Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017–2018

Double Award Science: Chemistry

Unit C1
Foundation Tier

ML

[GSD21]

THURSDAY 17 MAY 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.
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 70.
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 **7(b)**.
A Data Leaflet, which includes a Periodic Table of the elements is provided.

1 Look at the boxes in the two lists below. Draw a line from each substance to the correct statement about this substance.

Substance	Statement
carbon dioxide	Bleaches litmus paper
water	Is a base that reacts with acids to form salts
magnesium sulfate	Turns limewater milky white
hydrogen	Is a white solid at room temperature
copper oxide	Turns anhydrous copper sulfate from white to blue
	Makes a popping sound when tested with a lit splint

[5]

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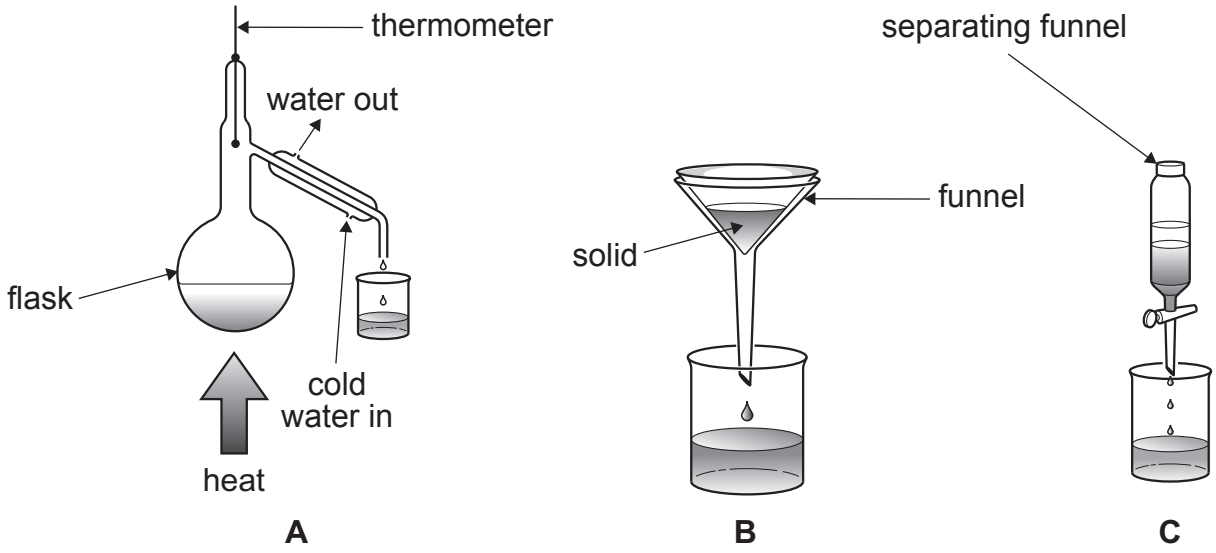
(Questions continue overleaf)

2 The diagrams **A**, **B** and **C** below show three different ways of separating mixtures.



Source: CCEA

Read the sentences below.
Circle the correct answer in the box.

(i) The method of separation in diagram **A** is

evaporation.
filtration.
distillation.

[1]

(ii) The liquid in the beaker of diagram **B** is the

distillate.
filtrate.
residue.

[1]

(iii) The solid in the funnel in diagram **B** is the

distillate.
filtrate.
residue.

[1]

(iv) The liquids in the separating funnel in diagram **C** are

immiscible.
miscible.
soluble.

[1]

(v) A

solute
solvent
solution

of salt and water will pass through the funnel in diagram **B**. [1]

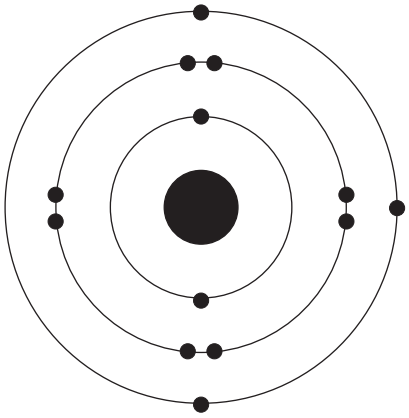
[Turn over

3 **(a)** Look at the table below. It shows the relative charge and relative mass of the three particles found in an atom.
Fill in the missing answers.

Particle	Relative mass	Relative charge
proton		+1
electron	$\frac{1}{1840}$	
neutron	1	

[3]

(b) Look at the diagram below. It shows the electronic structure of an atom of aluminium. This has an atomic number of 13 and a mass number of 27.



(i) Fill in the table below to show the number of electrons, protons and neutrons in an atom of aluminium.

Particle	Number present in an atom of aluminium
proton	
electron	
neutron	

[3]

(ii) How many electron shells are there in an atom of aluminium?

_____ [1]

(iii) Why does an aluminium atom not have a charge?

_____ [1]

[Turn over

4 **(a)** Look at the sentences below. They are about the development of the Periodic Table. Fill in the missing answers.

(i) Who wrote the Law of Octaves? _____ [1]

(ii) Newlands and Mendeleev both arranged the chemical elements by their atomic _____. [1]

(iii) Elements with similar properties are placed in the same _____ of the Periodic Table. [1]

(b) Look at the sentence below. Circle the correct answer in the box.

All noble gases have

seven outer electrons.
eight outer electrons.
full outer shells.

[1]

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(Questions continue overleaf)

5 **(a)** Look at the table below. It gives information about five solutions, A, B, C, D and E.

(i) Fill in the table by adding the missing colours.

