



Rewarding Learning

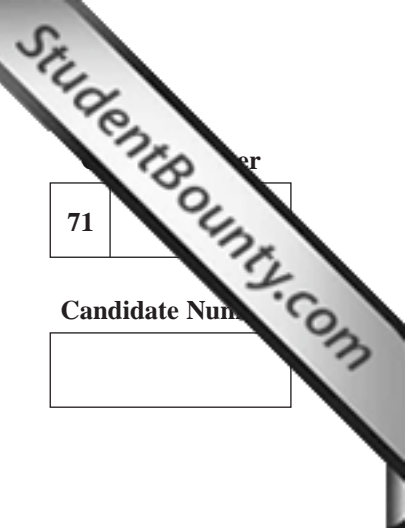
General Certificate of Secondary Education
2012

Science: Chemistry

Paper 2
Foundation Tier

[G1402]

FRIDAY 22 JUNE, AFTERNOON



71	er
Candidate Number	
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TIME

1 hour 30 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 six** questions.

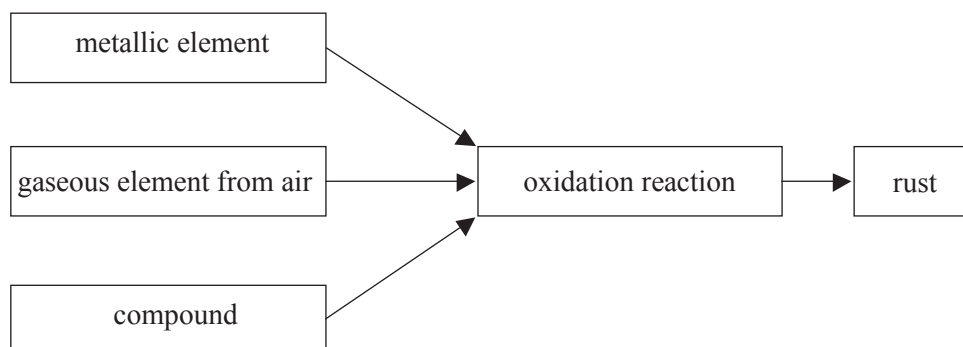
INFORMATION FOR CANDIDATES

The total mark for this paper is 120.
Quality of written communication will be assessed in question **5(d)(iii)**.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
A Data Leaflet which includes a Periodic Table of the Elements is provided.

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



- 1 (a) The formation of rust is described as an oxidation reaction. The flow chart below shows the formation of rust during which a metallic element reacts with a gaseous element from the air and a compound.



- (i) Name the metallic element which reacts to form rust.

_____ [1]

- (ii) Name the gaseous element from the air which is required for the formation of rust.

_____ [1]

- (iii) Name the compound which is required for the formation of rust.

_____ [1]

- (iv) Explain what is meant by oxidation.

_____ [1]

- (v) Describe the appearance of rust.

_____ [2]

Examiner Only

Marks Remark

- (b) The reaction of chlorine with hydrogen may be described as both an exothermic reaction and as a reduction.



- (i) Write a balanced symbol equation for the reaction of chlorine with hydrogen.

_____ [3]

- (ii) Explain why chlorine is described as being reduced in this reaction.

_____ [2]

- (iii) Describe the colour of the reactants in this reaction.

chlorine _____

hydrogen _____ [2]

- (iv) What is meant by the term exothermic?

_____ [1]

- (c) Copper(II) carbonate breaks down on heating in an endothermic reaction.

- (i) What term is used to describe a reaction in which a substance breaks down on heating?

_____ [2]

- (ii) Write a balanced symbol equation for the reaction which occurs when copper(II) carbonate is heated.

_____ [2]

Examiner Only

Marks Remark

(iii) State the colour change observed when copper(II) carbonate is heated.

[2]

Examiner Only	
Marks	Remark

2 Many pharmaceutical drugs contain carbon along with other elements.



"

Í 'Dtcpf'Z'Rkwatgu'TVj kpmogem

- (a) Complete the paragraph below about carbon using the words and numbers in the box. Each word or number may be used once, more than once or not at all.

6	electrons	shells	12
nucleus	protons	neutrons	4

Carbon is an element which is found in Group _____ of the Periodic Table. The relative atomic mass of all other atoms is based on an atom of carbon with a mass of _____.

