



Rewarding Learning

General Certificate of Secondary Education
2021–2022

Centre Number

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Candidate Number

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Single Award Science: Chemistry

Unit 2

Foundation Tier



[GSA21]

GSA21

TUESDAY 23 NOVEMBER, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 60.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 6.

A Data Leaflet, which includes a Periodic Table of the Elements, is included for your use.



- 1 (a) Four hazard symbols and their names are given below.
Using lines, match the symbols to their correct name.
One has been done for you.

Hazard symbol

Name



corrosive



toxic



caution



flammable

Source: © Getty Images

[2]

- (b) Suggest **one** precaution that you would take when using a flammable substance.

[1]



2 (a) Materials can either be described as natural or synthetic.

(i) What is meant by the term **synthetic material**?

[1]

(ii) Complete the table below placing each of the following materials in the correct column.

plastic wood cotton wool

Natural	Synthetic

[2]

Many years ago, linen was the main material used in making tablecloths and napkins, nowadays nylon is mostly used. Linen takes a long time to make and involves many complex processes to convert the flax plants into the finished products. Linen creases very easily and is difficult to iron, whereas nylon is crease resistant and can be made easily.

(b) Suggest **two** reasons why nylon has replaced linen in the manufacture of clothing.

1. _____

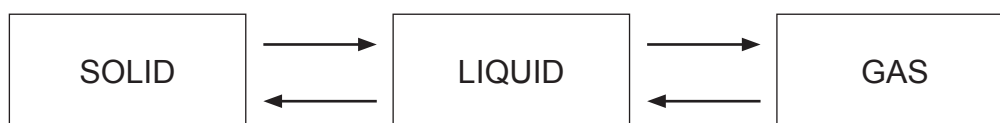
2. _____

[2]

[Turn over



- 3 (a) The diagram below shows the changes of state that occur between a solid, a liquid and a gas.



- (i) Complete the sentences below describing a change of state.

Choose from:

freezing

cooled

evaporation

heated

condensation

When a substance changes state from a gas to a liquid the process is called _____. The gas needs to be _____ for this to happen.

[2]

- (ii) Another change of state is called sublimation. Which of the changes shown below describes sublimation?

Circle your answer.

solid to liquid : **solid to gas** : **liquid to gas**

[1]

- (b) When Helen added some **salt** to **water** it dissolved to produce **brine** (salty water).

Which of the named substances is the solute and which is the solution?

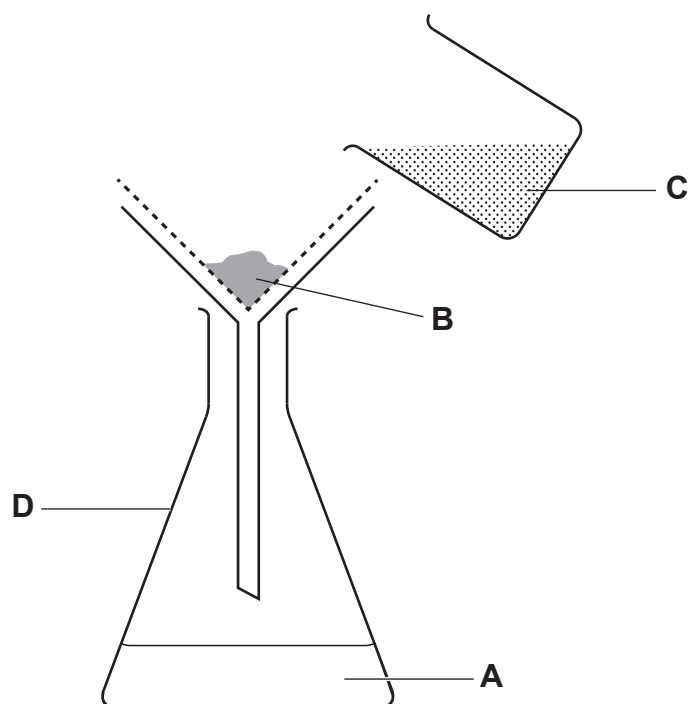
Solute _____

Solution _____

[2]



- (c) A mixture of sand and water can be separated using filtration as shown in the diagram below.



- (i) Which label (**A**, **B** or **C**) represents the filtrate in this separation?

_____ [1]

- (ii) Name the piece of apparatus labelled **D** in the diagram.

