



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

THURSDAY 24 FEBRUARY 2022, 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 **6(b)**.

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



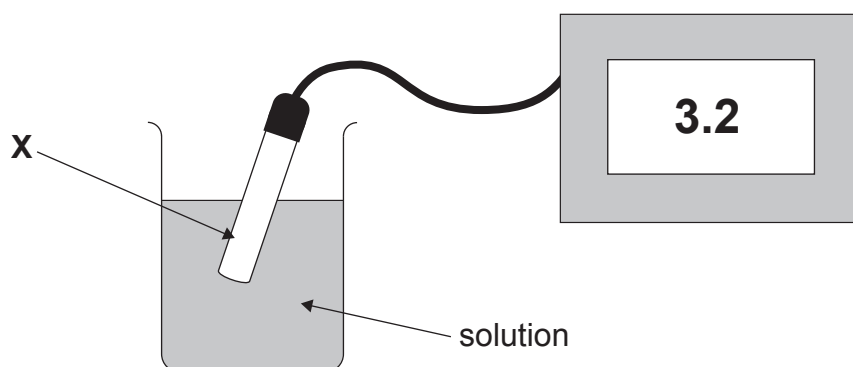
- 1 (a) A student investigated the effects of three solutions/liquids on red litmus, blue litmus and universal indicator papers. Some results are recorded in the table below.

Complete the table.

solution/liquid	colour of red litmus paper	colour of blue litmus paper	colour of universal indicator paper
sodium hydroxide	blue		purple
sulfuric acid	red		
water		blue	

[2]

- (b) The diagram below shows the apparatus used for accurately measuring the pH of a solution.



What name is given to the piece of apparatus labelled X?

[1]



- (c) Choose words from the list to complete the statement below about neutralisation.

acid hydrogen hydrated alkali hydroxide water

Neutralisation is a reaction between _____ ions in an _____
and _____ ions in an alkali to form _____. [2]

- (d) (i) Complete the word equation below.

copper(II) oxide + sulfuric acid → + [1]

- (ii) Complete the sentence below by circling the correct words to describe what is observed when solid copper(II) oxide reacts with dilute sulfuric acid.

The

black
white
green

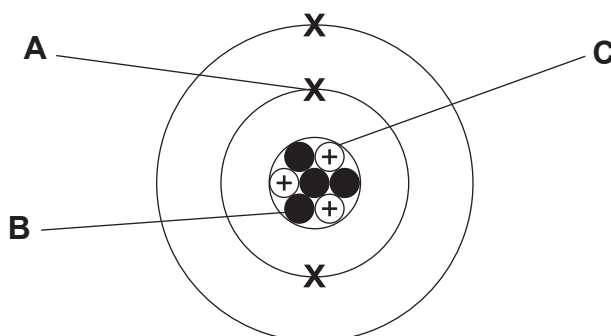
 solid reacts to form a solution which is

colourless.
green.
blue.

 [2]



- 2 The diagram shows the structure of an atom. Labels **A**, **B** and **C** point to the different types of particles found in an atom.



- (a) Identify particles **A**, **B** and **C** and name the central part of the atom, which contains particles **B** and **C**.

Particle **A** _____

Particle **B** _____

Particle **C** _____

The central part of an atom is called the _____.

[3]

- (b) Complete the statement by choosing the correct term from the list.

atomic number

mass number

atomic weight

The total number of protons and neutrons in an atom is known

as the _____.

[1]



- (c) The table below gives information about the structure of four atoms **W**, **X**, **Y** and **Z**.

atom	number of protons	number of neutrons	number of electrons
W	6	6	6
X	9	10	9
Y	6	8	6
Z	11	12	11

Which two atoms **W**, **X**, **Y** or **Z** are isotopes?

_____ [1]



3 (a) Use the list of substances given below to answer the questions that follow.

sodium chloride

iodine

diamond

brass

carbon dioxide

zinc

Choose a substance from the list which:

is a metallic element.

has ionic bonding.

is very hard and is used in cutting tools.

has a molecular covalent structure.

[4]

(b) Describe the structure of graphene.

[2]





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(Questions continue overleaf)



4 (a) Read the passage below and answer the questions which follow.

Titanium dioxide and zinc oxide nanoparticles are added to sun creams.

These nanoparticles are able to scatter visible light which makes the sun creams transparent and not white like other sun creams. The nanoparticles are also very good at filtering out UV rays.

Sun creams which contain nanoparticles feel lighter on the skin. This means that they are easy to spread and give good coverage of the skin, which in turn provides more protection from UV damage. They do not need to be reapplied as often as other sun creams.

There is some concern that if nanoparticles penetrate the outer skin layer they may cause potential cell damage but there is little evidence to support this.

