



Centre Number

71	
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Candidate Number

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General Certificate of Secondary Education
2013

Double Award Science: Chemistry

Unit C2

Foundation Tier

[GSD51]

MV18

MONDAY 10 JUNE 2013, AFTERNOON

TIME

1 hour 15 minutes, plus your additional time allowance.

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 nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.

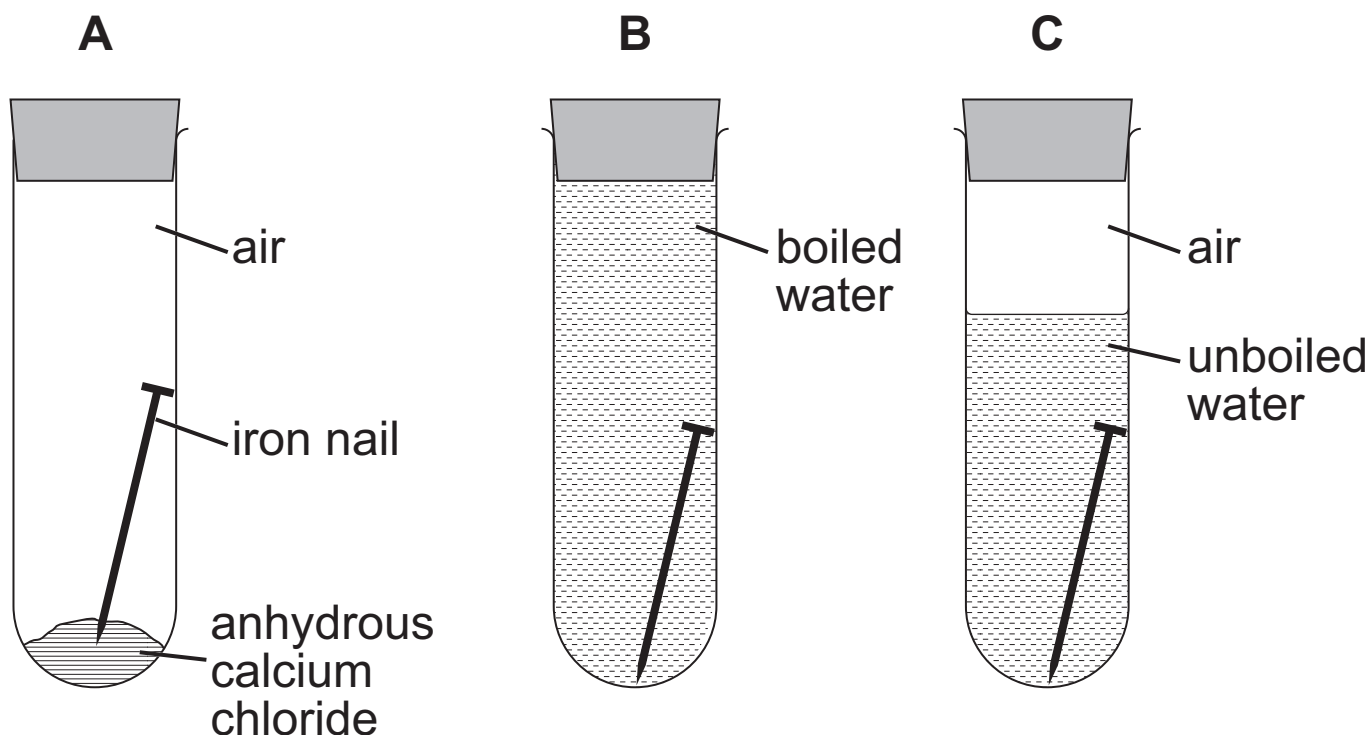
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **6(a)**.

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

- 1 (a) An experiment was carried out to investigate the conditions needed for iron nails to rust.

After one week only one of the test tubes contained a rusty nail.