The mass of any atom is mainly in the _____ because _____ have a very low mass compared to other subatomic particles.

[4]

Examiner Only

Marks Remark

(b) Amyl nitrite is a drug commonly used to treat patients with heart disease. Its chemical formula is $C_5H_{11}NO_2$.

(i) How many different elements are present in amyl nitrite?

_____ [1]

(ii) Calculate the relative formula mass of amyl nitrite.
(Relative atomic masses: H = 1; C = 12; N = 14; O = 16)

Relative formula mass _____ [1]

(iii) Calculate the percentage of carbon in amyl nitrite using the expression below.

$$\text{Percentage of carbon} = \frac{\text{total mass of all carbon atoms}}{\text{relative formula mass}} \times 100$$

Percentage of carbon _____ [1]

Examiner Only

Marks Remark

- (c) Another pharmaceutical drug, Eskalith, contains a carbonate compound. The formula of this compound may be written as X_2CO_3 . The relative formula mass of X_2CO_3 is 74.

(Relative atomic masses: C = 12; O = 16)

- (i) Calculate the mass of carbonate in X_2CO_3 .

_____ [1]

- (ii) Calculate the mass of the two atoms of X in X_2CO_3 .

_____ [1]

- (iii) Calculate the mass of one atom of X.

_____ [1]

- (iv) Use your Data Leaflet to find the identity of X.

_____ [1]

Examiner Only

Marks Remark

- 3 (a) Acids, bases, alkalis and salts are used in many commonly available household products such as those shown below. One substance found in each is stated.

‘The following images have been removed from this page due to copyright issues:

- A bag of Bath Crystals containing magnesium chloride.
- A bottle of Milk of Magnesia liquid containing magnesium hydroxide.
- A can of Mr Muscle Oven Cleaner containing sodium hydroxide.
- A bag of Mosskiller & Lawn Tonic containing zinc sulphate.’

”
”
”
”

- (i) Classify each substance as an acid, base, alkali or salt by placing a tick (✓) in the correct column in the table below. Choose the most common classification for each substance. You may find your Data Leaflet useful in answering this question.

Substance	acid	base	alkali	salt
magnesium chloride				
magnesium hydroxide				
sodium hydroxide				
zinc sulphate				

[4]

- (ii) Sodium hydroxide reacts with sulphuric acid. Write a balanced symbol equation for this reaction.

_____ [3]

- (iii) Name the salt produced when magnesium hydroxide reacts with nitric acid.

_____ [1]

Examiner Only

Marks Remark

(iv) Hydrated zinc sulphate has the formula $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$. What is meant by the term hydrated?

_____ [2]

(b) Aqueous ammonia is a weak alkali and it is used in hair dyes.

(i) Write the chemical formula for ammonia.

_____ [1]

(ii) Suggest a value for the pH of aqueous ammonia.

_____ [1]

(iii) Ammonia reacts with acids producing ammonium compounds. Write a balanced symbol equation for the reaction of ammonia with nitric acid.

_____ [2]

(iv) Name the ion which is present in all alkalis.

