



General Certificate of Secondary Education
2023–2024

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

Double Award Science: Chemistry

Unit C1

Foundation Tier



[GDW21]

GDW21

WEDNESDAY 22 MAY 2024, 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 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 **8(b)**.

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

You may use a scientific calculator.

14365.06R



16GDW2101

1 Group 7 in the Periodic Table is a group of reactive non-metal elements.

(a) (i) What name is given to Group 7 in the Periodic Table?

_____ [1]

(ii) The elements in Group 7 are diatomic. What is meant by the term diatomic?

_____ [2]

(iii) Complete the following table to give the correct colour and physical state of the Group 7 elements at room temperature (20 °C).

Element	Colour	Physical state
fluorine	yellow	
chlorine		gas
bromine	red-brown	
iodine		solid

[4]

(iv) State the trend in the reactivity of the Group 7 elements as you go down the group.

_____ [1]

(b) Solid iodine changes directly into a purple gas when heated.
Name this change of state.

_____ [1]



- (c) Chlorine is used in swimming pools to kill bacteria. Pool attendants often test for the levels of chlorine, in order to keep the water safe for swimmers.

Choose words from the list below to complete the sentence to give the correct positive test for chlorine.

blue white purple red green

Damp universal indicator paper changes to _____

and then bleaches _____. [2]



2 Atoms are made up of three types of subatomic particles, protons, electrons and neutrons.

(a) Complete the table below about three different atoms. (You may find the Data Leaflet useful.)

Atom	Number of protons	Number of electrons	Number of neutrons
nitrogen		7	
potassium	19		
	3		4

[3]

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

(i) The total number of protons and neutrons in an atom

is the

atomic number.

group number.

mass number.

[1]

(ii) The number of protons in an atom is the

atomic number.

group number.

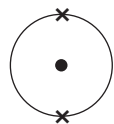
mass number.

[1]

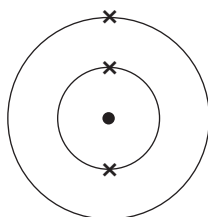


(c) The electronic configuration gives the arrangement of electrons in an atom.

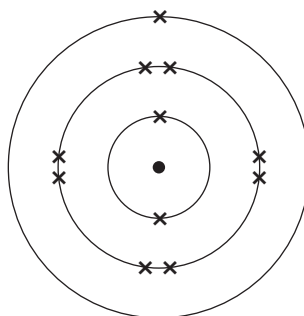
Look at the electronic configurations below and answer the following questions.



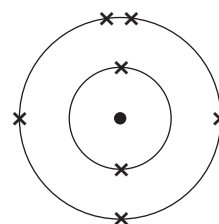
Atom A



Atom B



Atom C



Atom D

(i) How many electrons are in the first shell of **Atom B**? _____ [1]

(ii) Write the electronic configuration of **Atom C**. _____ [1]

(iii) Which atom has a full outer shell? _____ [1]

(iv) Which two atoms belong to the same group? _____ [1]

[Turn over



- 3 In the test for carbon dioxide gas, carbon dioxide is bubbled through limewater (calcium hydroxide solution). If carbon dioxide is present the limewater changes from colourless to milky.

The word equation for the reaction is given below.



- (a) How many products are in this reaction?

_____ [1]

- (b) Name the compound in the reaction that has a boiling point of 100 °C.

_____ [1]

- (c) Write the formula of calcium hydroxide.

_____ [1]

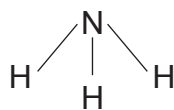
- (d) Complete the table below with the correct state symbols for the compounds given.

Compound	State symbol
carbon dioxide	
water	
calcium hydroxide	(aq)

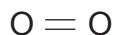
[1]



4 Below are the diagrams for five covalent molecules labelled **A**, **B**, **C**, **D** and **E**.



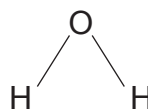
A



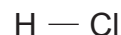
B



C



D



E

(a) Define the term **covalent bond**.

_____ [1]

(b) Choose from the covalent molecules labelled **A**, **B**, **C**, **D** and **E**, the letter which matches the following statements.