_____ [1]

[Turn over



- 4 (a) The table below gives the pH of some solutions and the colour of different indicators at these pH values.

Solution	pH	Colour		
		universal indicator paper	red litmus paper	blue litmus paper
salt solution	7	green	red	blue
baking soda	9	blue	blue	blue
battery acid	1	red	red	red
vinegar	3	orange	red	red
drain cleaner	14	purple	blue	blue
tomato juice	4	yellow	red	red

(i) How many of the solutions tested were acidic? _____ [1]

(ii) From the table name:

the strongest alkali. _____

the weakest acid. _____ [2]

Bacteria in the mouth produces acid as a by-product of eating foods. The acid can cause tooth decay.

(b) Explain fully why adding baking soda to toothpaste helps stop tooth decay.

_____ [2]



(c) Explain fully why universal indicator paper is more useful than red or blue litmus paper.

[2]

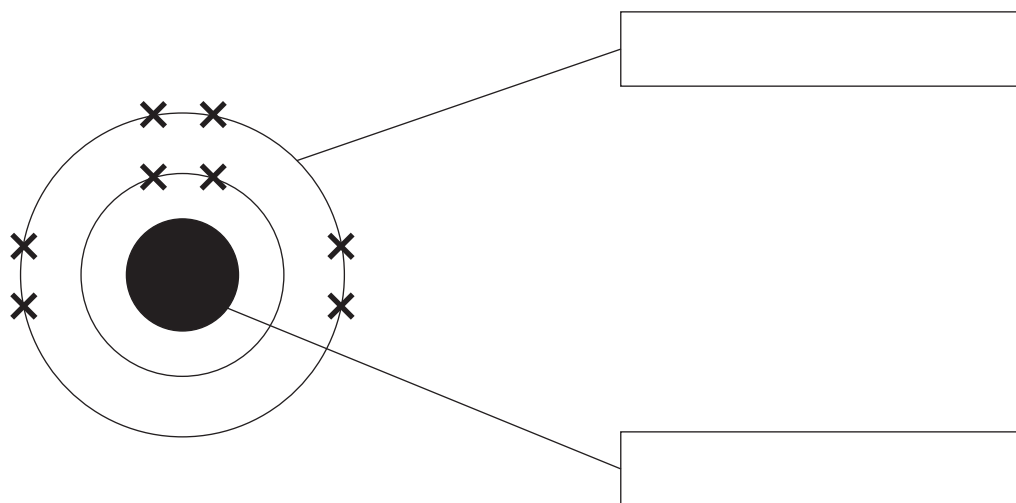
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20GSA2107

5 (a) The diagram below represents an atom.



(i) Complete the diagram by adding the names of the parts of the atom shown. [2]

(ii) Give the group number and period number of the atom shown above.

You may find your Periodic Table useful.

Group _____

Period _____ [2]

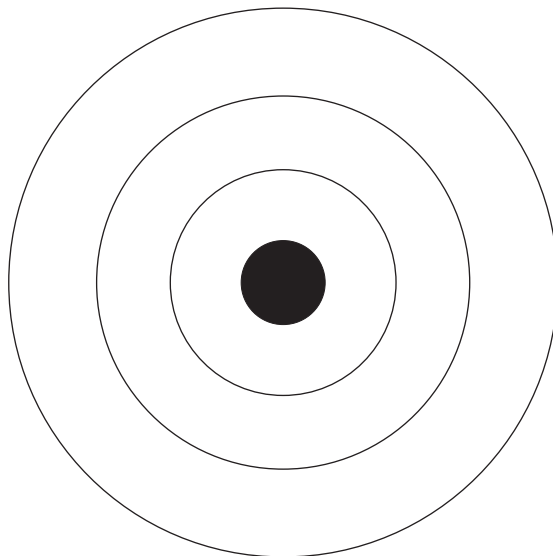
(iii) How many protons will this atom have?

_____ [1]



(b) An atom of chlorine has 17 electrons and belongs to Group 7 of the Periodic Table.

(i) Complete the diagram below to show how these electrons are arranged in the atom.



[1]

(ii) Name the group of the Periodic Table that chlorine belongs to.

[1]

(iii) Tick (✓) **two** of the statements below that are correct for chlorine.

