



Rewarding Learning

General Certificate of Secondary Education
2021–2022

Centre Number

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Candidate Number

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Double Award Science: Chemistry

Unit C1

Foundation Tier



[GDW21]

GDW21

TUESDAY 23 NOVEMBER, 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 7.

A Data Leaflet, which includes a Periodic Table of the elements is provided.

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20GDW2101

1 (a) The table below gives information about the particles in an atom.

Complete the table.

Subatomic particle	Relative charge	Relative mass
proton	+1	
electron		1/1840
neutron	0	

[3]

(b) Complete the sentence below about atomic number.

Atomic number is the number of _____

in an _____.

[2]

(c) The electronic configuration of a sodium atom is 2,8,1.

What is the electronic configuration of a nitrogen atom?

[1]



- (d) The number of protons, electrons and neutrons in four different particles are given in the table below. Only one of the particles is an atom.

Particle	Number of protons	Number of neutrons	Number of electrons
A	8	8	10
B	11	12	10
C	11	12	11
D	12	12	10

State which particle **A**, **B**, **C**, or **D** is an atom and explain your choice.

The atom is particle _____ because _____

_____ [2]



- 2 (a) The table below shows the colour of universal indicator in five different solutions (A, B, C, D and E) and the pH range for each solution.

Solution	pH range	Colour of universal indicator
A	0–2	red
B	3–6	orange / yellow
C	7	green
D	8–11	blue
E	12–14	purple

Use the information in the table to help you answer the questions below.

- (i) What is the **colour** of universal indicator in a weak alkali?

_____ [1]

- (ii) Which solution **A, B, C, D** or **E** could contain:

ethanoic acid? _____

sodium hydroxide? _____

hydrochloric acid? _____

[3]

- (b) What is the formula of the ion which is present in all **alkalis**?

Circle the correct answer

H

H⁻

H⁺

OH⁻

OH⁺

OH

[1]



(c) Magnesium reacts with dilute sulfuric acid.

(i) Complete the word equation below for this reaction.



(ii) Choose **two** statements below which correctly describe observations when magnesium is added to sulfuric acid.

Put a tick (✓) in the **two** correct boxes.

Observations	Tick (✓) if correct
burns with an orange flame	
there is an explosion	
magnesium eventually disappears	
bubbles of gas form	
temperature of acid decreases	
green solution formed	

[2]

[Turn over



3 When atoms react, they share or transfer electrons. Transfer of electrons produces compounds which have ionic bonding. Sharing of electrons produces molecules such as propane and fluorine.

(a) Complete the sentences below about ionic bonding by circling the correct answers.

Ionic bonding is typically found in

metal compounds.
metals.
non-metal compounds.

Ionic bonding involves the

arrangement
attraction
repulsion

between

negatively
positively
oppositely

charged ions.

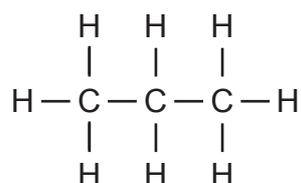
Ionic bonds are

hard.
strong.
weak.

[4]



(b) The structure of a molecule of propane is shown below.



(i) How many covalent bonds are there in a molecule of propane?

_____ [1]

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

_____ [1]

(c) Draw a dot and cross diagram of a molecule of fluorine, F_2 , showing outer shell electrons only.

[3]

[Turn over



- 4 Chemical reactions may be described using word equations and balanced symbol equations.

The balanced symbol equation for a chemical reaction is given below with state symbols.



- (a) How many **products** are in the equation for this chemical reaction?

_____ [1]

- (b) Complete the word equation for the chemical reaction shown in this question.



[2]

- (c) Complete the table below to give the meaning of each of the state symbols. One has been done for you.

State symbol	Meaning of state symbol
(s)	solid
(aq)	
(g)	
(l)	

[2]





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20GDW2109

5 The Periodic Table contains different groups of elements with similar chemical properties.

(a) Complete the sentences below about the **unreactive non-metals** by circling the correct answers.

The unreactive non-metals are found in

Group 1

Group 4

Group 0

of the Periodic Table.

These elements are known as the

halogens.

noble gases.

transition elements.

These elements are all

colourless.

white.

coloured.

[3]

(b) The element potassium reacts with water. During the reaction heat is given out.

(i) State three **other** observations which would be made during this reaction.

1. _____

2. _____

3. _____ [3]

(ii) Complete the word equation for the reaction between potassium and water.

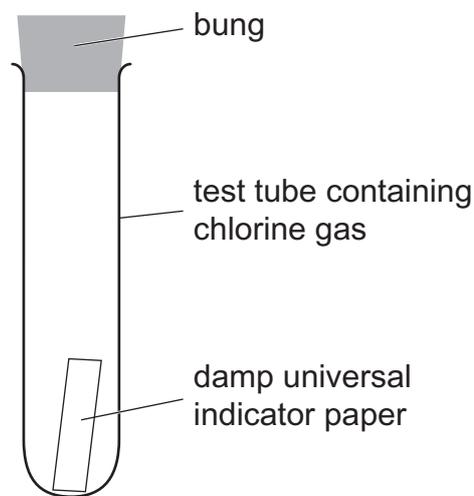
potassium + water →

+

[2]



(c) The diagram below shows how a test for chlorine gas may be carried out in the laboratory.



