New Specification

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017–2018

Single Award Science
Chemistry

Unit 2
Foundation Tier

MV18

[GSA21]

THURSDAY 22 FEBRUARY 2018, MORNING

Time

1 hour, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.

Information for Candidates

The total mark for this paper is 60.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
A Data Leaflet, which includes a Periodic Table of the elements, is provided.
Quality of written communication will be assessed in Question **6(a)**.

1 **(a)** Shown below are some hazard symbols and their names.
Using lines, match each symbol to its name. The first one has been done for you. [2 marks]

Hazard symbol	Name
	toxic
	corrosive
	explosive
	flammable

(b) The symbol below was found on a bottle of acid.

What effect does acid have on human skin? [1 mark]

_____

_____

2 Fingerprints are one type of evidence that can be collected at a crime scene.

(a) Name the two types of fingerprints shown below. [1 mark for each]

Choose from:

whorl
composite
arch
loop

(i)  _____

(ii)  _____

(b) (i) Complete the following sentences about collecting a fingerprint from a crime scene. [2 marks]

Scientists dust powder over fingerprints to make them more visible. If the surface is _____ in colour then the scientist will use carbon black powder.

Fingerprints are very useful as evidence because they are _____ to every person.

(ii) Apart from using powders, give **one** other way that forensic scientists can make fingerprints more visible. [1 mark]

_____

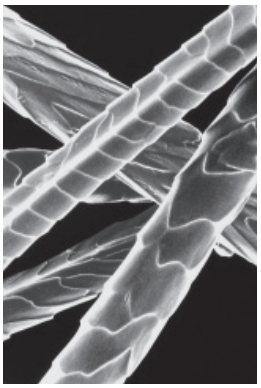
(c) Fingerprints are now commonly used as a security measure. Describe **one** way in which fingerprint recognition is used for security. [1 mark]

_____

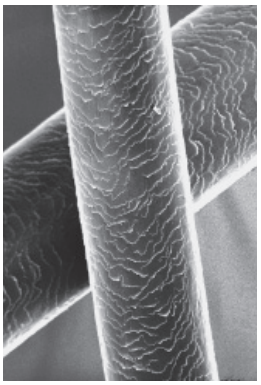
_____

(d) Below are images of four fibres as seen under a microscope.

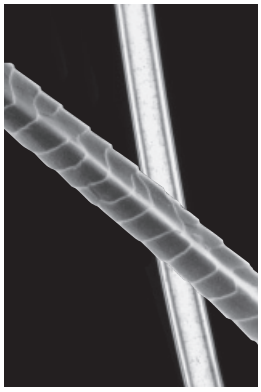

nylon


wool


cotton


hair

A scientist collected the fibres below from a crime scene.



(i) Using the images above, identify the two different fibres collected from the crime scene. [1 mark]

_____ and _____

(ii) Why might hairs collected at a crime scene be useful in helping to solve the crime? [1 mark]

