



General Certificate of Secondary Education
2014

Double Award Science: Chemistry

Unit C2

Higher Tier

[GSD52]



TUESDAY 10 JUNE 2014, AFTERNOON

TIME

1 hour 15 minutes.

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 eight** 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 **1(a)** and **8(a)**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

Centre Number

71

Candidate Number

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

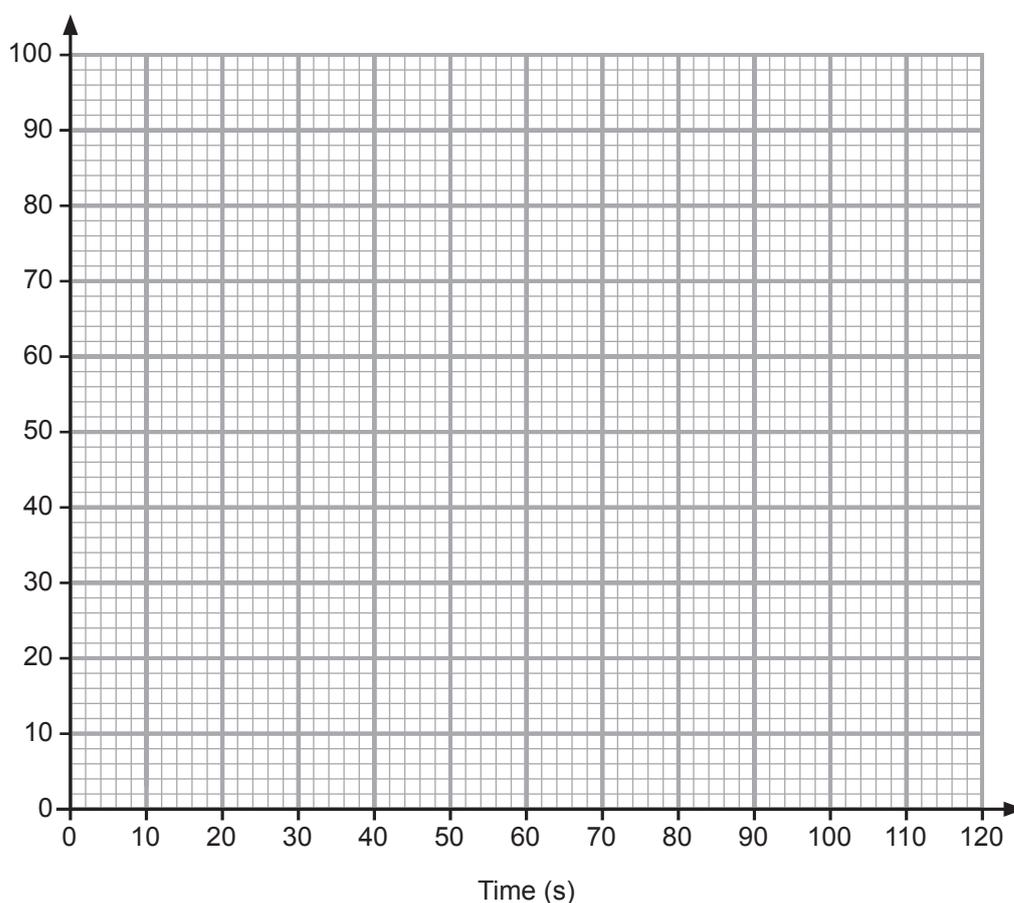
Total
Marks

- (c) Magnesium ribbon reacts with dilute hydrochloric acid to produce hydrogen gas. A student measured the volume of gas produced over a period of time. The results are shown in the table below.

Volume of H ₂ gas (cm ³)	0	23	40	58	71	75	78	80	80
Time (s)	0	10	20	40	60	70	80	90	100

- (i) Label the y-axis on the grid below. [1]

- (ii) Use the grid to plot a curve showing the results of the experiment. [3]



- (iii) At what time did the reaction stop?

_____ [1]

- (iv) From your graph, how long did it take for 50 cm³ of hydrogen to be formed?

_____ [1]

Examiner Only

Marks Remark

- (iii) Calculate the maximum mass of iron that could be produced from 80 g of Fe_2O_3 . You may find your Data Leaflet useful when answering this question.

Answer _____ g [1]

- (iv) Calculate the maximum mass of iron that could be produced from 8 tonnes of Fe_2O_3 . (1 tonne = 1000 kg)

Answer _____ tonnes [1]

- (d) The final part of this question is about the effect that dilution has on the concentration of a solution and the number of moles in the solution.

- (i) If 800 cm^3 of water is added to 200 cm^3 of a 1 mol/dm^3 solution of hydrochloric acid, to make a 1 dm^3 solution, what happens to the **concentration** of the acid? Tick (✓) the correct answer.

It stays the same

It becomes 0.25 mol/dm^3

It becomes 0.20 mol/dm^3

[1]

- (ii) If 800 cm^3 of water is added to 200 cm^3 of a 1 mol/dm^3 solution of hydrochloric acid, what happens to the **number of moles** of acid in the solution? Tick (✓) the correct answer.

It stays the same

It becomes 25% of its original value

It becomes 20% of its original value

[1]

Examiner Only

Marks

Remark

3 (a) This part of the question is about the heating of solid calcium carbonate.

(i) Complete the word equation for this reaction.