An element

A molecule with 4 atoms

A molecule with four covalent bonds

[3]

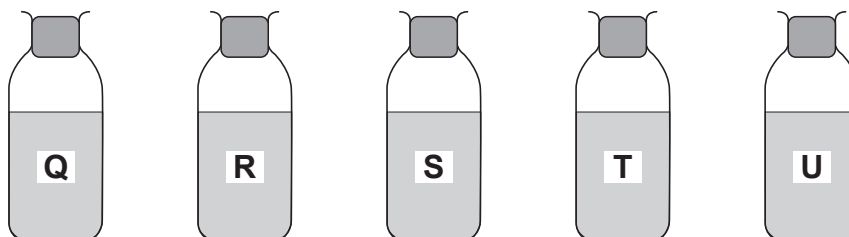
(c) Draw the dot and cross diagram for a molecule of chlorine (Cl_2) showing the outer electrons only.

[3]

[Turn over]



- 5 A pH meter was used to obtain pH readings for five solutions labelled **Q**, **R**, **S**, **T** and **U**. The results are shown in the table below.



- (a) (i) Use ticks (✓) to identify each solution as an acid, an alkali or neutral. One has been completed.

Solution	pH	Acid	Alkali	Neutral
Q	1.9	✓		
R	4.5			
S	7.0			
T	8.9			
U	12.6			

[4]

Use the table to answer the following:

- (ii) Which solution is a strong acid?

[1]



(b) Name the hazard symbol commonly seen on bottles of concentrated acid.

_____ [1]

(c) The table below gives information about three salts formed when three acids react with three alkalis. Complete the table by filling in all the gaps.

Acid	Alkali	Salt
hydrochloric acid	potassium hydroxide	
	sodium hydroxide	sodium sulfate
ethanoic acid		potassium ethanoate

[3]

[Turn over

14365.06R



16GDW2109

- 6 Silver nitrate solution reacts with sodium chloride solution to give a white precipitate of silver chloride and sodium nitrate solution.

8.50 g of silver nitrate was added to 0.05 moles of sodium chloride.

(Relative atomic masses (A_r): Ag = 108; Cl = 35.5; N = 14; O = 16)

- (a) (i) Calculate the relative formula mass (M_r) of silver nitrate, AgNO_3 .

_____ [1]

- (ii) Determine the number of moles of silver nitrate in 8.50 g.

_____ [1]

- (iii) The relative formula mass (M_r) of sodium chloride is 58.5. Calculate the mass of 0.05 moles of sodium chloride.
Give your answer to **2** decimal places.

_____ g [2]



- (b) Calculate the percentage by mass of **chlorine** in silver chloride, AgCl, using the equation below. The relative formula mass (M_r) of silver chloride is 143.5.

$$\% \text{ of element Cl in a compound} = \frac{(\text{number of atoms of Cl in a compound}) \times (A_r \text{ of Cl})}{M_r \text{ of compound}} \times 100$$

Show your working.

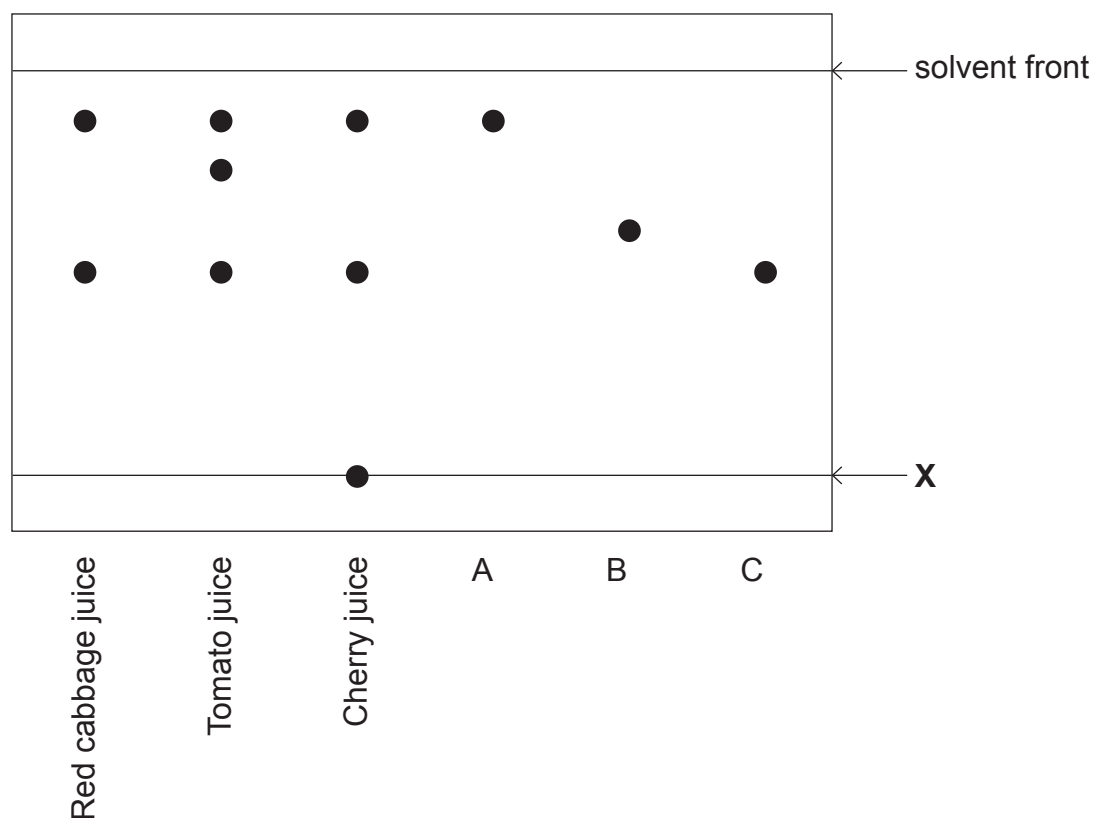
_____ % [2]