- (i) In test tube B, why was the water boiled? [1]

- (ii) What is the purpose of having **anhydrous** calcium chloride in test tube A? [1]

- (iii) What **two** conditions are necessary for the rusting of iron to occur? [1]

_____ and _____

(iv) From the list below, **circle** the word which best describes rusting. [1]

decomposition

displacement

neutralisation

oxidation

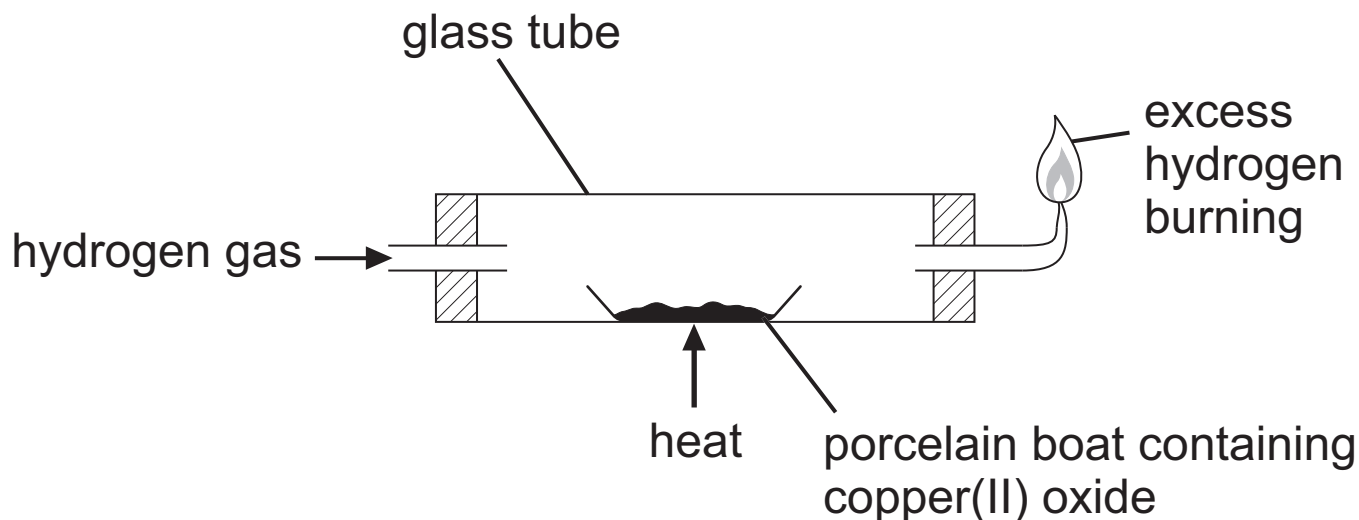
reduction

(b) Give two suitable methods that could be used to prevent the bars of an iron gate from rusting. [2]

1. _____

2. _____

(c) The reaction between hydrogen gas and copper(II) oxide can be carried out using the apparatus shown below.



(i) What colour change takes place during this reaction? [2]

from _____ to _____

(ii) Complete the word equation for the reaction. [2]



- 2 This question is about the reaction between zinc powder and dilute hydrochloric acid. The reaction rate can be altered by making some changes.

(a) Complete the table by stating if the changes given will speed up the reaction or not. One has been done for you. [4]

Change	Speed up Reaction? Yes or No
stir the reaction mixture	Yes
cool the reaction mixture down	
use hydrochloric acid which is more concentrated	
add a catalyst	
use a larger lump of zinc	

(b) The rate of the reaction can be measured by timing how long it takes for the reaction to stop and then using one of the formulae given below.

Which is the correct formula? Put a tick (✓) in the box beside the correct formula for the rate of a reaction. [1]