Solution	pH	Colour with universal indicator	Colour with red litmus	Colour with blue litmus
A	1	red	red	
B	10	blue		blue
C	7		red	blue
D	4	orange		
E	14		blue	blue

[3]

Look again at the solutions in the table **above**.
These solutions are named below.

(ii) Use the information to put A, B, C, D or E beside the solution named.

Chemical name	Solution
ethanoic acid	
sodium hydroxide	
ammonia	
sodium chloride	
sulfuric acid	

[4]

(b) Look at the word equation below. It shows the reaction between hydrochloric acid and copper(II) oxide:

hydrochloric acid + copper(II) oxide → copper(II) chloride + water

If some warm dilute hydrochloric acid is added to a beaker of copper(II) oxide, write down what you would **see** happening in the beaker.

_____

_____

_____ [3]

(c) Finish the word equation for the following reaction.

sodium hydroxide + sulfuric acid → [ ] + [ ]

[2]

(d) What are the units of concentration of acids?
Circle the correct answer.

mol/dm^3 grams/litre dm^3/mol mol/cm^3

[1]

[Turn over

6 Read the paragraph below about lithium and some of its uses. With this information and your own knowledge and understanding, answer the questions that follow.

Lithium is a very light, soft Group 1 metal and is an excellent conductor of electricity. Lithium can be extracted by electrolysis of molten lithium chloride. Lithium is used in making batteries for mobile phones and golf trolleys. Lithium–aluminium alloys are used in the manufacture of aircraft, bicycle frames and high speed trains.

(a) (i) What is the name of the Group 1 elements?

_____ [1]

(ii) How are lithium and the other Group 1 elements stored in the laboratory?

_____ [1]

(b) (i) What does **electrolysis** mean?

_____

_____ [2]

(ii) Electrolysis of molten lithium chloride produces lithium and what other substance?

_____ [1]

(c) Why is lithium used in batteries for mobile phones and golf trolleys?

_____ [1]

(d) Give two main advantages of using lithium–aluminium alloys.

1. _____

2. _____ [2]

(e) Some people are worried that we may run out of lithium.

Write down why we might run out of lithium:

_____

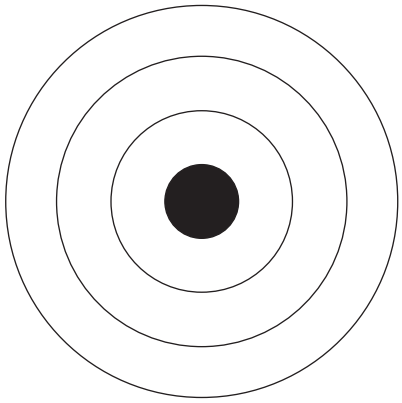
How can we improve this situation?

_____ [2]

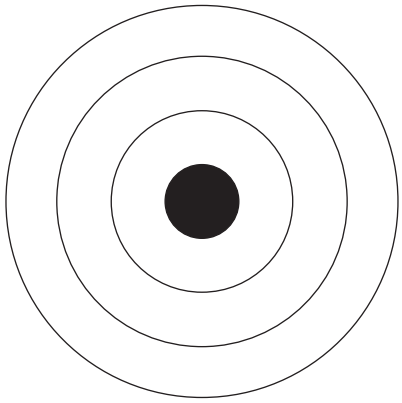
[Turn over

7 Sodium reacts with sulfur to form a compound called sodium sulfide.

(a) Finish the diagrams below to show the electronic structures of:



a sodium **atom**



a sulfur **atom**

[2]

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

Describe in words:

1. how the electronic structures of both the sodium atom and the sulfur atom change in order to form sodium sulfide. Your answer should include the charges on the ions formed, and the formula of the compound produced.

2. at least two physical properties you would expect sodium sulfide to have.

[6]

[Turn over

8 **(a)** What is a covalent bond?

_____ [1]

(b) Draw a dot and cross diagram to show how covalent bonding occurs in a chlorine molecule, Cl_2. Show all the electrons.

[3]

(c) Finish the three sentences below by adding the missing words:

Covalent bonding is typical of _____ elements and compounds.

The term diatomic means that there are _____ atoms

covalently bonded in a _____.

Covalent bonds are _____ and _____

amounts of _____ are needed to break them. [6]

9 Look at the table below. It shows that some salts are soluble (S) or insoluble (I) in water.

anion / cation	carbonate	chloride	nitrate	sulfate
sodium	S	S	S	S
lead	I	I	S	I
magnesium	I	S	S	S
ammonium	S	S	S	S
calcium	I	S	S	S

(a) Use the information in the table to finish the sentences that follow:

(i) For the **cations**:

All _____ and _____

salts are soluble. [2]

(ii) For the **anions**:

All chlorides are _____ except

for _____. [1]

(b) Do you think sodium bromide and zinc nitrate are soluble (S) or insoluble (I) in water?

sodium bromide _____ zinc nitrate _____ [2]

(c) A colourless sodium chloride solution is mixed with a colourless lead nitrate solution. Why does the mixture turn white?

_____

_____

_____ [2]

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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

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
Carbonate	CO_3^{2-}
Dichromate	$Cr_2O_7^{2-}$
Ethanoate	CH_3COO^-
Hydrogen carbonate	HCO_3^-
Hydroxide	OH^-
Methanoate	$HCOO^-$
Nitrate	NO_3^-
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

Rewarding Learning

DATA LEAFLET

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.

Contents **Page**

gcse
science
chemistry
double award
single award

Rewarding Learning

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	99 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	263 Sg Seaborgium 106	262 Bh Bohrium 107	265 Hs Hassium 108	266 Mt Meitnerium 109	269 Ds Darmstadtium 110	272 Rg Roentgenium 111	285 Cn Copernicium 112						

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

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

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 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