New Specification

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2018–2019

Double Award Science: Chemistry

GDW21

Unit C1
Foundation Tier

[GDW21]

THURSDAY 8 NOVEMBER 2018, MORNING

TIME

1 hour.

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 eight** questions.

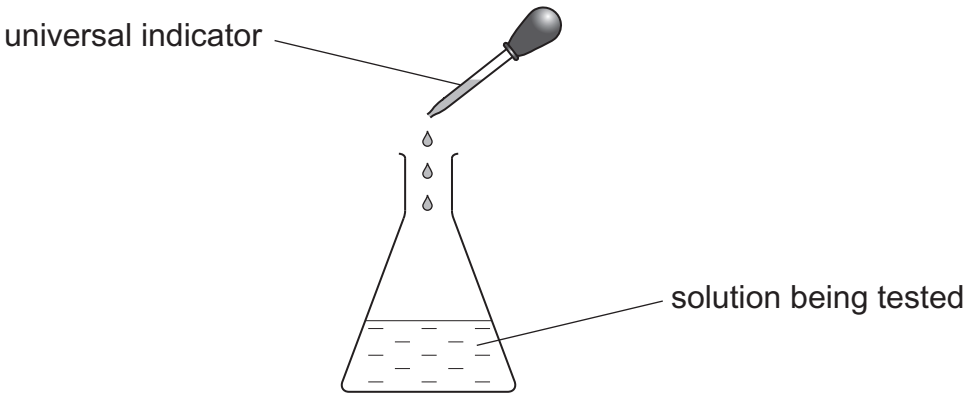
INFORMATION FOR CANDIDATES

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 in this question paper.

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

Examiner Only	
Marks	Remark

1 **(a)** A student added a few drops of universal indicator to two different solutions.
Both solutions changed colour.



(i) Complete the table below to show the colour of the solutions after universal indicator had been added.

Solution	Colour with universal indicator
dilute hydrochloric acid	
dilute sodium hydroxide	

[2]

(ii) What colour is a solution of universal indicator in water?

_____ [1]

(b) **(i)** A juice drink turned universal indicator orange. What pH would you expect the drink to be? Circle the correct answer.

2 **5** **7** **10**

[1]

(ii) A soap solution has a pH of 9. Which indicator would **not** change colour in the soap solution? Circle the correct answer.

blue litmus **red litmus** **universal indicator**

[1]

(c) All acids dissolve in water to produce the same ion. What is the formula for this ion? Circle the correct answer.

H **H^+** **H^-** **OH^-** **H_2** **OH**

[1]

(d) When lumps of calcium carbonate are added to dilute hydrochloric acid, a reaction occurs.

(i) Complete the word equation for the reaction

calcium carbonate + hydrochloric acid → + + water

[2]

(ii) Describe two observations that can be made during this reaction.

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

2 **(a)** Blue ink is a mixture of three coloured dyes.

Describe how you would use paper chromatography to prove this statement.

_____

_____

_____

_____

_____

_____ [3]

(b) Water may be used as a solvent in chromatography.

(i) Name the copper(II) compound used to test for water.

_____ [2]

(ii) Describe what is observed when a few drops of water are added to this copper(II) compound.

_____

_____ [2]

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

3 The Periodic Table contains all the known elements.

(a) Explain what is meant by the term element.

_____

_____ [1]

(b) The symbols of some elements are given below:

Al Ar C Cl Fe Na O P

Use **only** the elements listed above to answer the questions which follow.

(i) Give the symbol for the element with 4 electrons in its outer shell.

_____ [1]

(ii) Give the symbol for the element which is found in Group 6 and in Period 2.

_____ [1]

(iii) **Name** an element that is malleable.

_____ [1]

(iv) Which of the elements has the highest atomic number?

_____ [1]

(c) Some properties of four elements, A, B, C, and D are given in the table below.

Element	Melting point/°C	Boiling point/°C
A	–7	59
B	98	883
C	–101	-35
D	660	1221

Use the information in the table to answer the following questions.

(i) Which element A, B, C or D could be bromine?

_____ [1]

(ii) Which element A, B, C or D could be chlorine?

_____ [1]

(iii) Which element A, B, C or D could be aluminium?

_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 When sodium is added to water it moves on the surface of the water, fizzes as a gas is produced and heat is released.

(a) Give two **other** observations from the reaction of sodium with water.

1. _____

2. _____ [2]

(b) Complete the sentences below by circling the correct answers:

(i) The density of sodium is

less than
the same as
more than

that of water. [1]

(ii) The gas produced when sodium reacts with

water is

carbon dioxide.
hydrogen.
oxygen.

[1]

(c) Write a balanced symbol equation for the reaction of sodium with water.

_____ [3]

(d) The image shows some sodium stored in a jar.