rate = time ☐

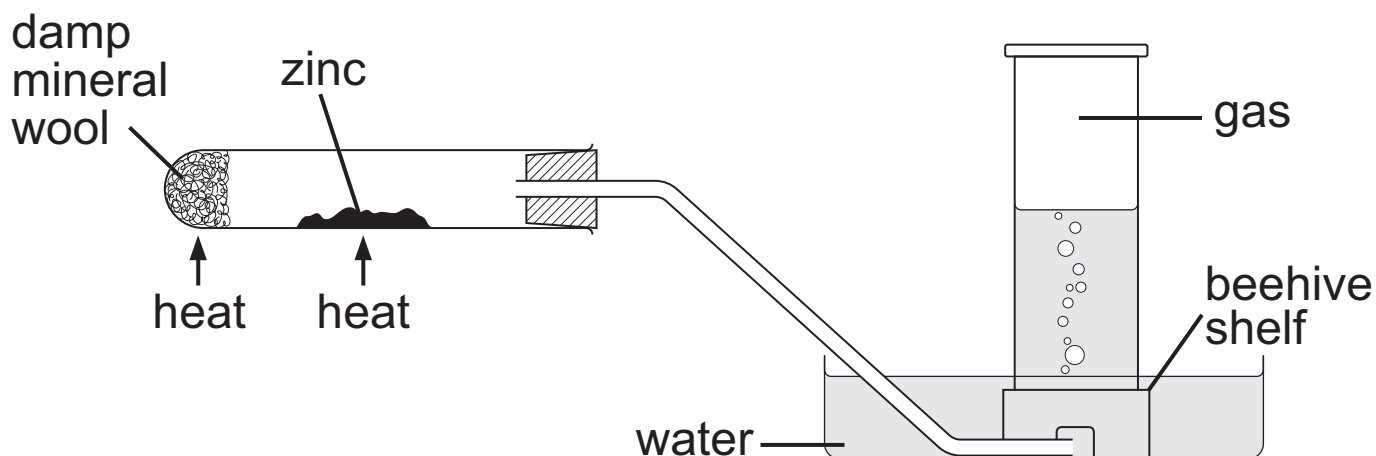
rate = $2 \times \text{time}$ ☐

rate = $\frac{1}{\text{time}}$ ☐

rate = $(\text{time})^2$ ☐

- 3 (a)** Zinc does not react with cold water, but does react with steam.

The diagram below shows the apparatus used to react zinc with steam and to collect the gas produced.



- (i)** What gas is produced when zinc reacts with steam? [1]

- (ii)** Why is the damp mineral wool heated? [1]

- (iii)** What colour is the solid product formed from zinc in this reaction? [1]

- (iv)** Name a metal, other than zinc, which will react with steam but not with cold water. [1]

(b) Magnesium is a Group 2 metal.

(i) Give two observations made when magnesium is burned in air. [2]

1. _____

2. _____

(ii) Complete and balance the symbol equation for the reaction of magnesium with air. [2]



4 (a) Exothermic reactions give out heat and endothermic reactions take in heat.

(i) Complete the table to show which of the processes are exothermic and which are endothermic. One has been done for you. [3]

Process	Exothermic or Endothermic
photosynthesis	endothermic
neutralisation of sodium hydroxide with hydrochloric acid	
dehydration of blue copper(II) sulfate crystals	
burning coal	

(ii) Calcium carbonate can be broken down into simpler substances by heating it. What two words are used to describe this type of endothermic reaction? [2]

(iii) Complete the word equation by identifying the gas given off when calcium carbonate is heated. [1]

calcium carbonate \rightarrow calcium oxide +

(b) Limestone is taken from the ground by quarrying and has many uses.

(i) Give one use of limestone. [1]

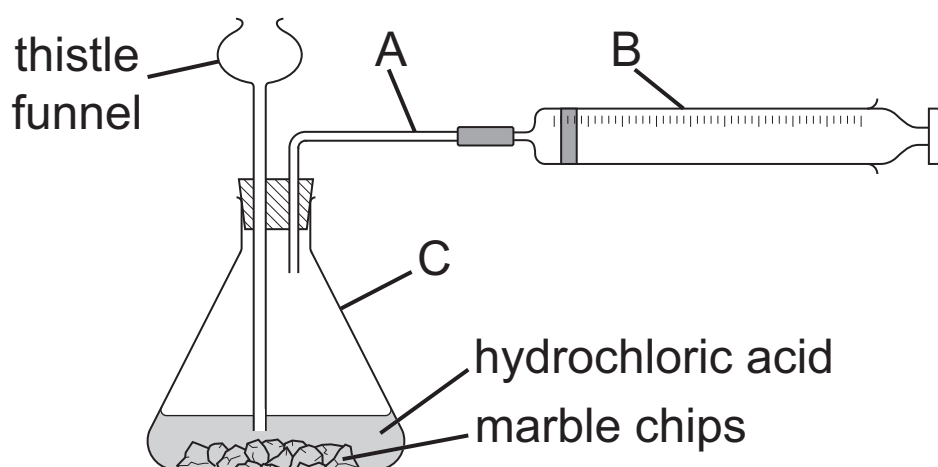
(ii) Complete the table below which shows some positive and negative effects of quarrying limestone. The first one has been done for you. [5]

