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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2018–2019

Single Award Science: Chemistry

Unit 2

Foundation Tier

[GSA21]

GSA21

THURSDAY 28 FEBRUARY 2019, 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 **8(a)**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included for your use.

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1 The following hazard symbol was found on a lorry carrying sulfuric acid.

© Ecelop / iStock / Thinkstock

(a) Name the hazard symbol shown above.

_____ [1]

(b) Hazard symbols warn of danger. Give **two** reasons why symbols are used and not just words.

1. _____

2. _____ [2]

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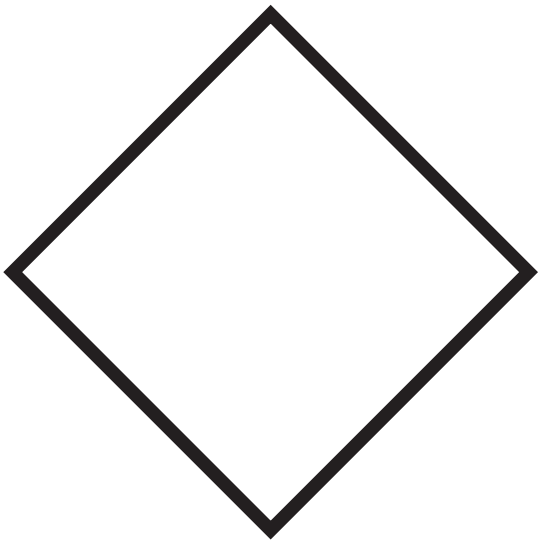
(c) In the box below draw the hazard symbol you would find on a bottle of weedkiller to show that it is **toxic**.



[1]

[Turn over

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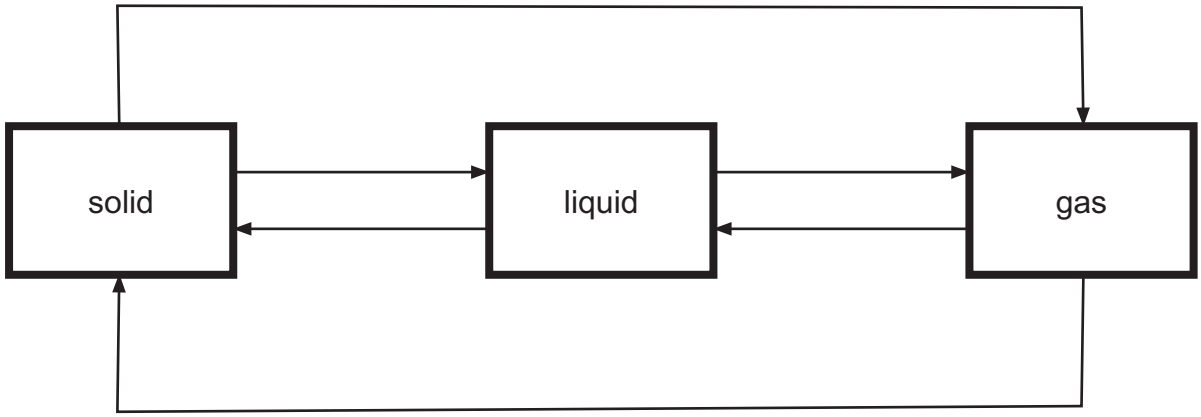
2 The diagram below shows the three states of matter. The arrows represent the changes of state.



(a) Complete the following sentences about changes of state.

When a liquid changes into a solid it is described

as _____.

Sublimation can describe the change of state from

_____ to _____.

[2]

(b) In the box below draw a diagram to show the arrangement of particles in a gas. Use a ● to represent a particle.

[1]

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(c) Below is a table of common substances showing their melting and boiling points.

Substance	Melting point/°C	Boiling point/°C
Water	0	100
Salt	804	1413
Oxygen	–218	–183

(i) What is meant by the term **melting point**?

_____

_____ [1]

(ii) What is the state of matter of oxygen at 25 °C?

_____ [1]

(iii) What needs to be done to salt to change it from a solid to a liquid?

_____ [1]

[Turn over

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3 **(a)** Given below is information about some household substances.

Substance	Colour in universal indicator	pH number
orange juice	orange	4
oven cleaner		14
milk of magnesia	blue	

(i) Complete the table above.

Choose from:

green **10** **purple** **2** **7** **red**

[2]

(ii) Complete the following sentence.

Choose from:

weak acid : **strong alkali** : **weak alkali** : **strong acid**

Orange juice is described as a _____. [1]

(iii) Suggest why a pH meter is more useful than universal indicator when measuring the pH of a solution.

_____

_____ [1]

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(b) Below is the general equation for the reaction between an acid and an alkali.

acid + alkali ⟶ salt + water

(i) What name is given to this **type** of reaction?