© Andrew Lambert Photography / Science Photo Library

Choose words from the list below to complete the sentence about storing sodium.

oil	**nitrogen**	**water**
air	**acid**	**oxygen**

Sodium is stored under _____ to prevent it reacting with _____ and water vapour which are present in _____. [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

5 Atoms and ions are made up of the three subatomic particles: protons, electrons and neutrons.

(a) Information about an atom of indium is shown below.

$$^{115}_{49}\text{In}$$

(i) How many neutrons does this atom of indium contain?

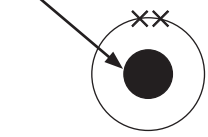
_____ [1]

(ii) Indium forms an indium(III) ion, In^{3+}. How many electrons would this ion contain?

_____ [1]

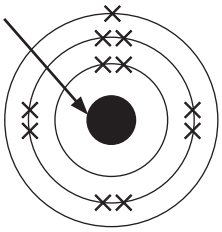
(b) The diagrams below show some atoms and ions of elements in the Periodic Table. They are labelled **Q**, **R**, **S**, **T**, **U** and **V**.

3 protons
4 neutrons



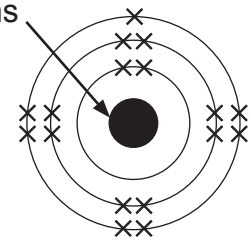
Q

11 protons
12 neutrons



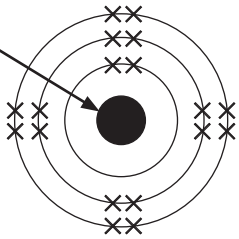
R

17 protons
20 neutrons



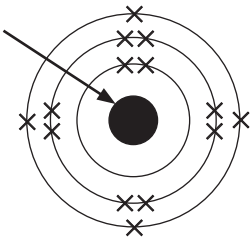
S

19 protons
20 neutrons



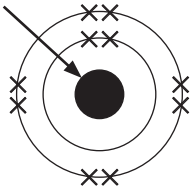
T

14 protons
14 neutrons



U

8 protons
8 neutrons



V

(i) Complete the table below about the atoms and ions **Q** to **V**. Some information has already been filled in.

Atom or Ion	Atomic number	Mass number	Number of electrons	Electronic configuration
Q	3		2	2
R	11	23		2,8,1
S		37		2,8,7
T	19	39	18	
U	14		14	
V		16	10	2,8

[4]

(ii) Which of the diagrams **Q, R, S, T, U** or **V** represent ions?

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 Iodine is a halogen which has a molecular covalent structure. If some iodine is placed in a boiling tube and gently heated, the iodine sublimes. The experiment should be carried out in a fume cupboard.

Demonstrate your understanding of the above paragraph.

You should:
- Describe what is observed in the boiling tube when iodine sublimes
- Explain why the experiment should be carried out in a fume cupboard
- Explain, in terms of having a molecular covalent structure, why iodine sublimes

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

Describe what is observed in the boiling tube when iodine sublimes.

Explain why the experiment should be carried out in a fume cupboard.

Explain, in terms of having a molecular covalent structure, why iodine sublimes.

[6]

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(Questions continue overleaf)

Examiner Only	
Marks	Remark

7 Iron and copper form a variety of compounds.

(a) Calculate the relative formula mass (M_r) of the following compounds which contain iron.
(relative atomic masses: C = 12, O = 16, S = 32, Cl = 35.5, Fe = 56)

(i) $FeCl_2$

_____ [1]

(ii) $FeCO_3$

_____ [1]

(iii) $Fe_2(SO_4)_3$

_____ [1]

(b) Complete the sentence below.

The mass of one mole of a substance in grams is _____

_____

_____ [1]

(c) The relative formula mass of copper(II) carbonate is 124.

Examiner Only	
Marks	Remark

(i) What is the mass of 0.40 moles of copper(II) carbonate?

_____ g [1]

(ii) How many moles are present in 186 g of copper(II) carbonate?

_____ [1]

Examiner Only	
Marks	Remark

8 Non-metallic elements and compounds contain covalent bonds.

(a) What is meant by the term **single covalent bond**?

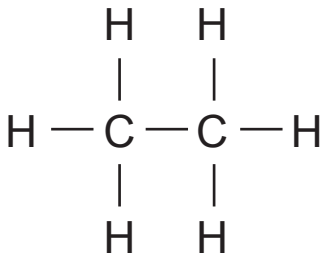
_____

_____ [1]

(b) Draw a dot and cross diagram of a molecule of chlorine (Cl_2).
Show the outer electrons only.

[3]

(c) Ethane is a chemical found in natural gas and has the formula C_2H_6.
The diagram below represents a molecule of ethane.



How many covalent bonds are shown in the diagram above?

_____ [1]

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112901

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

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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

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