Effect of Quarrying	Positive	Negative
Produces a cheap material with many uses	✓	
Disused quarries can be used for landfill		
Natural habitats disrupted		
Creates jobs in the community		
Produces dust		
Quarries can be unsightly		

5 (a) Complete the table below to describe the tests for two gases. [4]

Gas	Test	Result
oxygen		
hydrogen		

(b) Carbon dioxide gas can be prepared in the school laboratory using the apparatus below:



Name the pieces of apparatus A, B and C
[3 marks] one mark for each part.

A _____

B _____

C _____

- (c) This part of the question is about the non-metal sulfur and some of its compounds. For each of the statements below three ways of completing the statement are given. Only **one** is correct. Put a ring round the correct answer. One has been done for you.

When sulfur burns in air it reacts with:

nitrogen

hydrogen

oxygen

- (i) The flame produced when sulfur burns in air is:

white

blue

black

[1]

- (ii) Sulfur is a:

yellow
gas

yellow
solid

white
solid

[1]

- (iii) When a mixture of iron and sulfur is heated the mixture:

evaporates

glows

turns white

[1]

- (iv) FeS is the formula of:

iron(II)
sulfide

iron(II)
sulfate

iron(II)
sulfite

[1]

- (v) Sulfur dioxide is a colourless gas. It has:

no
smell

a pungent
smell

a pleasant
smell

[1]

(vi) Sulfur dioxide causes:

acid
rain

hard
water

dry
ice

[1]

(vii) Sulfur is sometimes:

removed from
fuels

added to
fuels

used as
a fuel

[1]

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(Questions continue overleaf)

6 Town A has a hard water supply and town B has a soft water supply.

You are provided with two samples of water, one from town A and the other from town B.

(a) Explain what is meant by hard water and describe a **fair** test you could carry out to find which is the hard water sample. [6]

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

[illegible]

(b) The water in town A is hard water.

(i) Name an ion which causes water to be hard. [1]

(ii) Why is hard water thought to be good for your health? [1]

(iii) Name one industry which benefits from hard water. [1]

(iv) Why could it be less expensive to live in town B, where the water is soft, rather than town A? [2]

7 This question is about relative atomic mass and using relative atomic masses to calculate the relative formula mass of compounds.

(a) What do you understand by the relative atomic mass of an atom? [3]

(b) (i) Calculate the relative formula mass of nitric acid HNO_3 . [1 mark]
(Relative atomic masses: $\text{H} = 1$; $\text{N} = 14$; $\text{O} = 16$)

Answer _____

- (ii) The relative formula mass of zinc oxide is 81.
Calculate the mass of 0.5 moles of zinc oxide.
Include the unit in your answer. [2]

Answer _____

8 This question is about carbon dioxide and the gases in the Earth's atmosphere.

(a) The atmosphere contains about 0.04% carbon dioxide gas. Complete the table below by adding the two most abundant gases in the atmosphere and their approximate proportions. [4]

Gas	Approximate proportion in the atmosphere
carbon dioxide	about 0.04%

- (b) The table below shows how the level of carbon dioxide in the Earth's atmosphere has changed over the last 150 years. The table also shows the change in average global temperature in the same time span.

