and two other products.

- (i) What is the **name** of the salt that is formed when sulfuric acid reacts with copper carbonate?

..... [1]

- (ii) What are the formulae of the two **other** products of the reaction?

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



[1]

- (b) Eve uses sulfuric acid to remove copper carbonate from old coins.

She finds that the rate of reaction is very slow.

How can she speed up the reaction?

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

Add more water to the acid.

☐

Heat the acid.

☐

Add sodium chloride to the acid.

☐

Add an alkali to the acid.

☐

Use a higher concentration of acid.

☐

[2]

[Total: 4]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2	Key										3	4	5	6	7	0		
		relative atomic mass atomic symbol name atomic (proton) number																1 H hydrogen 1	
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.