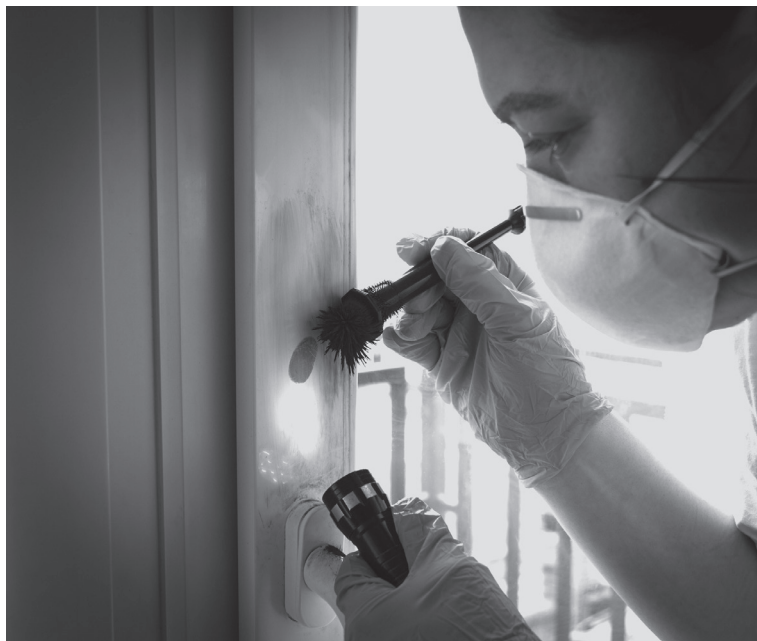
Statement	Tick
it is a metal	
it is a non-metal	
it forms a positive ion when it reacts with sodium	
it is a compound	
it belongs to the same Period as magnesium	

[2]

[Turn over]



- 6 Forensic scientists can help to solve crime by taking and analysing fingerprints found at a crime scene.



Source: © Getty Images

Describe how fingerprints are collected at a crime scene and why they are useful in solving crimes.

Your answer should include:

- the names of **two** different types of fingerprints and
- how powder is used to collect a fingerprint from a **white** surface.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.



[6]

[Turn over

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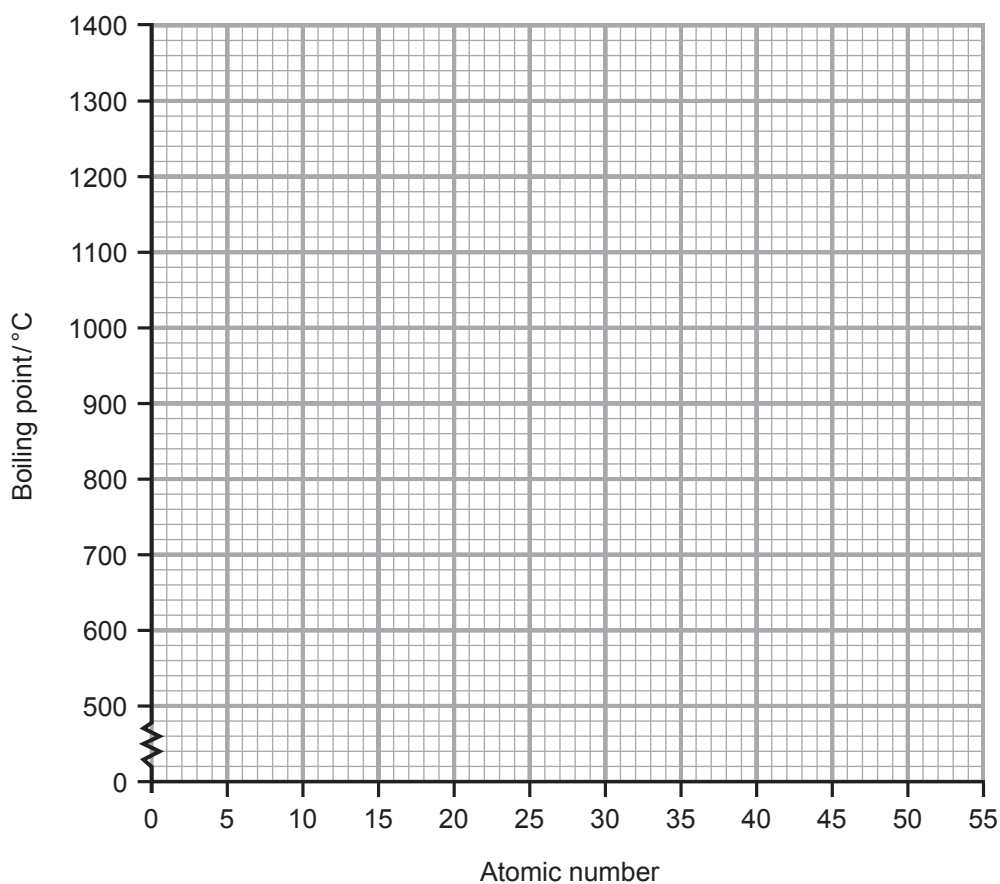