What would be observed happening to the damp universal indicator paper during this test?

[2]

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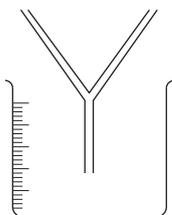


6 Sodium sulfate is a soluble salt.

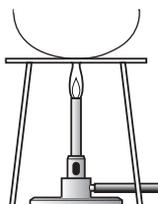
(a) What colour would you expect solid sodium sulfate to be?

_____ [1]

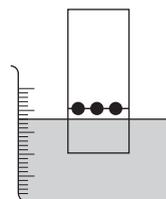
The diagrams **A**, **B**, **C**, **D** and **E** below show apparatus used to separate mixtures.



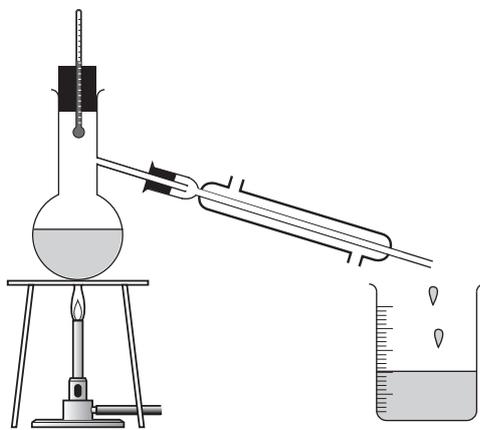
A



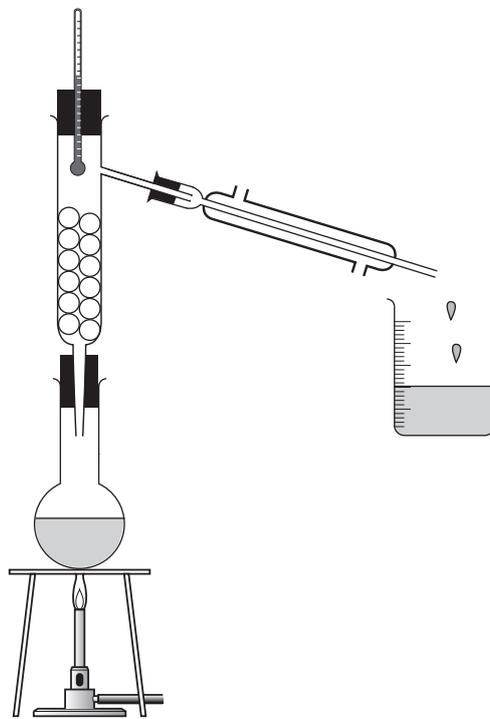
B



C



D



E



(b) Which diagram **A, B, C, D** or **E** shows the apparatus **most** suitable for:

Obtaining pure water from an aqueous solution of sodium sulfate?

Obtaining solid sodium sulfate from an aqueous solution of sodium sulfate?

_____ [2]

(c) A student separated a colourless liquid from a salt solution and thought it could be water.

(i) Describe the chemical test for water.

_____ [2]

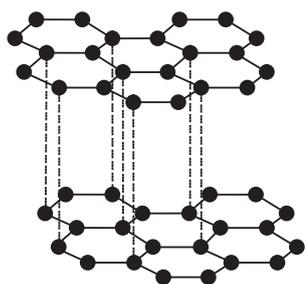
(ii) Explain how the student could find out if the liquid was **pure** water.

_____ [2]

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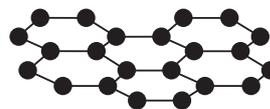
7 The diagrams below show the structures of three allotropes.



graphite



diamond



graphene

Describe:

- what both the solid lines and the black dots represent in these diagrams
- what is meant by the term allotropes
- the structure of graphene

Explain why graphite and graphene can both conduct electricity

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

The solid lines and the black dots represent _____

Allotropes are _____

The structure of graphene is _____

Graphite and graphene can both conduct electricity because _____

[6]





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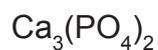


20GDW2115

8 Calcium, a Group 2 metal, forms a variety of compounds.

(a) Calculate the relative formula mass (M_r) of CaSO_4 and $\text{Ca}_3(\text{PO}_4)_2$
(Relative atomic masses: O = 16, P = 31, S = 32, Ca = 40)





_____ [2]

(b) The relative formula mass of calcium oxide, CaO , is 56.
Calculate, to two decimal places, the percentage by mass of oxygen in calcium oxide.

_____ % [2]



- (c) Calcium propanoate (relative formula mass 186) is used to preserve bread. One loaf of bread typically contains 3.72 g of calcium propanoate.

Calculate the number of moles of calcium propanoate in one loaf of bread.

_____ [2]

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Question Number	Marks
1	
2	
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Examiner Number

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