



Rewarding Learning

General Certificate of Secondary Education

Centre Number

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Candidate Number

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# Double Award Science: Chemistry

Unit C2



Foundation Tier

[GDW51]

\*GDW51\*

## Assessment

### TIME

1 hour 15 minutes.

### Assessment Level of Control:

Tick the relevant box (✓)

Controlled Conditions	
Other	

### 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 70.

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 **4(c)**.

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

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\*16GDW5101\*

- 1 (a) What gas is produced if a metal reacts with water?  
Circle the correct answer.

**carbon dioxide**                      **hydrogen**                      **nitrogen**                      **oxygen**

Which metal burns with a lilac flame?  
Circle the correct answer.

**calcium**                      **magnesium**                      **potassium**                      **sodium**                      [2]

- (b) Give three observations, apart from bubbles of gas, when sodium reacts with water.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_ [3]

- (c) Complete the reactivity series for the eight metals in the list below. Two are done for you.

<b>aluminium</b>	<b>calcium</b>	<b>copper</b>	<b>iron</b>
<b>magnesium</b>	<b>potassium</b>	<b>sodium</b>	<b>zinc</b>

potassium

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

aluminium

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

[2]



(d) (i) Describe **three** observations when magnesium ribbon is added to copper(II) sulfate solution. You can assume that the magnesium is in excess.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_ [3]

(ii) Complete the word equation for the reaction between magnesium and copper(II) sulfate.

magnesium + copper(II) sulfate → \_\_\_\_\_ + \_\_\_\_\_ [2]

(e) A student wanted to find out the order of reactivity of four metals, A, B, C and D. She carried out a series of displacement reactions and found that:

Metal B displaced metal C

Metal C displaced metal D but not metal A

Metal A displaced two of the other three metals.

Which was the **least** reactive metal A, B, C or D?

\_\_\_\_\_ [1]

[Turn over



**2** This question is about energy changes and electrochemistry.

- (a)** A student carried out two investigations to determine whether there was an exothermic, an endothermic, or no energy change taking place.

In the first investigation the temperature decreased from 21°C to 13°C.  
What type of energy change, if any, was taking place?

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In the second investigation the test tube warmed up. What type of energy change, if any, was taking place?

---

[2]



(b) Complete the sentences below about electrolysis by putting a circle around the correct word/phrase from each box.

Electrolysis uses two electrodes. The negative electrode is called

the 

anode.
cathode.
diode.

During electrolysis 

atoms
electrons
ions

 move to the electrodes.

An electrolyte is a 

gas
liquid
solid

 or solution that conducts 

nothing
light
electricity

and is 

decomposed.
dissolved.
oxidised.

[5]

(c) The electrolysis of molten lead(II) chloride forms two products. From the list below, tick (✓) the box that shows the correct names of the two products.

lead and chlorine

lead and chloride

lead chloride and water

[1]

[Turn over



3 (a) Name three of the four most common gases in the atmosphere. Do **not** include water vapour in your answer.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_ [3]

(b) This part of the question is about the reactions of magnesium and sulfur with oxygen.

(i) From the list below, circle **two** observations you would make when magnesium is burned in oxygen.

**sweet smell                      bright white flame                      fizzing**  
**white powder formed                      red flame** [2]

(ii) What flame colour is obtained when sulfur burns in oxygen?  
Circle the correct colour from the list below.

**red                      blue                      yellow                      green                      white** [1]

(iii) Write a balanced symbol equation for the reaction of sulfur with oxygen.

\_\_\_\_\_ [2]

(c) This part of the question is about the reaction of carbon dioxide gas with water.

From the list below, circle the compound formed when carbon dioxide and water react.

**carboxylic acid                      carbon dioxide acid**  
**carbonic acid                      carbo acid**

[1]





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**DO NOT WRITE ON THIS PAGE**

**(Questions continue overleaf)**

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**[Turn over**



\*16GDW5107\*

4 (a) Circle the words which are needed to correctly complete the sentences below:

Iron is used in the structures of buildings because of

its colour.  
melting point.  
strength.

