



General Certificate of Secondary Education
2012

Science: Chemistry

Paper 2
Higher Tier

[G1404]

FRIDAY 22 JUNE, AFTERNOON



Centre Number

71

Candidate Number

TIME

2 hours.

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 seven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 160.

Quality of written communication will be assessed in question 7(c).

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

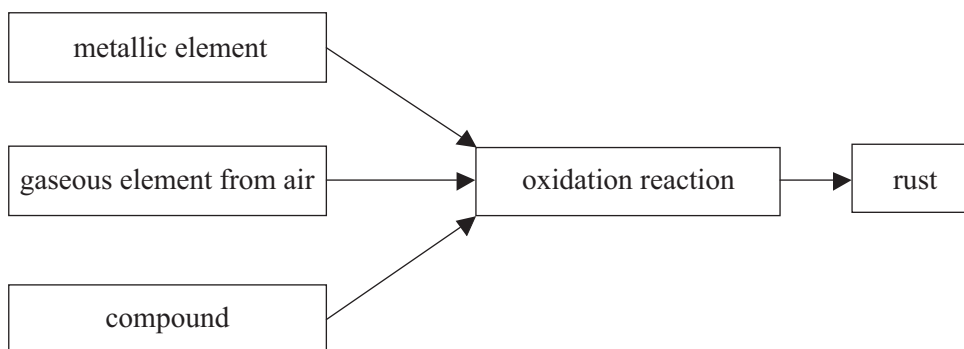
A Data Leaflet which includes a Periodic Table of the Elements is provided.

For Examiner's
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	

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

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- 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.

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eqr {tki j v'kuwgu<

ÉC"dcí "qh'Dcý "Et{ucn"eqpvckpki "o ci pgukwo "ej mtkf g0"
 ÉC"dqwrq"qh'O km'qh'O ci pguk"hs wkf "eqpvckpki "o ci pgukwo "j {ftqzkf g0"
 ÉC"ecp"qh'O t'O wuerg"Qxgp"Engcpgt"eqpvckpki "uqf kwo "j {ftqzkf g0"
 ÉC"dcí "qh'O quunkmrt"("Ncy p"Vqple"eqpvckpki "l kpe"uwr j cvg0"

- (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

- 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.

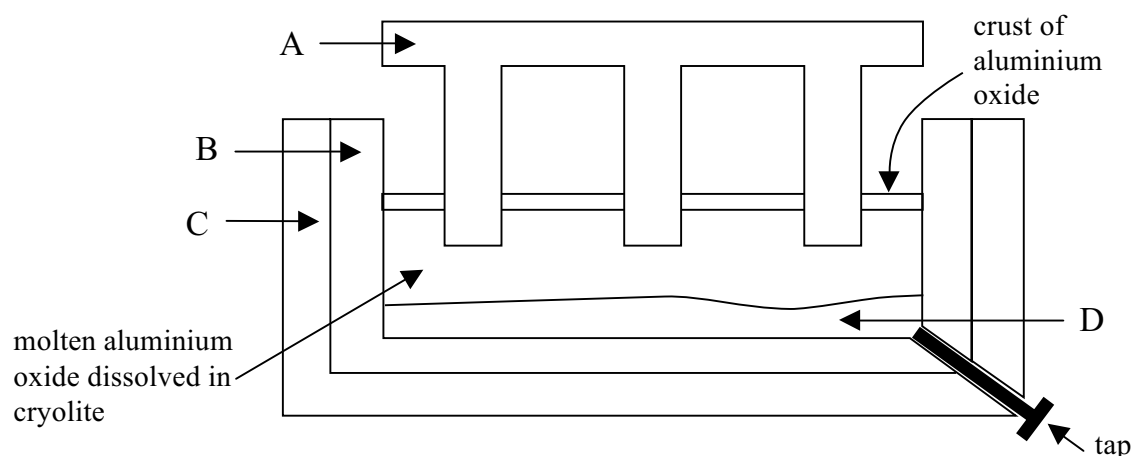
(a) What is meant by the term electrolysis?

_____ [2]

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

_____ [1]

(c) The electrolysis of the purified ore is carried out in the Hall-Héroult 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

(iii) At what temperature does the electrolysis take place?

_____ [1]

(iv) Suggest **one** reason why the aluminium oxide is dissolved in cryolite.

_____ [1]

(v) Name the products formed at the positive and negative electrodes and write half equations for the reactions taking place at each electrode.

	Positive electrode	Negative electrode	
Name of product			[2]
Half equation			[6]

Examiner Only	
Marks	Remark

(vi) Which electrode must be replaced regularly? Write a balanced symbol equation to explain your answer.

Electrode: _____ [1]

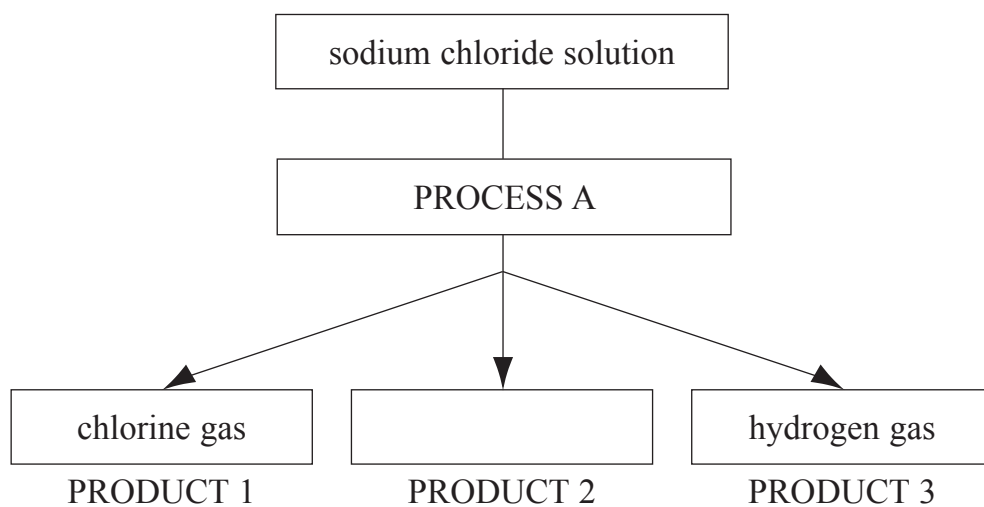
Equation: _____ [2]

(vii) Explain how the aluminium produced in the process is removed from the cell.

 _____ [1]

Examiner Only	
Marks	Remark

- (d) The chlor-alkali industry uses a substantial percentage of the sodium chloride produced from solution mining. The main process involved is summarised in the diagram below.



- (i) Name Process A.

_____ [1]

- (ii) Write the chemical formula for Product 2.

_____ [1]

- (iii) State **one** use of each of the gaseous products.

chlorine: _____

hydrogen: _____ [2]

Examiner Only

Marks Remark

- 6 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.



Í 'Aðqenr j qv"l"Vj kpmuqem

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

- (a) Complete the table below to describe the tests used to identify each of these gases in the laboratory, and state the result of a positive test for each gas.

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

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Marks	Remark

Examiner Only	
Marks	Remark

7 Hydrogen peroxide, H_2O_2 , decomposes very slowly to produce water and oxygen.

- (a) Draw a labelled diagram of the assembled apparatus used to carry out this reaction and measure the volume of oxygen produced every minute. Include all apparatus required.

[4]

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Marks	Remark

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