_____ [1]

(ii) During the reaction of an acid and an alkali heat is given out.

What word describes a reaction that produces heat?

Circle the correct answer.

endothermic **thermochromic** **exothermic**

[1]

(c) The table below gives four steps used to produce an indicator from red cabbage. They are **not** in the correct order.

Give the correct order for these steps by using the numbers **1**, **2**, **3** and **4**.

Step	Instruction
	Use the remaining solution as an indicator
	Cut the cabbage into small pieces
	Filter to remove cabbage
	Add cabbage to a beaker of water and boil

[2]

[Turn over

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4 A chemical can be described as an element, compound or mixture.

(a) What is meant by the term **compound**?

_____

_____

_____ [2]

(b) Given below are the names of some chemicals. Place **one** tick (✓) in each row to show if the chemical is an element, compound or mixture.

One has been done for you.

Chemical	Element	Compound	Mixture
gold	✓		
sodium chloride			
crude oil			
magnesium			
seawater			

[2]

(c) What is the chemical formula for sodium chloride?

Circle the correct answer.

$NaCl_2$ **Na_2Cl** **NaCl** **Na_2Cl_2** [1]

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(d) The chemical name for baking powder is sodium hydrogencarbonate. It has the formula $NaHCO_3$.

(i) How many elements are represented by the formula $NaHCO_3$?

_____ [1]

(ii) How many atoms are represented by the formula $NaHCO_3$?

_____ [1]

[Turn over

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5 Rory added dilute acid to three powders **A**, **B** and **C.**

He tested any gas produced with a lit splint.

Powder	Effect of acid	Result with lit splint
A	bubbles of gas produced	popping sound produced
B	no gas produced	test not carried out
C	bubbles of gas produced	gas puts out lit splint

(a) Name the gas produced when powder **A** reacts with dilute acid.

_____ [1]

(b) Powder **C** is calcium carbonate. Complete the word equation for the reaction of calcium carbonate with hydrochloric acid.

calcium carbonate	+	hydrochloric acid	→		+		+	carbon dioxide

[2]

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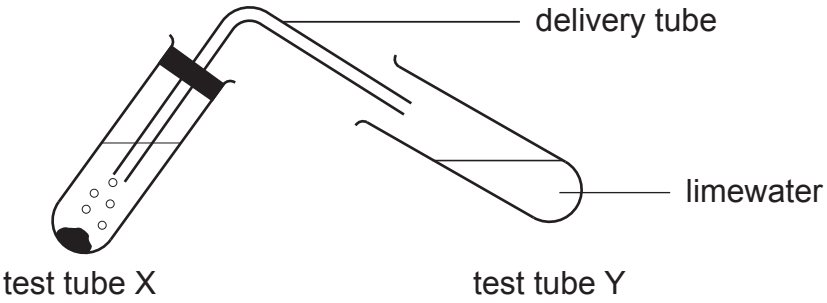
(c) The diagram below shows the apparatus that Rory used to test for carbon dioxide.

He has not set the apparatus up correctly.



(i) Describe **one** error Rory has made when setting up the apparatus.

_____

_____ [1]

(ii) Complete the sentence below.

Limewater is a colourless liquid that will

turn _____ in the presence

of carbon dioxide. [1]

[Turn over

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6 Sodium is a Group 1 metal. It is represented by the following symbol:

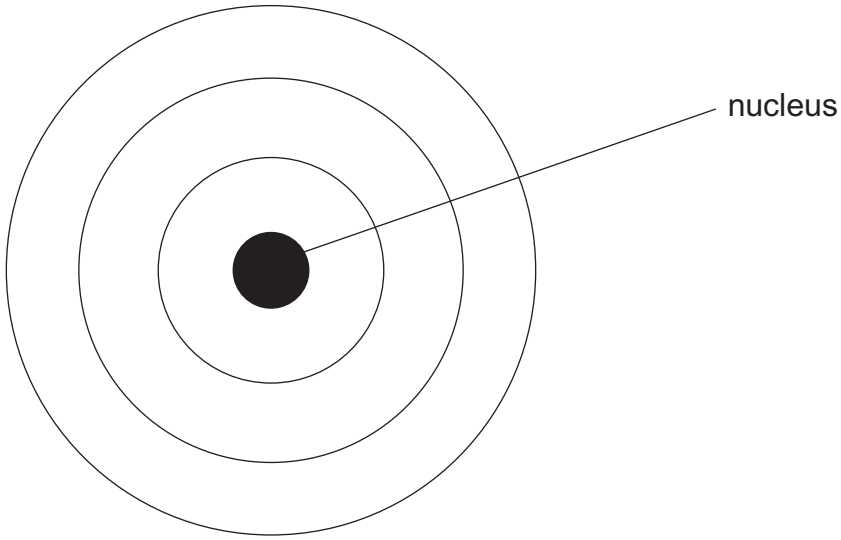
$$^{23}_{11}Na$$

(a) (i) Complete the table below to give the numbers of protons and neutrons in a sodium atom.