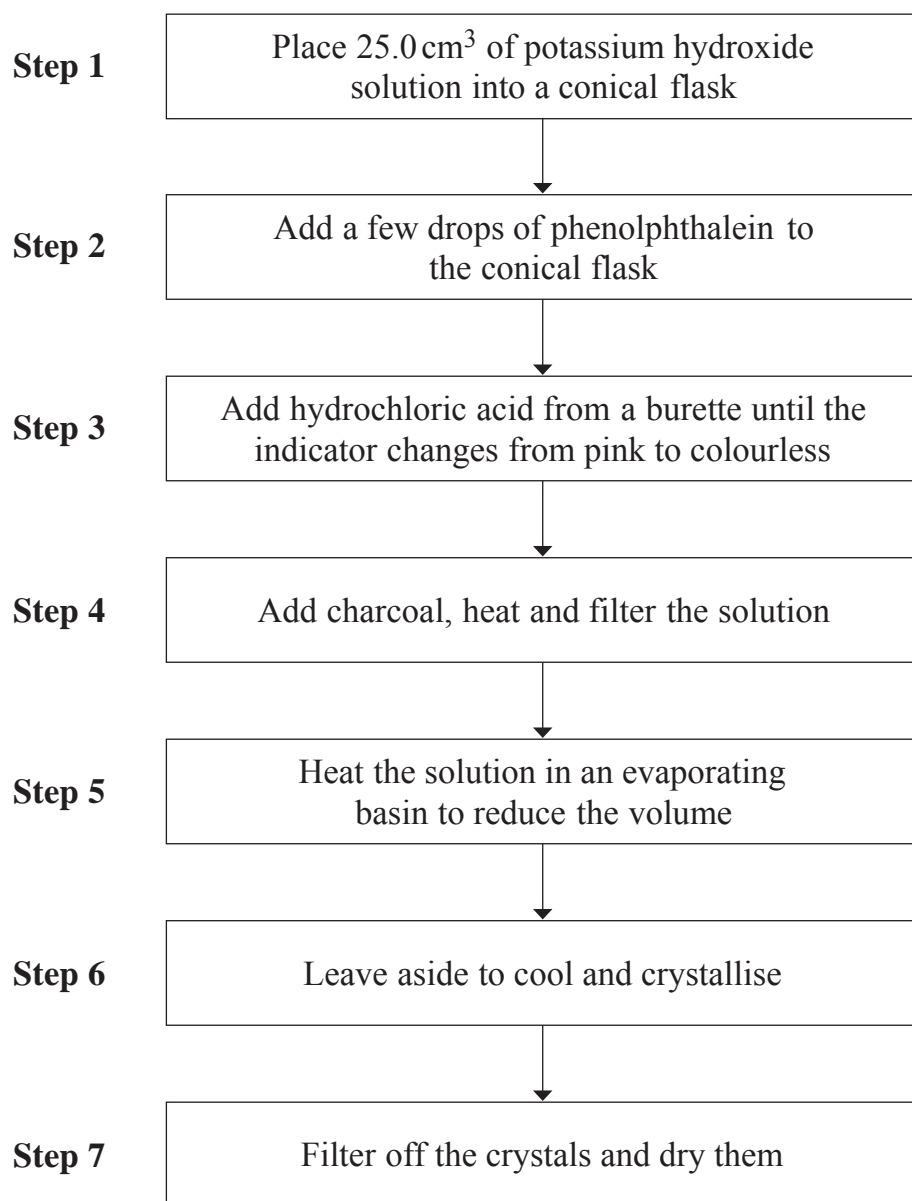
_____ [1]

Examiner Only

Marks Remark

- (c) A pure, dry sample of potassium chloride can be prepared by the reaction of potassium hydroxide solution with hydrochloric acid.

The flow chart below explains how this is carried out.



- (i) Name the piece of apparatus required to place 25.0 cm³ of potassium hydroxide solution into the conical flask in **Step 1**.

_____ [1]

- (ii) What is the purpose of the charcoal in **Step 4**?

_____ [1]

Examiner Only

Marks Remark

(iii) Draw a labelled diagram of the assembled apparatus used to heat the solution in **Step 5**.

[3]

(iv) Explain why crystals form on cooling in **Step 6**.

_____ [1]

(v) State **two** methods which may be used to dry the crystals in **Step 7**.

1. _____

2. _____
_____ [2]

Examiner Only	
Marks	Remark

[Turn over

4 Aluminium is the most abundant metal in the Earth's crust. Aluminium ore is first purified to give aluminium oxide and the metal is then extracted from the aluminium oxide by electrolysis.

