



General Certificate of Secondary Education
2010

Science: Chemistry

Paper 2
Foundation Tier

[G1402]

WEDNESDAY 9 JUNE, AFTERNOON



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71

Candidate Number

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 **1(c)(iv)**.
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 Neutralisation occurs when an acid and an alkali react to form a salt and water.

(a) (i) Complete the table below to give the names and formulae of the ions present in all acids and alkalis.

	Name	Formula
Ion present in all acids		
Ion present in all alkalis		

[4]

(ii) Different acids produce different salts. Complete the table below. One has been done for you.

Name of acid	Name of salt
Sulphuric acid	sulphate
Nitric acid	
Hydrochloric acid	

[2]

(b) Sulphuric acid can be neutralised using an alkali such as sodium hydroxide or by adding an insoluble base such as copper(II) oxide.

(i) Write a word equation for the reaction between sodium hydroxide and sulphuric acid.

_____ [1]

(ii) Write a balanced symbol equation for the reaction between copper(II) oxide and sulphuric acid.

_____ [2]

Examiner Only

Marks Remark

(c) In the preparation of copper(II) sulphate crystals, an excess of copper(II) oxide is added to warm dilute sulphuric acid.

(i) Why is the copper(II) oxide added in excess?

_____ [1]

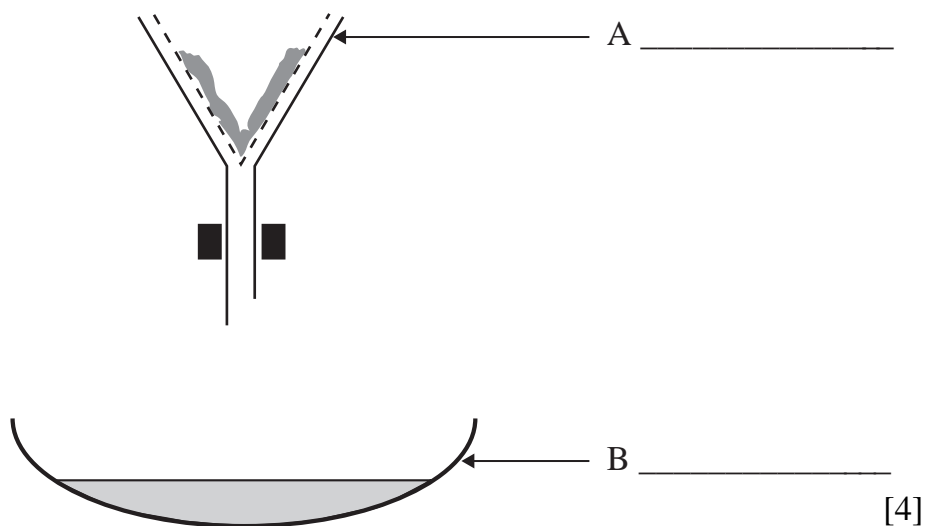
(ii) What colour is the solution when the reaction is complete?

_____ [1]

(iii) The apparatus shown in the diagram below is used to separate the excess copper(II) oxide from the solution.

Identify the apparatus A and B.

Label the filtrate and the residue clearly using an arrow.



(iv) Describe how you would obtain pure dry crystals of copper(II) sulphate from the solution collected in part (iii).

_____ [3]

Quality of written communication [2]

Examiner Only	
Marks	Remark

(v) Copper(II) sulphate can also be prepared by adding an excess of copper carbonate to sulphuric acid. Write a word equation for this reaction.

_____ [1]

(vi) Copper(II) sulphate cannot be prepared by adding copper metal to sulphuric acid. Explain why not.