Particle	Number
electron	11
proton	
neutron	

[2]

(ii) Complete the diagram below to show the electronic structure of a sodium atom.



[1]

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(iii) Describe how a sodium **ion** is formed.

_____

_____ [1]

(b) Potassium is also a Group 1 metal. Explain why sodium and potassium have similar reactions.

_____

_____ [1]

[Turn over

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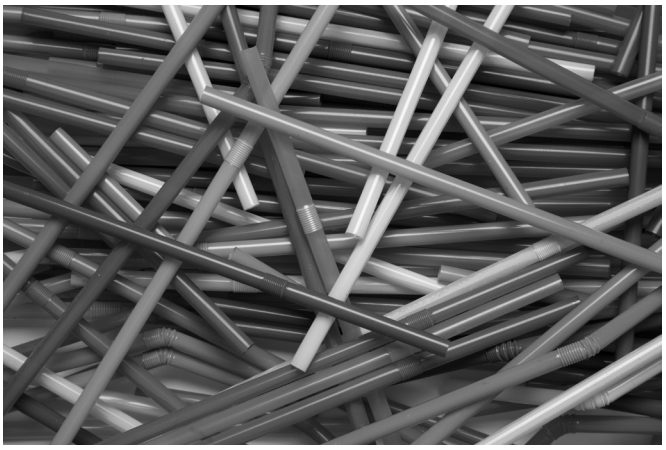
7 The following article about plastic straws is from a local newspaper.



© Victor De Schwanberg / Science Photo Library

A consultation on banning disposable plastic products will launch later this year in an effort to cut the amount of waste that ends up in rivers and oceans, entangling and endangering aquatic life.

Around 8.5 billion plastic straws are thrown away each year, with one million birds and over 100,000 sea mammals dying every year from eating and getting tangled in plastic waste. A straw may only be used for 20 minutes but it will last as waste for over 200 years.

Last year, on average, 437 items of rubbish were found per 100 m of beach in Northern Ireland and 82% of this was made of plastic.

Adapted from 'Northern Ireland should follow lead of England in banning plastic straws: MLA',
© Belfast Telegraph, Adrian Rutherford, April 20 2018

(a) From the information above suggest **two** reasons why the use of plastic straws should be banned.

1. _____

2. _____ [2]

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(b) Plastic straws are non-biodegradable.

Give **one** disadvantage of disposing of plastic straws in a landfill site.

_____

_____

_____ [1]

(c) Combustion of hydrocarbon fuels is a major source of pollution. During the combustion of these fuels carbon dioxide is produced.

Describe fully how increasing carbon dioxide levels affect the Earth.

_____

_____

_____

_____ [2]

[Turn over

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8 **(a)** A forensic scientist collected some paint fragments from the scene of a car collision. He also had a paint sample from the suspect's car.

Explain how the scientist would carry out a flame test to prove that both paint samples contain calcium ions.

Your answer should include:
- one safety precaution
- the flame colour for calcium ions.

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

[6]

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(b) The forensic scientist also collected some hair and fibre samples from the crime scene.
Name the piece of apparatus he will need to use to be able to compare the hair and fibres to the suspect's hair and fibres.

_____ [1]

(c) Fingerprints are also useful to a forensic scientist.
Name **two** types of fingerprints.

_____ and _____ [1]

[Turn over

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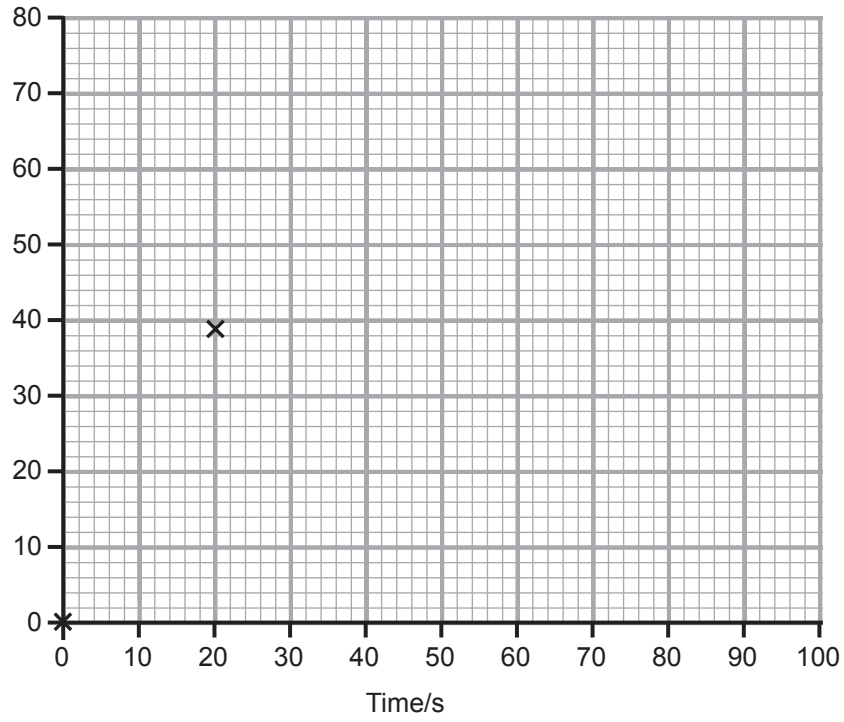
9 **(a)** A student reacted magnesium ribbon with dilute hydrochloric acid and measured the volume of gas produced over 100 seconds. The results are shown below.