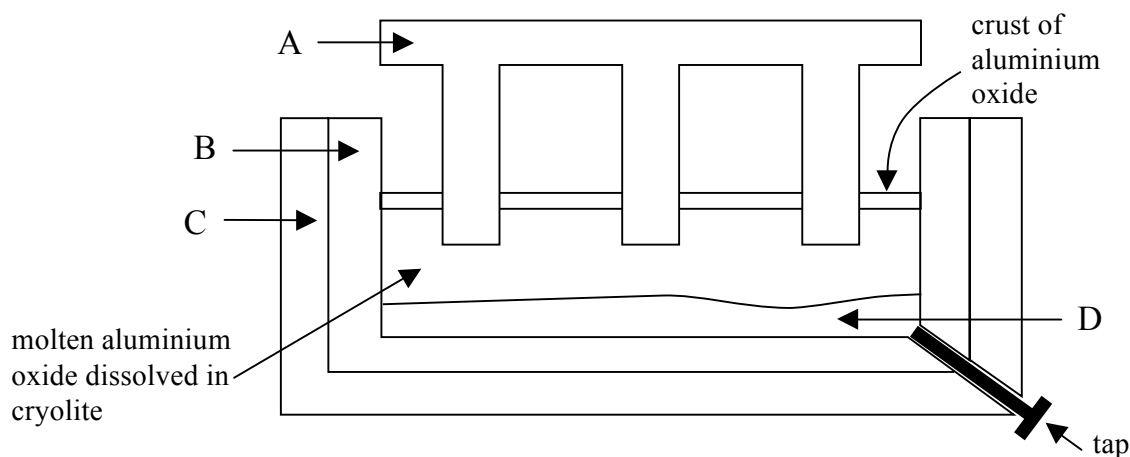
(a) What is meant by the term electrolysis?

_____ [2]

(b) Name the ore from which aluminium is extracted.

_____ [1]

(c) The electrolysis of the purified ore is carried out in the Hall-Hérout cell. The diagram below shows the cell used.



(i) Name parts A, B and C, and substance D.

A _____

B _____

C _____

D _____

[4]

(ii) Explain why the aluminium oxide will only conduct electricity when molten.

_____ [2]

Examiner Only	
Marks	Remark

- 5 On 14th April 2010 the volcano Eyjafjallajökull erupted in Iceland, creating an ash cloud which was dangerous for aircraft and led to the closure of many airports for about ten days.



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A large number of gases were released into the atmosphere from the volcano. These volcanic gases included carbon dioxide, hydrogen, hydrogen chloride and water vapour.

- (a) Complete the table below to give the formula, one use and two physical properties of carbon dioxide and hydrogen gas.

Gas	Formula	Use	Physical properties	
carbon dioxide			1. 2.	[4]
hydrogen			1. 2.	[4]

Examiner Only

Marks Remark

(b) Complete the table below to describe the tests used to identify carbon dioxide, hydrogen, hydrogen chloride and water in the laboratory and state the result of a positive test.

Gas	Test	Result of positive test	
carbon dioxide			[2]
hydrogen			[2]
hydrogen chloride			[4]
water			[3]

(c) Sulphur dioxide is also emitted when a volcano erupts. It is a pollutant gas which reacts with water in the air to form acid rain.

(i) Write a balanced symbol equation for the reaction of sulphur dioxide with water.

_____ [2]

(ii) State **two** harmful effects of acid rain on the environment.

1. _____

2. _____

_____ [2]

Examiner Only	
Marks	Remark

(d) Sulphur dioxide can be produced in the laboratory by burning sulphur .

(i) Describe the appearance of sulphur.

_____ [2]

(ii) Write a balanced symbol equation for the burning of sulphur in air.

_____ [2]

(iii) What is observed when sulphur burns in air?

_____ [3]

Quality of written communication [2]

(iv) State **one** use of sulphur dioxide.

_____ [1]

Examiner Only

Marks

Remark

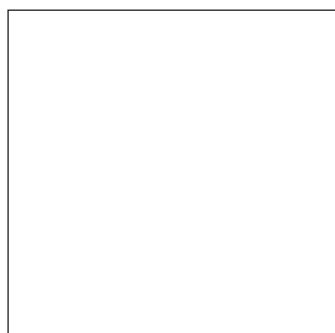
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(Questions continue overleaf)

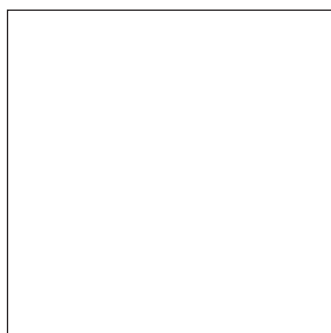
6 Substances may be classified according to their physical state.

(a) In the boxes below draw the arrangement of particles in a solid and in a gas.

The particles should have the approximate size shown on the right.