_____ [1]

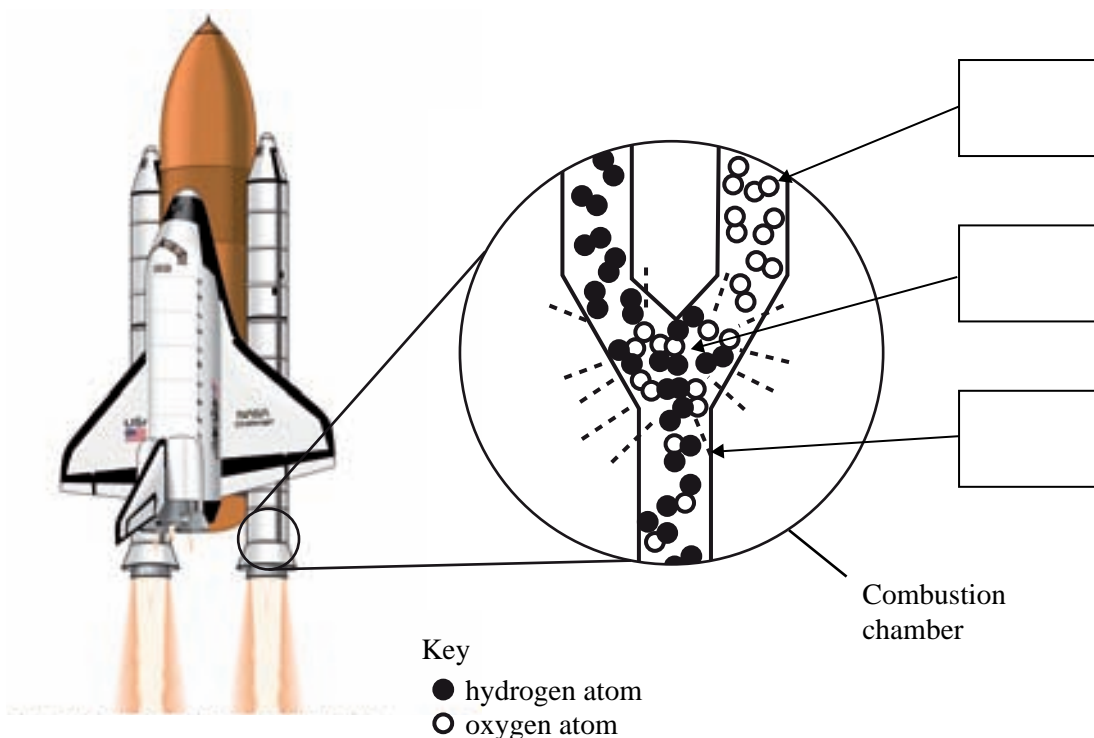
Examiner Only

Marks Remark

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(Questions continue overleaf)

2 Hydrogen is a powerful rocket fuel. The diagram shows the reaction which occurs in the combustion chamber of a rocket.



© NASA <http://www1.dfr.nasa.gov/Gallery/Graphics/STS/Large/EG-0076-04.gif>

(a) (i) Using the description for the letters **A**, **B** and **C** below, complete the diagram above by placing a letter to label each arrow in the boxes on the right of the diagram above.

A oxygen molecules

B mixture of hydrogen and oxygen gas

C compound of hydrogen and oxygen

[3]

(ii) Write a balanced symbol equation for the reaction which occurs in the combustion chamber.

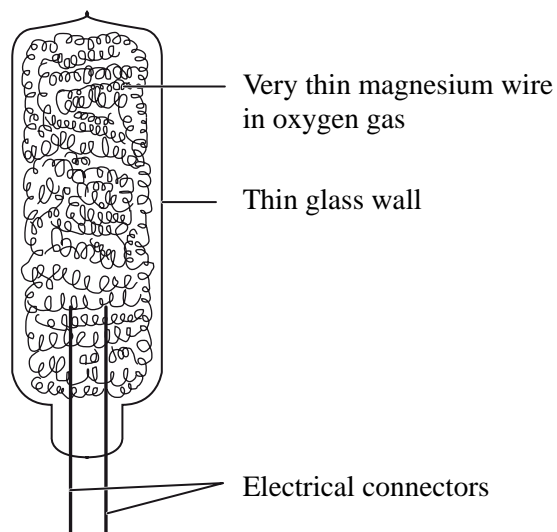
_____ [3]

(iii) Explain why hydrogen is considered to be a 'clean' fuel.

 _____ [1]

Examiner Only	
Marks	Remark

- (c) Before the use of electronic built-in flashes, most cameras needed flash bulbs to create a flash of artificial light. The diagram below represents a flash bulb which works by the reaction of very thin magnesium wires with oxygen.