Volume of gas/cm^3	0	39	58	70	77	77
Time/s	0	20	40	60	80	100

(i) On the grid below add the correct label to the y-axis. [1]

(ii) On the grid below draw a line graph for these results.
The first two points have been plotted for you.



[3]

(iii) Describe fully the trend shown by these results.

_____

_____ [2]

(iv) Use your graph to find the time it took to produce the first **50 cm^3 of gas** in this reaction.

_____ s [1]

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(v) Suggest a suitable piece of apparatus that could be used to measure the volume of hydrogen gas produced in this reaction.

_____ [1]

(vi) During which period of time was the rate of reaction fastest?
Circle the correct answer.

0 – 20 s : 20 – 40 s : 40 – 60 s : 60 – 80 s

[1]

(b) The rate of reaction between magnesium ribbon and dilute hydrochloric acid can be changed by varying the reactants and their conditions.

Complete the table below to show the effects of different conditions on the rate of the reaction.

One has been done for you.

Change	speeds up	slows down	stays the same
shaking the reactants	✓		
using powdered magnesium			
using a higher concentration of hydrochloric acid			
using a lower temperature			
using dilute sulfuric acid			

[2]

(c) The student carried out another investigation in which he reacted dilute hydrochloric acid with copper instead of magnesium.

How would the reaction using copper be different from the reaction using magnesium?

Circle the correct answer.

faster : slower : no effect : no reaction

[1]

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THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Number

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SYMBOLS OF SELECTED IONS

Positive ions

Name	Symbol
Ammonium	NH_4^+
Chromium(III)	Cr^{3+}
Copper(II)	Cu^{2+}
Iron(II)	Fe^{2+}
Iron(III)	Fe^{3+}
Lead(II)	Pb^{2+}
Silver	Ag^+
Zinc	Zn^{2+}

Negative ions

Name	Symbol
Butanoate	$C_3H_7COO^-$
Carbonate	CO_3^{2-}
Dichromate	$Cr_2O_7^{2-}$
Ethanoate	CH_3COO^-
Hydrogencarbonate	HCO_3^-
Hydroxide	OH^-
Methanoate	$HCOO^-$
Nitrate	NO_3^-
Propanoate	$C_2H_5COO^-$
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}

SOLUBILITY IN COLD WATER OF COMMON SALTS, HYDROXIDES AND OXIDES

Soluble
All sodium, potassium and ammonium salts
All nitrates
Most chlorides, bromides and iodides EXCEPT silver and lead chlorides, bromides and iodides
Most sulfates EXCEPT lead and barium sulfates Calcium sulfate is slightly soluble

Insoluble
Most carbonates EXCEPT sodium, potassium and ammonium carbonates
Most hydroxides EXCEPT sodium, potassium and ammonium hydroxides
Most oxides EXCEPT sodium, potassium and calcium oxides which react with water

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New Specification

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Data Leaflet

Including the Periodic Table of the Elements

For the use of candidates taking
Science: Chemistry,
Science: Double Award
or Science: Single Award

Copies must be free from notes or additions of any kind. No other type of data booklet or information sheet is authorised for use in the examinations

gcse examinations

chemistry

For first teaching from September 2017

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THE PERIODIC TABLE OF ELEMENTS

Group

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	64 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	210 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	285 Cn Copernicium 112						

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	145 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	242 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	245 Bk Berkelium 97	251 Cf Californium 98	254 Es Einsteinium 99	253 Fm Fermium 100	256 Md Mendelevium 101	254 No Nobelium 102	257 Lr Lawrencium 103

* 58 – 71 Lanthanum series
† 90 – 103 Actinium series

a X b

a = relative atomic mass (approx)
x = atomic symbol
b = atomic number