(ii) The reaction in part (i) is an example of an endothermic change. Which one of the following statements describes an endothermic reaction? Tick (✓) the correct statement.

Gives out heat energy to the surroundings

Takes in heat energy from the surroundings

No change in energy during reaction

[1]

(iii) Circle the term below which best describes the type of reaction which occurs when calcium carbonate is heated.

thermal cracking

displacement

neutralisation

thermal decomposition

photosynthesis

[1]

Examiner Only	
Marks	Remark

4 (a) Temporary hard water is found in limestone regions.

(i) Name the compound that causes temporary hardness in water.

_____ [1]

(ii) Explain how water in limestone regions becomes hard.

_____ [4]

(b) Hard water can be softened by addition of washing soda Na_2CO_3 .

Explain, in terms of the ions involved, why the addition of washing soda can be used to soften hard water.

_____ [3]

Examiner Only

Marks Remark

5 (a) During the first billion years of the Earth's existence, there was intense volcanic activity which released gases that formed the early atmosphere. The early atmosphere contained over 90% carbon dioxide, 5% nitrogen, 3% sulfur dioxide and traces of hydrogen sulfide, ammonia and methane, but no oxygen. It was hot, smelly and deadly poisonous.

(i) What is the **difference** in percentage composition of nitrogen gas found in the atmosphere today compared to its composition in the early atmosphere?

_____ [1]

(ii) One theory suggests that the early atmosphere changed as living organisms evolved. State two ways that the carbon dioxide could have been removed from the early atmosphere.

1. _____

2. _____ [2]

(b) This part is about the Group 2 metal strontium and some of its compounds.

- You may find your understanding of the properties of magnesium and calcium and their compounds to be helpful.
- You may find your Data Leaflet useful.

(i) What is the formula of strontium sulfate?

_____ [1]

(ii) What would you expect to happen if some strontium carbonate was placed in a beaker of water?

_____ [1]

(iii) What would you expect to observe if a small piece of strontium metal was placed in a beaker of water?

 _____ [3]

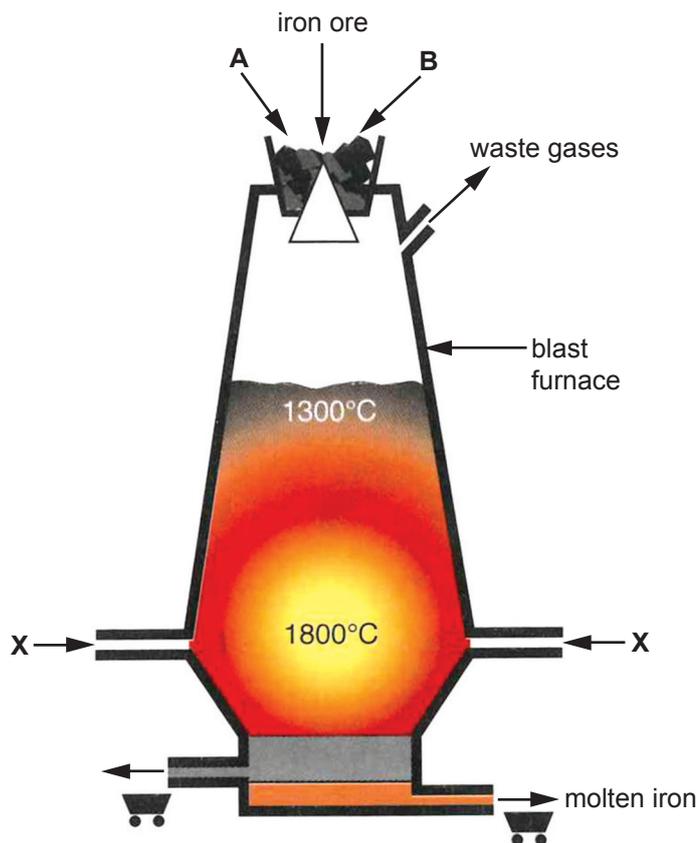
Examiner Only	
Marks	Remark

(iii) Give two uses of ammonia.

1. _____
2. _____ [2]

Examiner Only	
Marks	Remark

- 7 (a) The diagram below shows a Blast Furnace, used in the manufacture of iron.



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- (i) What is the common name for the iron ore used in the Blast Furnace?

_____ [1]

- (ii) Name the substances **A** and **B** that go into the top of the Blast Furnace.

A _____

B _____ [2]

- (iii) Name substance **X**, which goes into the bottom of the Blast Furnace.

_____ [1]

- (iv) How is the iron removed from the Blast Furnace?

_____ [1]

Examiner Only

Marks Remark

- (v) Describe how the acidic impurities are removed from the Blast Furnace.

[2]

- (b) Carbon monoxide is produced from carbon dioxide in the Blast Furnace. Write a balanced symbol equation to show how carbon monoxide is formed.

[3]

- (c) The extraction of iron in the Blast Furnace is an example of a redox reaction.

- (i) What is meant by the term **redox**?

[2]

- (ii) The extraction of iron from iron ore can be represented by the half equation:



Explain, in terms of electrons, why this is a reduction reaction.

[2]

Examiner Only

Marks Remark

(c) Polythene is a useful polymer made from ethene molecules.

- (i) Write a balanced equation, using **structural formulae**, for the polymerisation of ethene.

[4]

- (ii) Polythene can be used to make plastic buckets.

State two properties of polythene that make it suitable for this use.

1. _____
2. _____ [2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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