Year	1750	1800	1850	1900	1950	2000
concentration of CO ₂ in atmosphere/ % by volume	0.027	0.028	0.029	0.030	0.032	0.037
average global temperature/°C	13.3	13.4	13.5	13.6	13.8	14.4

- (i) Use the information in the table to describe the pattern of change in carbon dioxide levels in the atmosphere between 1750 and 2000. [2 marks]

(ii) What is the relationship between the level of carbon dioxide in the atmosphere and average global temperature? [1]

(iii) Give one reason for the changing amounts of carbon dioxide in the atmosphere. [1]

(iv) Give one way in which our planet is affected by global warming. [1]

(c) Carbon dioxide is used to make fizzy drinks and can be tested for in the laboratory using limewater solution.

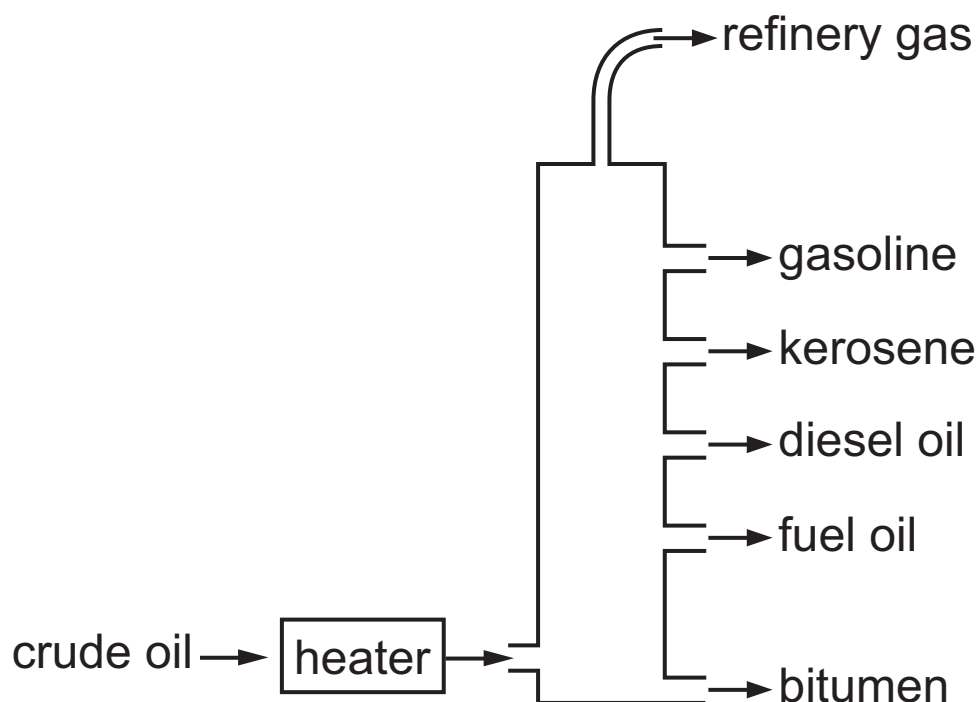
(i) Give one physical property which makes carbon dioxide suitable for use in fizzy drinks. [1]

(ii) What is the name of the substance formed when carbon dioxide dissolves in water? [1]

(iii) What would be observed when carbon dioxide gas is bubbled through limewater solution? [2]

(iv) What would be observed if you continued to bubble carbon dioxide gas through limewater solution? [1]

- 9 (a)** The diagram below shows how crude oil can be separated into useful products:



- (i)** Name the separation process shown in the diagram. [2]

- (ii)** Explain how the crude oil is separated into useful products by this method. [2]

(b) Natural gas is an important fossil fuel that is found in refinery gases. It is described as a non-renewable fuel.

(i) What is a **fossil fuel**? [1]

(ii) What element is present in all fossil fuels? [1]

(iii) Natural gas is described as **non-renewable**. What does this mean? [1]

(c) Ethanol is a renewable fuel. It is produced from food crops. Distillation is needed in the manufacture of ethanol. Burning ethanol produces less carbon dioxide than burning natural gas but ethanol is more expensive to produce than natural gas.

(i) Suggest one reason why ethanol is used as a fuel. [1]

(ii) Suggest one reason why there could be concerns about replacing natural gas with ethanol as a fuel. [1]

(iii) Why is hydrogen considered to be a “cleaner” fuel than either ethanol or natural gas? [1]

THIS IS THE END OF THE QUESTION PAPER

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Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

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