

New
Specification



Rewarding Learning

General Certificate of Secondary Education
2017–2018

Centre Number

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Candidate Number

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Double Award Science: Chemistry

Unit C1
Foundation Tier

ML

[GDW21]

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 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 **7(b)**.

A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

- 1 Look at the lists of substances and statements below. Draw lines to match each substance to the correct statement.

Substance	Statement
carbon dioxide	Bleaches damp universal indicator paper
magnesium oxide	Makes a popping sound when tested with a lit splint
iron	Turns limewater milky white
hydrogen	Relights a glowing splint
chlorine	Is one of the transition elements
	Reacts with sulfuric acid to form a salt and water only

[5]

- 2 (a) Look at the table below. Complete the table to show the relative charge and relative mass of the three particles found in an atom.

Particle	Relative charge	Relative mass
proton		1
neutron	0	
electron		$\frac{1}{1840}$

[3]

- (b) A fluorine atom has an atomic number of 9 and a mass number of 19.

- (i) Complete the table below to show the number of electrons, protons and neutrons in a fluorine atom.

Particle	Number present in an atom of fluorine
proton	
neutron	
electron	

[3]

- (ii) Why does a fluorine atom have no electrical charge?

_____ [1]

- (iii) What is the chemical symbol for fluorine?

_____ [1]

[Turn over

3 (a) Answer the questions below about the Periodic Table and its development.

(i) Why did Mendeleev leave gaps in his Periodic Table?

_____ [1]

(ii) Give three differences between Mendeleev's Periodic Table and the modern Periodic Table.

1. _____
2. _____
3. _____ [3]

(b) Complete the sentence below by circling the correct answer from the box.

All elements in the same Group have the same number of

outer electrons.

electrons.

shells.

[1]

4 Look at the balanced symbol equation below and answer the questions which follow:



(a) How many **products** are shown in this equation?

_____ [1]

(b) How many **compounds** are shown in this equation?

_____ [1]

(c) Write the **names** of all **five elements** whose **symbols** appear in the equation.

_____ [1]

(d) What does the **(aq)** written after 2NaNO_3 mean?

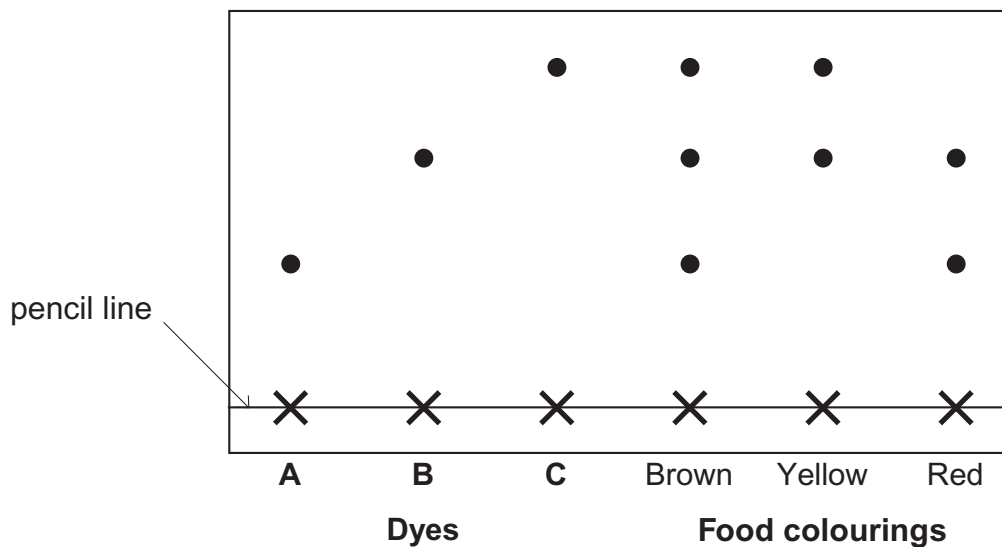
_____ [1]

(e) What is the name of the substance with the formula Na_2CO_3 ?

_____ [1]

[Turn over

- 5 Look at the diagram below. It shows the results of an experiment to find out which dyes (A, B or C) were present in brown, yellow and red food colourings.



- (a) (i) What name is given to the separation technique used?

_____ [1]

- (ii) Why is the line drawn in pencil and not in ink?

_____ [1]

- (b) Which food colouring contains all three dyes?

_____ [1]

- (c) Which dye (A, B or C) is the **least** soluble in the solvent used? Give a reason for your answer.