However, iron can rust when it reacts with air and

hydrogen.  
water.  
chlorine.

The rusting of iron is an example of a reaction

involving oxidation.  
dehydration.  
reduction.

[3]

(b) Two equations are given below:



Which substance is being oxidised in equation 1 and which substance is being reduced in equation 2?

In equation 1 \_\_\_\_\_ is being oxidised.

In equation 2 \_\_\_\_\_ is being reduced.

[2]



(c) Describe the extraction of iron in the blast furnace.

In your answer you should:

- Name the iron ore which is used and the two other substances which are added at the top of the blast furnace
- Describe, in words, how the iron ore is converted to iron in the blast furnace
- Describe how the iron is removed from the blast furnace

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

Name of the iron ore which is used and the two other substances which are added at the top of the blast furnace:

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Description, in words, of how the iron ore is converted to iron in the blast furnace:

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Description of how the iron is removed from the blast furnace:

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[6]

[Turn over



- 5 (a) The thermal decomposition of hydrated copper(II) sulfate ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) is an example of a reversible reaction. Write a balanced symbol equation for this reversible reaction.

\_\_\_\_\_ [2]

- (b) (i) Calculate the relative formula mass of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$   
(Relative atomic masses: H = 1, O = 16, S = 32, Cu = 64)

\_\_\_\_\_ [1]

- (ii) If 1 mole of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  is heated to constant mass how many moles of water will be lost?  
Circle the correct answer.

0                      1                      2                      3                      4                      5

\_\_\_\_\_ [1]



- 6 (a) There are many organic compounds, some of which are hydrocarbons. Explain what is meant by the term hydrocarbon.

\_\_\_\_\_

\_\_\_\_\_ [2]

- (b) Butane and propene are two examples of organic compounds.

Complete the table below to show the molecular formula, structural formula and physical state at room temperature of butane and propene.

Name	Molecular formula	Structural formula	Physical state at room temperature
butane		$\begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\   &   &   &   \\ \text{H} - \text{C} - & \text{C} - & \text{C} - & \text{C} - \text{H} \\   &   &   &   \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array}$	
propene	$\text{C}_3\text{H}_6$		

[4]

- (c) Choose **three words** from the list below to complete the sentence which explains what is meant by the term cracking.

**bigger**      **boiling**      **breakdown**      **combustion**      **heavier**  
**oxidised**      **smaller**      **sugars**      **unsaturated**

Cracking involves the \_\_\_\_\_ of large saturated hydrocarbons into \_\_\_\_\_ more useful ones, some of which are \_\_\_\_\_ .

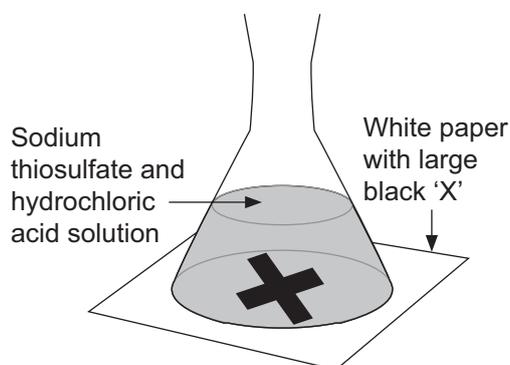
[3]

[Turn over



- 7 (a) When sodium thiosulfate solution reacts with hydrochloric acid, a precipitate is formed (the mixture in the flask goes cloudy).

The diagram below shows how the rate can be investigated by drawing an X on a piece of paper placed under a flask containing the reaction mixture and timing how long it takes for the X to disappear from sight.