- 7 A student investigates the dyes in some different fruit and vegetable juices.

A spot of each juice is dotted onto chromatography paper, along with three dyes A, B and C.

The diagram shows the chromatogram at the end of the experiment.



- (a) Give the correct name for the line labelled X.

_____ [1]

- (b) Which one of the juices contains **only** two dyes?

_____ [1]

- (c) Which one of the dyes A, B or C is **not found** in any of the juices?

_____ [1]



(d) Which of the dyes A, B or C is **most soluble** in the solvent?

_____ [1]

(e) Which one of the juices contains a dye that is **insoluble** in the solvent?

_____ [1]

(f) What is the total number of **different** dyes in red cabbage juice and tomato juice?

_____ [1]

[Turn over

14365.06R

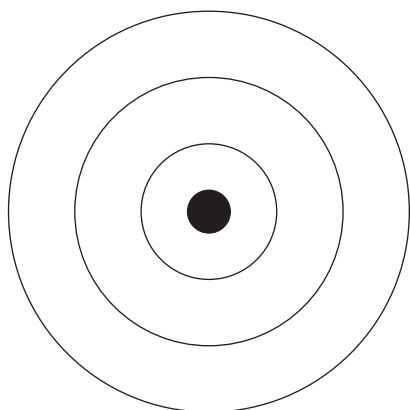


16GDW2113

8 Potassium chloride is an ionic compound used in medicine to treat and prevent low blood pressure.

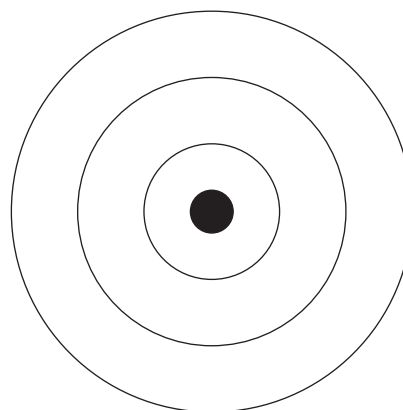
- (a) Potassium chloride is formed when potassium atoms and chlorine atoms react to form ions. Complete the diagrams below to show the electronic configuration of the potassium ion and the chloride ion. Include the charges.

Potassium ion



Charge _____

Chloride ion



Charge _____

[2]



- (b) The physical properties of ionic compounds depend on their structure and bonding.

Discuss the bonding, structure and physical properties of potassium chloride using the following headings:

- Define the term ionic bond
- Name the type of structure found in potassium chloride
- Explain why potassium chloride has a high melting point
- State and explain the electrical conductivity of molten potassium chloride

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

Define the term ionic bond

Name the type of structure found in potassium chloride

Explain why potassium chloride has a high melting point

State and explain the electrical conductivity of molten potassium chloride

[6]

14365.06R



16GDW2115

Sources:

Question 2(c) . . . Principal Examiner

Question 5 Principal Examiner

Question 7 Principal Examiner

Question 8(a) . . . Principal Examiner

THIS IS THE END OF THE QUESTION PAPER

DO NOT WRITE ON THIS PAGE

**For Examiner's
use only**

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	

Total Marks	
------------------------	--

Examiner Number

Permission to reproduce all copyright material has been applied for.

In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA
will be happy to rectify any omissions of acknowledgement in future if notified.

14365.06R



16GDW2116

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-}

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

gcse examinations chemistry

Group

1	H	Hydrogen	1
---	---	----------	---



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