_____

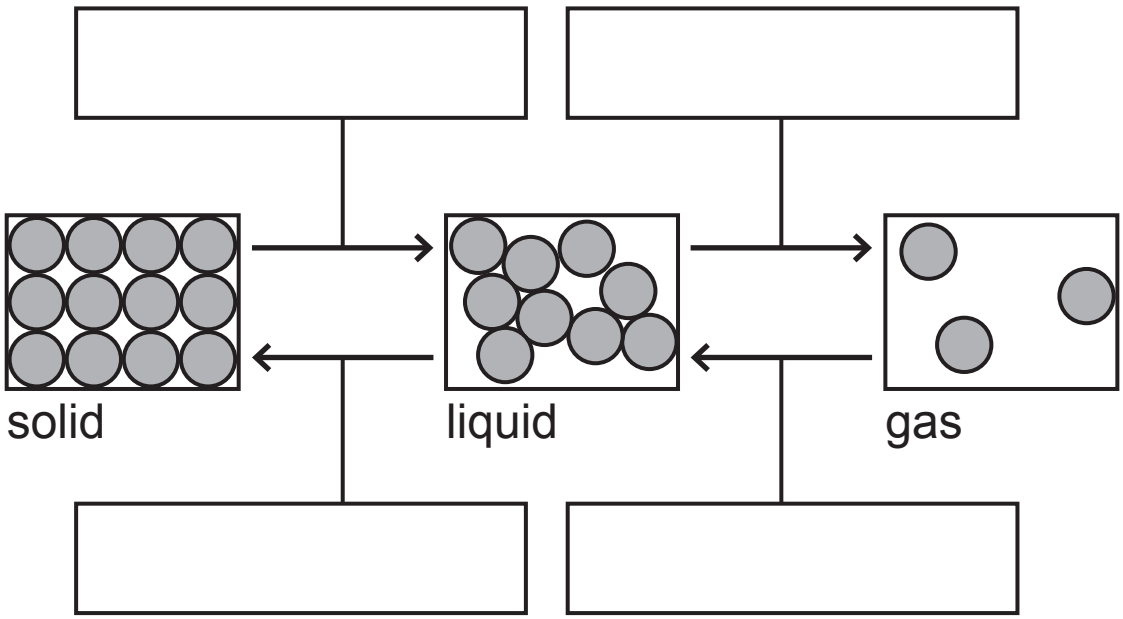
_____

3 The diagram below shows the arrangement of particles in the three states of matter. The arrows represent the change from one state to another.

(a) Complete the boxes on the diagram by naming the change of state shown by each arrow. [2 marks]

Choose from:

freezing
melting
boiling
condensing



(b) Iodine is an example of an element that can sublime.

(i) What is meant by the term element? [1 mark]

_____

_____

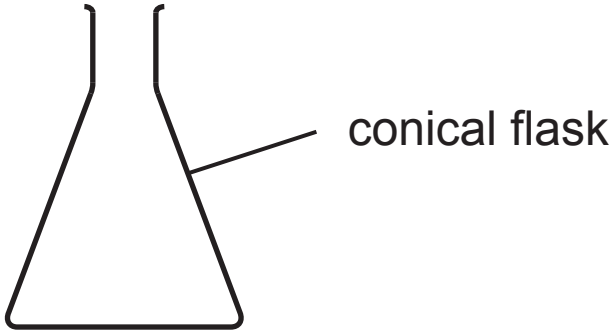
(ii) What is meant by the term sublime? [1 mark]

_____

_____

4 A student wants to separate a mixture of soil and water. She decides to use filtration.

(a) Complete and label the diagram below to show how she could set up the apparatus needed to separate the soil from the water. [2 marks]



(b) (i) Complete the table below by placing a tick (✓) in the correct column. The first one has been done for you. [1 mark]

Mixture	**Can be separated using filtration**	**Cannot be separated using filtration**
salt and water		✓
sand and water		
sugar and water		

(ii) Explain why filtration will **not** separate salt and water. [1 mark]

_____

_____

(iii) Name **one** method that can be used to separate salt from water. [1 mark]

_____

5 A student made a chemical indicator from blueberries and used it to test some substances. His results are shown below.

Substance	pH	Colour
water	7	green
vinegar	4	purple
hydrochloric acid	2	red
baking soda	9	green
sodium hydroxide	12	green

(a) Why can blueberry juice be described as an indicator? [2 marks]

(b) Describe how a chemical indicator can be made from blueberries. [3 marks]

(c) Use the information from the student's results to complete the table below. [2 marks]

Substance	Colour of blueberry indicator
weak acid	
strong acid	
neutral	green

(d) Another student had two beakers of colourless liquids; one was water and one was sodium hydroxide. Explain why the blueberry indicator could not be used to tell which was which. [1 mark]

_____

_____

(e) Give **one** advantage of using a pH sensor (meter) rather than a chemical indicator. [1 mark]