Dye: _____

Reason: _____

_____ [2]

6 Read the article below which is about nanoparticles in sun creams. Answer the questions that follow.

Today many sun creams use nanoparticles. These sun creams are very good at absorbing ultraviolet radiation which can be harmful to the skin. Due to their particle size, these sun creams spread more easily, and cover the skin better, which also saves money because less is needed. They are also transparent, unlike the more traditional sun creams which are white.

Nanoparticles of titanium oxide are used in some sun creams. Normal sized particles of titanium oxide are also used.

It is thought that nanoparticles can pass through the skin and travel more easily around the body than normal sized particles. It is possible that nanoparticles could be toxic to some types of cells such as skin, bone, brain and liver cells.

(a) How many atoms are in a typical nanoparticle?

Circle the correct answer.

a few a few hundred a few million a few billion

[1]

(b) Give three advantages of using sun creams which contain nanoparticles. Do not write about the cost.

1. _____

2. _____

3. _____ [3]

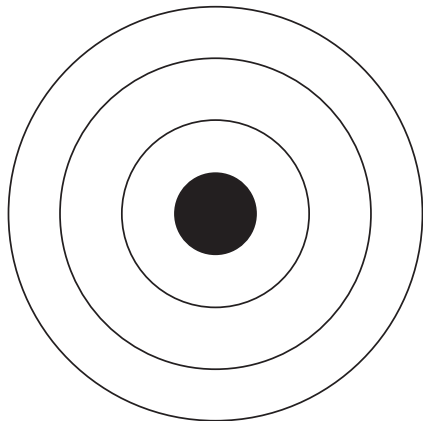
(c) Sun creams that contain nanoparticles may be a risk to the body. Why?

_____ [2]

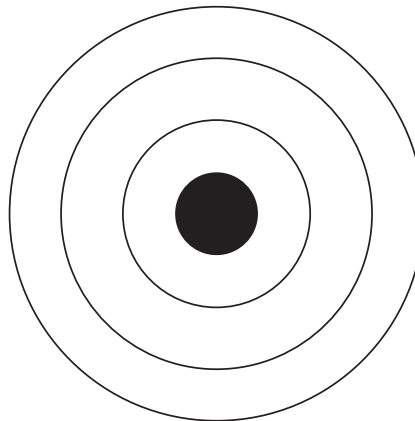
[Turn over

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

(a) Complete 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.

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

[6]

[Turn over

8 (a) What is a covalent bond?

_____ [1]

(b) In the space below draw a dot and cross diagram to show how covalent bonding occurs in a hydrogen chloride molecule, HCl. Show all the electrons.

[3]

(c) Complete the three sentences below by filling in the missing words:

Covalent bonding is typical of _____ elements and compounds.

Covalent bonds are strong and _____ amounts
of _____ are needed to break them.

Forces between covalent molecules are _____ and are
called _____ forces.

[5]



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(Questions continue overleaf)

9 This question is about relative formula masses, moles and the percentage of an element by mass in a compound.

(a) Complete the sentence below to define the term **relative atomic mass**.

The relative atomic mass (A_r) of an atom is the _____

_____ [3]

(b) Calculate the relative formula mass of each of the following substances.
(relative atomic masses: C = 12, N = 14, O = 16, Mg = 24, Ca = 40)

(i) calcium carbonate, CaCO_3

_____ [1]

(ii) magnesium nitrate, $\text{Mg}(\text{NO}_3)_2$

_____ [1]

(c) The relative formula mass of ethane, C_2H_6 , is 30.

(i) Calculate the number of moles in 150 g of ethane.

_____ [1]

(ii) Calculate the percentage of carbon, by mass, in ethane, C_2H_6 .

Show your working out.

_____ [3]

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For Examiner's use only	
Question Number	Marks
1	
2	
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7	
8	
9	

Total Marks	
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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	$\text{C}_3\text{H}_7\text{COO}^-$
Carbonate	CO_3^{2-}
Dichromate	$\text{Cr}_2\text{O}_7^{2-}$
Ethanoate	CH_3COO^-
Hydrogencarbonate	HCO_3^-
Hydroxide	OH^-
Methanoate	HCOO^-
Nitrate	NO_3^-
Propanoate	$\text{C}_2\text{H}_5\text{COO}^-$
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}



New
Specification

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

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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gcse examinations chemistry

For first teaching from September 2017

THE PERIODIC TABLE OF ELEMENTS

Group

												1 H Hydrogen 1						4 He Helium 2	
		1	2											3	4	5	6	7	0
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								

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

$\begin{matrix} a \\ \boxed{X} \\ b \end{matrix}$ a = relative atomic mass (approx)
 x = atomic symbol
 b = atomic number

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