SOLID



GAS



Particle size

[2]

(b) The table below shows the melting points and boiling points of a range of substances found in the laboratory.

Substance	Melting point ($^{\circ}\text{C}$)	Boiling point ($^{\circ}\text{C}$)
sodium chloride	808	1465
oxygen	-218	-182
sulphur	114	444
carbon	3550	4827
water	0	100
carbon dioxide	-78	-57

Questions (b)(i)–(b)(vi) refer to the substances in the table above.

(i) Name the substance which melts at the lowest temperature.

_____ [1]

(ii) Name the **element** which is a solid at room temperature (20°C) but a liquid at 400°C .

_____ [1]

Examiner Only

Marks

Remark

(iii) Write the formula of the substance which is a liquid at room temperature (20 °C).

_____ [1]

(iv) Which substance is a liquid over the greatest temperature range?

_____ [1]

(v) What is the physical state of oxygen at –200 °C?

_____ [1]

(vi) At what temperature does sulphur change from a liquid into a solid?

_____ [1]

(c) Solid carbon dioxide undergoes sublimation.

(i) What name is given to solid carbon dioxide?

_____ [1]

(ii) Explain fully what is meant by sublimation.

_____ [2]

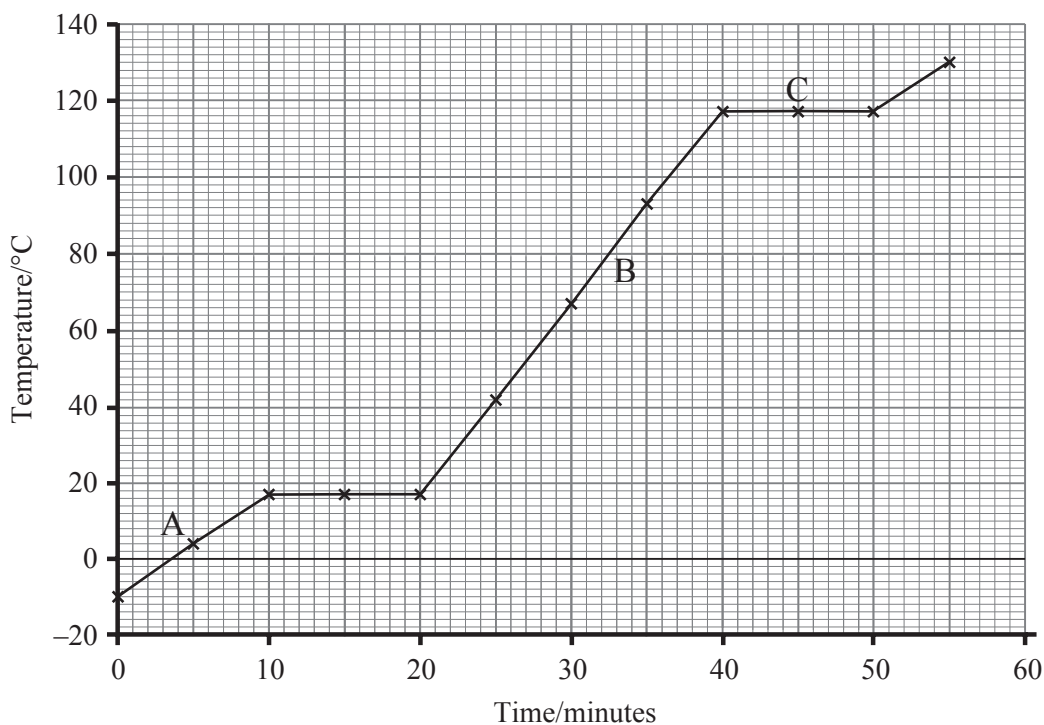
(iii) Name one **element** which undergoes sublimation.

_____ [1]

Examiner Only

Marks Remark

- (d) Ethanoic acid is an organic acid present in vinegar. In an experiment some crystals of ethanoic acid, at a temperature of -10°C , were heated and their temperature recorded every five minutes. The results are plotted on the graph below.



- (i) What is the melting point of ethanoic acid?

_____ [1]

- (ii) Which physical state will be observed at A and B on the graph?

A _____

B _____ [2]

- (iii) Name the process occurring at C on the graph.

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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