_____

6 **(a)** Sodium and potassium are both alkali metals that react with cold water. Describe how a teacher could demonstrate these reactions. [6 marks]

Your answer should also include:

- **all** the relevant safety precautions
- **two** similarities in the observations during these reactions
- **one** difference in the observations during these reactions

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

(b) Complete the word equation below for the reaction of sodium with water. [2 marks]

sodium + water → ☐ + ☐

7 Shown below is part of Mendeleev's table of elements.

I	II	III	IV	V	VI	VII			
H									
Li	Be	B	C	N	O	F			
Na	Mg	Al	Si	P	S	Cl			
K	Ca		Ti	V	Cr	Mn	Fe	Co	Ni
Cu	Zn			As	Se	Br			

(a) In what order did Mendeleev set out the elements? [1 mark]

_____

(b) Name the Group of elements in the modern Periodic Table that was **not** in Mendeleev's table. Suggest **one** reason why this Group was not in his table. [2 marks]

_____

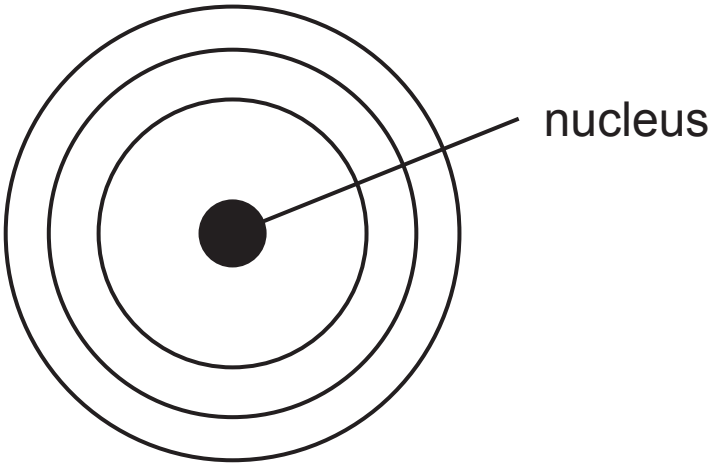
_____

_____

(c) Using the Data Leaflet provided and your knowledge, name **one** element that is now placed in a different position to where it was placed in Mendeleev's table. [1 mark]

_____

(d) Magnesium is in Group 2 of the Periodic Table.
Complete the diagram below to show the electronic configuration (structure) of a magnesium atom.
[1 mark]



8 Calcium metal and calcium hydroxide both react with hydrochloric acid.

(a) Complete the table below by ticking (✓) the boxes to show the products formed in the reaction between calcium metal and hydrochloric acid. [2 marks]

Reaction	**Products formed**			
	a salt	**water**	**hydrogen**	**carbon dioxide**
calcium hydroxide and hydrochloric acid	✓	✓		
calcium metal and hydrochloric acid				

(b) When calcium metal is added to hydrochloric acid, there is an increase in temperature. What name is given to this **type** of reaction that gives out heat? [1 mark]