- (i) Write a balanced symbol equation for the reaction which occurs inside the flash bulb.

_____ [3]

- (ii) State one observation made during this reaction.

_____ [1]

Examiner Only

Marks Remark

- 3 All swimming pools must be correctly treated with different chemicals to ensure that the water is free from bacteria and other microbes.



© Ambassador Pools Ltd http://1st-direct.com/panel-and-liner-pool-with-automatic-cover_photos.htm

- (a) The table below gives information about some of the chemicals used to treat water in swimming pools.

Complete the table.

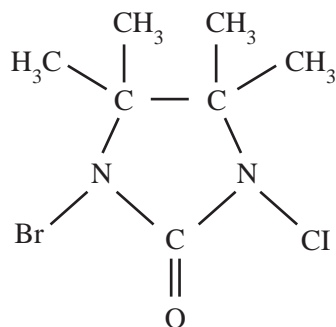
Name	Formula	Relative formula mass
sodium hypochlorite	NaClO	
chlorine dioxide	ClO_2	
ozone	O_3	

[3]

Examiner Only

Marks Remark

- (b) The diagram below shows a molecule of a compound which is used in the USA to kill bacteria in swimming pools.



Use the formula of the molecule to help you answer the following questions.

- (i) Complete the table to give the name, relative atomic mass and number of atoms present for all the elements in this compound. The first one has been done for you. You may find your Data Leaflet useful in answering this question.

Symbol	Name of element	Relative atomic mass	Number of atoms of this element present in the molecule
H	hydrogen	1	12
C	carbon	12	
N	nitrogen		2
Cl		35.5	1
O	oxygen	16	
Br	bromine		1

[5]

- (ii) Name the **two** elements in this compound which are in the same group of the Periodic Table.

_____ and _____ [1]

Examiner Only	
Marks	Remark

- (iii) Use the information in the table to calculate the relative molecular mass of this molecule.

Relative molecular mass = _____ [1]

- (iv) Find the percentage by mass of Br in this compound using the formula:

$$\text{percentage of Br by mass} = \frac{\text{relative atomic mass of Br}}{\text{relative molecular mass of compound}} \times 100$$

percentage of Br by mass = _____ [2]

- (c) Another chemical added to swimming pool water is chloramine. The formula mass of chloramine is 51.5 and its formula can be represented by NX_2Cl where X represents a non-metal.

Calculate the relative atomic mass of element X and use your Data Leaflet to identify the element represented by X.

Relative atomic mass of X _____

Identity of X _____ [4]

Examiner Only

Marks Remark

- 4 (a) Calcium carbonate thermally decomposes to form calcium oxide. Calcium oxide (lime) has a high melting point and can be heated to a high temperature without melting so that it emits white light, called limelight.



© Adam Hart-Davis/Science Photo Library

- (i) Explain what is meant by the term thermal decomposition.

_____ [2]

- (ii) Write a balanced symbol equation for the thermal decomposition of calcium carbonate.

_____ [2]

- (iii) The thermal decomposition of calcium carbonate is an endothermic reaction. What is meant by the term endothermic?

_____ [1]

- (iv) Explain why calcium oxide has a high melting point.

_____ [2]

Examiner Only

Marks Remark

- (v) Calcium oxide must be kept dry because when it comes into contact with even the slightest amount of moisture, it rapidly becomes hot and hisses, releasing a large amount of steam.

Write a balanced symbol equation for the reaction of calcium oxide with water.

_____ [2]

- (b) Calcium carbonate reacts with acids and is used in many antacid tablets, where it reacts with excess acid in the stomach, reducing acidity and relieving 'heartburn'.



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- (i) Write a balanced symbol equation for the reaction between calcium carbonate and hydrochloric acid.

_____ [3]

- (ii) State two observations made during this reaction.

1. _____
2. _____ [2]

- (iii) State one safety precaution which is necessary when carrying out this reaction in a test tube in the laboratory.

