



General Certificate of Secondary Education
2013

Centre Number

71

Candidate Number

Double Award Science: Chemistry

Unit C2

Higher Tier

[GSD52]

ML

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 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 Questions **2** and **5(a)**.

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

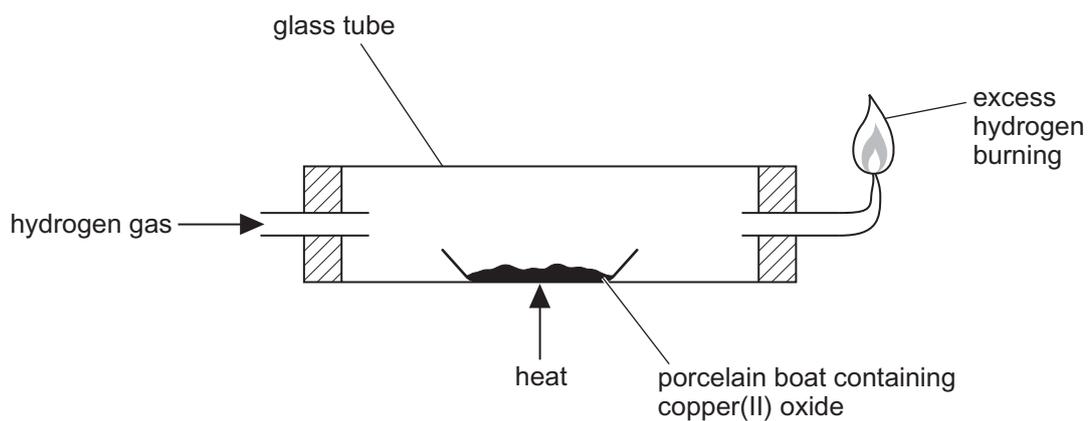
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Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	

Total
Marks

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- 1 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?

from _____ to _____ [2]

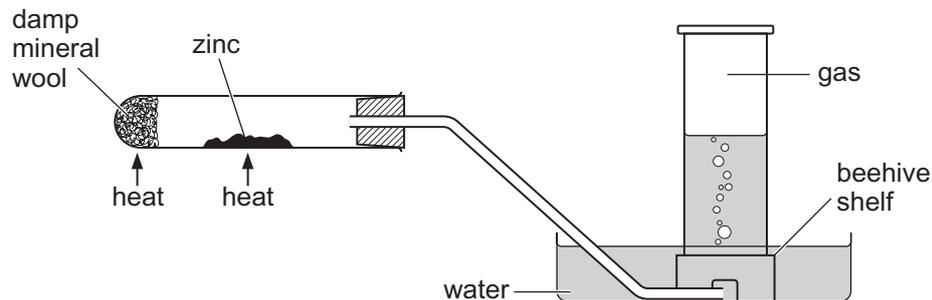
- (ii) Complete the word equation for the reaction.



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Marks	Remark

- 3 (a) Zinc does not react with cold water, but zinc 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 will not react with cold water.

_____ [1]

- (b) Magnesium is a Group 2 metal.

- (i) What is observed when magnesium is burned in air?
Write down two observations.

1. _____

2. _____ [2]

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



[2]

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Marks Remark

4 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 writing down the two most abundant gases in the atmosphere and their approximate proportions.

Gas	Approximate proportion in the atmosphere
carbon dioxide	about 0.04%

[4]

- (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 over the last 150 years.

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]

Examiner Only

Marks Remark

(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 our planet is affected by global warming.

_____ [1]

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

(i) Give one physical property that 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 is observed when carbon dioxide gas is bubbled through limewater solution?

_____ [2]

(iv) What is observed if you continue to bubble carbon dioxide gas through limewater solution?

_____ [1]

Examiner Only	
Marks	Remark

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

_____ [1]

(iv) The water in town B is soft water. It might be less expensive to live in town B. Explain why.

_____ [2]

(c) The water in town C is temporary hard water.

(i) Name a compound that causes temporary hard water.

_____ [1]

(ii) Explain, **in terms of ions present**, how temporary hard water can be softened by boiling.

_____ [4]

Examiner Only

Marks Remark

6 The Haber Process is used in the manufacture of ammonia. The Haber Process involves a reversible reaction.

(a) What is a **reversible reaction**?

_____ [2]

(b) Write a balanced symbol equation to show the important reversible reaction in the Haber Process.

_____ [4]

(c) Name the catalyst used in the Haber Process.

_____ [1]

Examiner Only	
Marks	Remark

7 When zinc metal reacts with hydrochloric acid, the mixture fizzes as hydrogen gas is given off. The reaction can be speeded up by increasing the concentration of the hydrochloric acid **or** by heating the reaction mixture.

(a) Use the collision theory to explain how increasing the concentration of the hydrochloric acid increases the rate of the reaction.

[2]

(b) Use the collision theory to explain how increasing the temperature of the reaction mixture increases the rate of reaction.

[3]

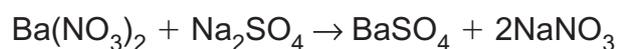
Examiner Only

Marks Remark

- (iii) Calculate the number of moles of barium nitrate in 13.05 g of the compound.

Answer _____ mole [1]

- (iv) Use your answer to (b)(i) and (b)(iii) and the equation:



to calculate the maximum mass of barium sulfate that can be obtained from 13.05 g of barium nitrate.

Answer _____ g [1]

- (c) A solution of dilute sodium hydroxide is described as 2.0 mol/dm³.

- (i) What does 2.0 mol/dm³ mean?

 _____ [2]

- (ii) How much water must be added to 100 cm³ of 2.0 mol/dm³ sodium hydroxide to make a 1.0 mol/dm³ solution?

_____ [1]

Examiner Only	
Marks	Remark

- 9 (a) Natural gas is an important fossil fuel that is found in refinery gases. Natural gas 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]

- (b) 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) Write down one reason why ethanol is used as a fuel.

_____ [1]

(ii) Write down 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?

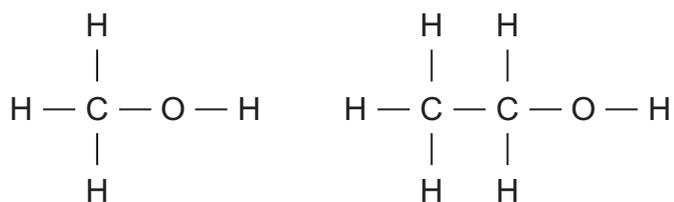
_____ [1]

Examiner Only

Marks

Remark

- (c) The structural formula for the first two members of the alcohol homologous series are given below:



- (i) Give the general formula of the alcohol homologous series.

_____ [1]

- (ii) What is the functional group of the alcohol homologous series?

_____ [1]

- (iii) Write down the molecular formula of ethanol.

_____ [1]

- (d) Ethanol can be prepared from the reaction of ethene with steam. Write a balanced symbol equation for this reaction.

_____ [2]

Examiner Only	
Marks	Remark

- (e) (i) Methanol and ethanol can be used as fuels.
Write a balanced symbol equation for the combustion of methanol in a plentiful supply of air.

_____ [3]

- (ii) When alcohols are burned in a limited supply of air another product is formed. Name this product.

_____ [1]

- (f) The alkane hexane and the alkene hexene are both colourless liquids. Describe a chemical test you could carry out on each of these liquids to determine which one is the alkene.

Test _____

_____ [2]

Expected result with hexene: _____

_____ [2]

Expected result with hexane: _____

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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Marks	Remark

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