- (i) Name a nanoparticle compound, mentioned in the passage, which is used in sun creams.

_____ [1]

- (ii) Complete the table below by putting a tick (✓) in the correct box to indicate if each of the nanoparticle properties is an advantage or a disadvantage.

property of nanoparticle	advantage	disadvantage
transparent		
penetrate skin		
feel lighter on skin		
filter out UV light		

[2]



(b) This question is about a compound with the formula K_2CO_3 .

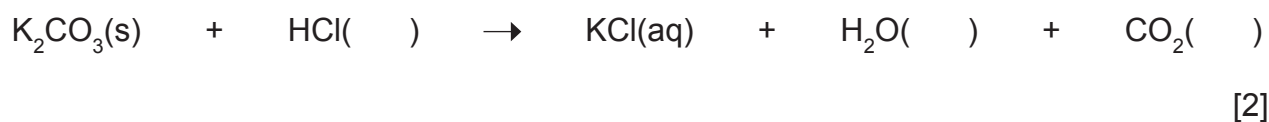
(i) Give the chemical name of K_2CO_3 .

How many different elements are present in K_2CO_3 ?

How many atoms are present in the formula K_2CO_3 ?

_____ [3]

(ii) Complete the equation for the reaction of K_2CO_3 with dilute hydrochloric acid below **by balancing** it and include the missing **state symbols**.



[Turn over



- 5 (a) (i) Complete the sentence below to give the definition of a molecule.

A molecule is _____ or more _____ covalently bonded together. [2]

- (ii) The list below shows the formulae of five different molecules.
Which two of these formulae represent diatomic molecules?

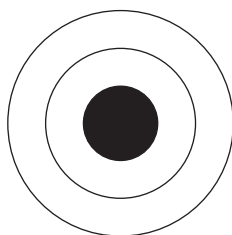
Circle the correct answers.

CO_2 N_2 H_2O Br_2 H_2O_2 [1]

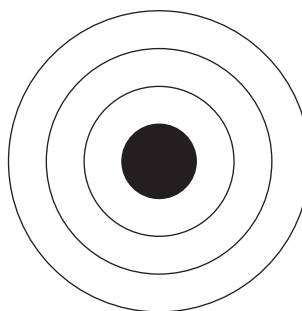
- (b) In the space below draw a dot and cross diagram to show the bonding in a molecule of hydrogen, H_2 .

[2]

- (c) (i) Complete the diagrams below to show the arrangement of all the electrons in a lithium atom and in a chlorine atom.



lithium atom



chlorine atom

[2]



(ii) Explain, in terms of the electrons involved, how atoms of lithium and chlorine react to form the compound lithium chloride.

[3]

[Turn over



- 6 (a) A list of four substances and a list of five descriptions are given below. Draw a line from each substance to its correct description.

substance	description
argon	coloured gas
sodium chloride	blue solid
chlorine	green solid
copper(II) carbonate	colourless gas
	white solid

[4]



(b) The modern Periodic Table has been developed over many years.

Describe:

- the key features of Mendeleev's Periodic Table including how he arranged the elements
- the main differences between the modern Periodic Table and the one developed by Mendeleev.

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

the key features of Mendeleev's Periodic Table including how he arranged the elements:

the main differences between the modern Periodic Table and the one developed by Mendeleev:

[6]

[Turn over



- 7 (a) Complete the sentence below to give the definition of a pure substance.

A pure substance is a single _____ or _____
not _____ with any other _____. [3]

- (b) A mystery powder found at the scene of a crime is thought to contain traces of potassium ions.

Complete the sentences below which set out how you would carry out a flame test on the powder and how you could prove that it contains potassium ions.

Dip a _____ wire into _____
to clean it.

Using the wire, pick up some of the powder and hold it in a blue Bunsen burner flame.

A _____ colour will show the presence of potassium ions. [3]



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[Turn over



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- 8 (a) Calculate the relative formula mass of the following compounds:
(relative atomic masses: C = 12, N = 14, O = 16, Mg = 24, Ca = 40)

calcium carbonate CaCO_3

_____ [1]

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

_____ [1]

- (b) Calculate, to one decimal place, the percentage of sulfur by mass in sodium sulfate, Na_2SO_4 . Sodium sulfate has a relative formula mass (M_r) of 142.
(relative atomic masses: O = 16, Na = 23, S = 32)

_____ % [2]



(c) The relative formula mass of ethanoic acid, $\text{C}_2\text{H}_4\text{O}_2$ is 60.

(i) Calculate the number of moles in 2.52 g of ethanoic acid.

_____ [2]

(ii) What mass of ethanoic acid is present in 0.65 moles?

_____ g [1]

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Question Number	Marks
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2	
3	
4	
5	
6	
7	
8	

Examiner Number

Total Marks	

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