_____ [1]

Examiner Only

Marks Remark

- (d) Metal compounds have important uses. For each of the uses listed in the table below, select the metal compound which is used for this purpose.
Each metal compound may be used once, more than once, or not at all.

sodium chloride silver nitrate copper sulphate
calcium sulphate calcium hydroxide calcium nitrate
aluminium hydroxide sodium hydrogen carbonate

Use	Metal compound
De-icing roads	
White line road markings	
Neutralising acidic soil	
Baking soda	

[4]

Examiner Only	
Marks	Remark

5 During the nineteenth and twentieth centuries many scientists contributed to the development of atomic theory.

(a) Name one scientist whose work led to the structure of the atom as we know it today.

_____ [1]

(b) The table below shows information about an aluminium **atom** and a fluoride **ion**.

(i) Complete the table.

	Symbol	Number of electrons	Electronic configuration
Aluminium atom		13	
Fluoride ion	F ⁻		

[4]

(ii) Write the formula for aluminium fluoride.

_____ [1]

(iii) Explain why an aluminium atom has no charge.

_____ [2]

(c) Compounds are formed when two or more different elements chemically bond together.

(i) Explain what you understand by the term element.

_____ [2]

Examiner Only

Marks Remark

- (ii) Using **full** electronic configurations, **draw diagrams** to show how atoms of magnesium combine with atoms of oxygen to form magnesium oxide.

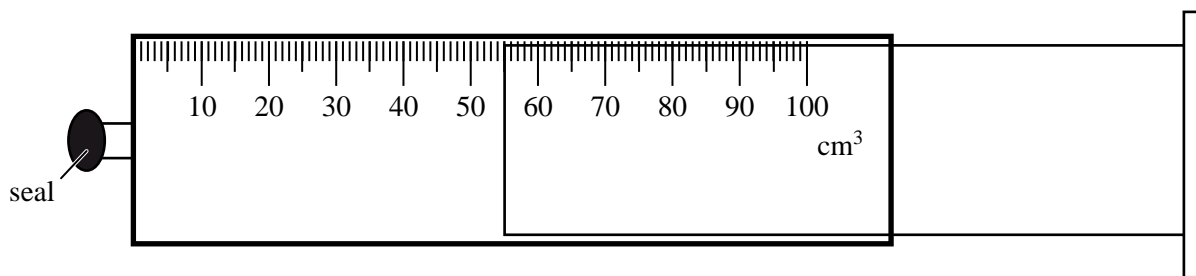
Examiner Only	
Marks	Remark

[6]

- (iii) State the type of bonding which is present in magnesium oxide.

_____ [1]

- 6 (a) The diagram below shows a gas syringe containing a sample of air. The syringe is sealed. The units on the syringe are cm^3 .



- (i) What volume of air is in the gas syringe?

_____ cm^3 [1]

- (ii) Indicate whether the volume of air in the sealed gas syringe would increase or decrease by placing a tick in the correct column in the following table.

External factor	Volume increases	Volume decreases
Increase pressure		
Increase temperature		

[2]

- (b) Air is a mixture of gases, some of which are listed in the table below. Complete the table giving the name or formula of the gas.

Name of gas	Formula of gas
	N_2
Oxygen	
Carbon dioxide	
	He
	Ar

[5]

Examiner Only

Marks Remark

- (c) Air contains only non-metallic elements. The table below lists the melting and boiling points of some non-metallic elements which are found in common pollutants in air.

Element	Melting point (°C)	Boiling point (°C)
carbon	3500	4827
fluorine	-220	-188
sulphur	114	444
chlorine	-101	-35
phosphorus	44	280
bromine	-7	59

- (i) What is meant by the term melting point?

_____ [2]

- (ii) At room temperature (20 °C), name the elements from the table above which are:

Gases _____

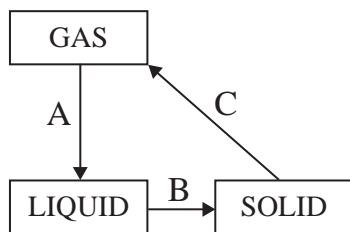
Liquids _____

Solids _____ [6]

Examiner Only

Marks Remark

(d) Some other changes of state are labelled in the diagram below.



Name the changes of state represented by the letters A, B and C.

A _____

B _____

C _____ [3]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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