20GSA2111

- 7 (a) The table below gives some information about the first five Group 1 elements.

Element	Atomic number	Boiling point/°C
lithium	3	1350
sodium	11	890
potassium	19	760
rubidium	37	680
caesium	55	670

- (i) On the grid below plot and draw a line graph for this information.



[3]



(ii) Describe the trend shown by this information.

[1]

(b) Given below are some observations for the reactions of the first five Group 1 elements with water.

Element	Observations
lithium	gas produced, floats, produces some heat
sodium	heat produced, melts into a ball, gas produced, floats and moves rapidly on surface
potassium	burns with a lilac flame, heat produced, gas produced, floats, moves around and can explode
rubidium	sinks, produces heat, melts, gas produced, disappears with an explosion
caesium	gas and heat produced causing an instant explosion

Use this information and your knowledge to answer the following questions.

(i) Apart from producing a gas, give **one** other observation common to all these reactions.

[1]

(ii) Complete the following sentence.

As you go down Group 1, from lithium to caesium, the speed of the reaction of the metal with water _____.

[1]

(iii) Complete the word equation below.

potassium + water $\longrightarrow$ hydrogen +

[1]

[Turn over]



(iv) Describe the test for hydrogen gas.

[2]

(c) Some chemical reactions release energy and cause their surroundings to heat up.

(i) What name is given to reactions that produce heat?

[1]

Patrick wanted to compare the amount of heat produced when iron reacts with acid to the amount produced when magnesium reacts with acid.

(ii) Give **one** way Patrick can make sure the investigation will be valid (a fair test).

[1]

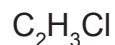
(iii) Describe fully what Patrick needs to measure to be able to compare the amount of heat produced in each reaction.

[2]



8 (a) The chemical formulae of four carbon compounds are given below.

(i) Circle the compound that is **not** a hydrocarbon.



[1]

(ii) In the box below draw the structural formula of butane (C_4H_{10}).



[1]

(iii) In what state is butane (C_4H_{10}) at room temperature?

_____ [1]

(b) Another carbon compound is ethanol ($\text{C}_2\text{H}_5\text{OH}$).

(i) How many elements are present in $\text{C}_2\text{H}_5\text{OH}$? _____ [1]

(ii) How many atoms are represented by the formula $\text{C}_2\text{H}_5\text{OH}$?

_____ [1]

[Turn over]



- 9 The table below shows some information about the elements in Period 2 of the Periodic Table.

Name of element	Lithium	Beryllium	Boron	Carbon	Nitrogen	Oxygen	Fluorine	Neon
symbol	Li	Be	B	C	N	O	F	Ne
atomic number	3	4	5	6	7	8	9	10
atomic mass	7	9	11	12	14	16	19	20
melting point/°C	180	1287	2076	3500	−210	−219	−220	−249
boiling point/°C	1350	2970	3927	4827	−196	−183	−188	−246
metallic character	metal	metal	semi-metal	non-metal	non-metal	non-metal	non-metal	non-metal

Use this information and your knowledge to answer the following questions.

- (a) Calculate the number of neutrons in an atom of lithium.

_____ [1]

- (b) Name the element which is a noble gas.

_____ [1]

- (c) Name the element that has the **lowest** melting point.

_____ [1]

- (d) Describe the trend in metallic character of the elements in Period 2.

_____ [1]



Lithium reacts with oxygen to form the compound lithium oxide.

(e) What is the chemical formula of lithium oxide?

Circle your answer.



[1]

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For Examiner's use only	
Question Number	Marks
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Examiner Number

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