_____

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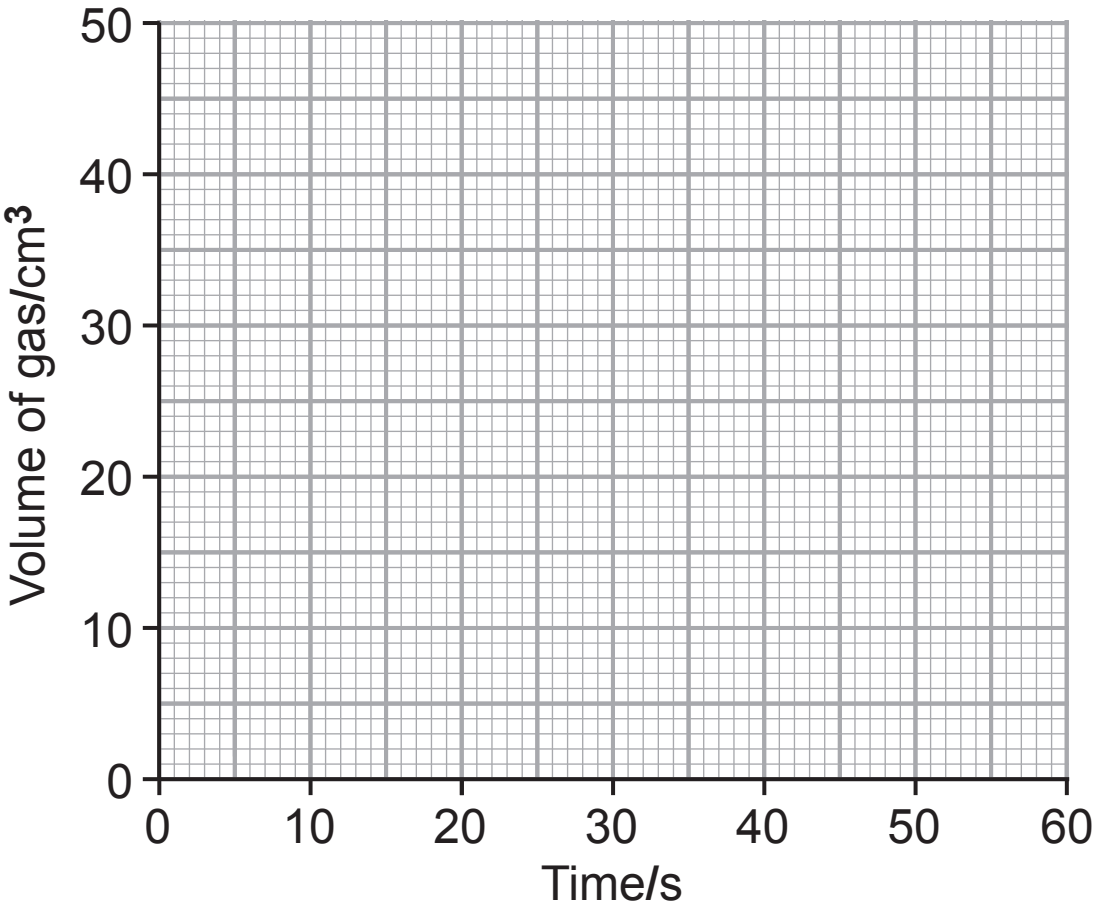
(Questions continue overleaf)

9 When acid is added to sodium hydrogencarbonate a gas is produced.
The table below shows the volume of gas produced by this reaction over 60 seconds.

Time/s	0	10	20	30	40	50	60
Volume of gas/cm^3	0	18	34	45	48	48	48

(a) On the grid below plot a **line** graph for these results.
[3 marks]



(b) Describe fully the trend shown by these results.
[2 marks]

(c) The gas produced during this reaction is carbon dioxide.

(i) Name the chemical used to test for carbon dioxide. [1 mark]

_____

(ii) Give the colour change observed during the test for carbon dioxide. [2 marks]

_____ to _____

(d) Sodium hydrogencarbonate has the formula $NaHCO_3$.

(i) How many elements are represented by this formula? [1 mark]

_____

(ii) How many atoms are represented by this formula? [1 mark]

_____

10 Burning hydrocarbons such as butane causes an increase in the amount of greenhouse gases.

(a) Describe **two** effects of increasing amounts of greenhouse gases. [2 marks]

1. _____

_____

2. _____

_____

(b) Butane has the molecular formula C_4H_{10}.

(i) In the space below draw the structural formula of butane. [1 mark]

(ii) Give the molecular formula for:

1. methane _____
2. propane _____ [2 marks]

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	
10	
Total Marks	

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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Rewarding Learning

New Specification

Rewarding Learning

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

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