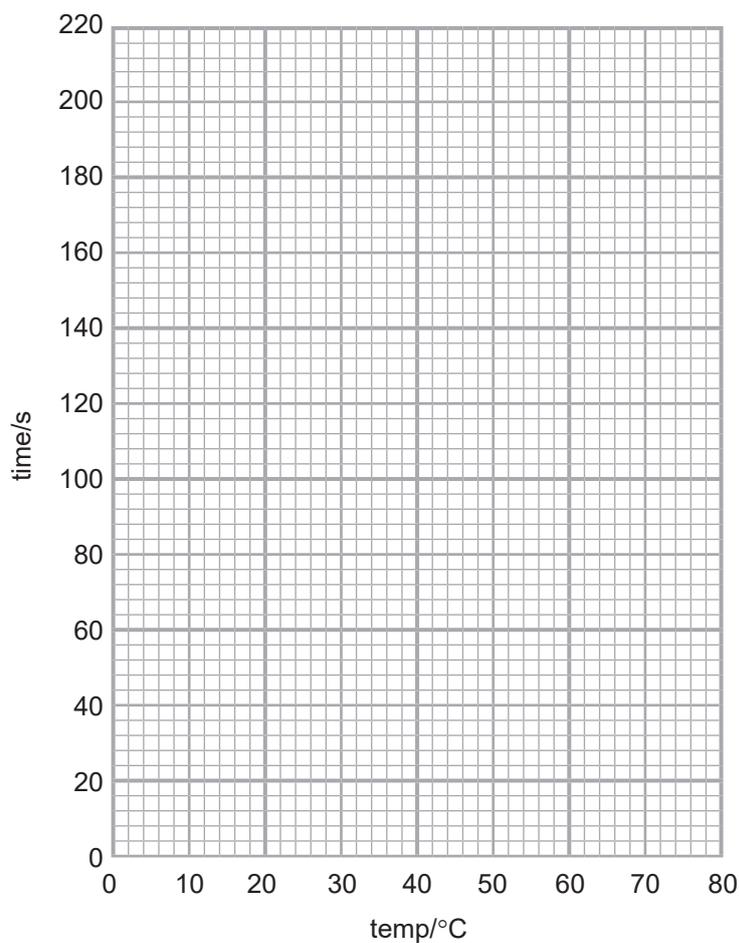


The reaction was carried out several times using exactly the same reactants but changing the temperature each time and the results below were obtained.

temp/ $^{\circ}\text{C}$	10	20	30	40	50	60
time/s	188	108	60	36	18	8



On the grid below, plot a graph to show how the time taken for the X to disappear changes with temperature.



[3]

(b) (i) From your graph, estimate the reaction time at 26 °C.

[1]

(ii) If the reaction had been carried out at 70 °C, how long might the reaction have taken?

Circle the most likely answer from the list below.

8 seconds      6 seconds      4 seconds      0 seconds

[1]

[Turn over

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\*16GDW5113\*

(c) Calcium carbonate reacts with dilute hydrochloric acid as shown in the equation below:



You are given 0.5 g of calcium carbonate and 100 cm<sup>3</sup> of dilute hydrochloric acid. Suggest an appropriate practical method to obtain a set of results which can be used to investigate the rate of this reaction at room temperature. Set out your steps clearly.

There is space below for up to three steps after Step 1 but you may use fewer or add more steps if you wish.

Step 1: Add the calcium carbonate to the acid in a conical flask

Step 2: \_\_\_\_\_

\_\_\_\_\_

Step 3: \_\_\_\_\_

\_\_\_\_\_

Step 4: \_\_\_\_\_

\_\_\_\_\_

[4]



8 (a) During the incomplete combustion of methane, water is formed.

From the list below, circle two other possible products of this incomplete combustion.

hydrogen

carbon monoxide

nitrogen

oxygen

carbon

[2]

(b) This part of the question is about functional groups in organic compounds. From the list below, circle the functional group found in an alkene.

C—C

C=O

C=C

C—OH

[1]

(c) Describe how bromine water can be used to distinguish between ethane gas and ethene gas.

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[4]

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<b>For Examiner's use only</b>	
<b>Question Number</b>	<b>Marks</b>
1	
2	
3	
4	
5	
6	
7	
8	

<b>Total Marks</b>	
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**Examiner Number**

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