



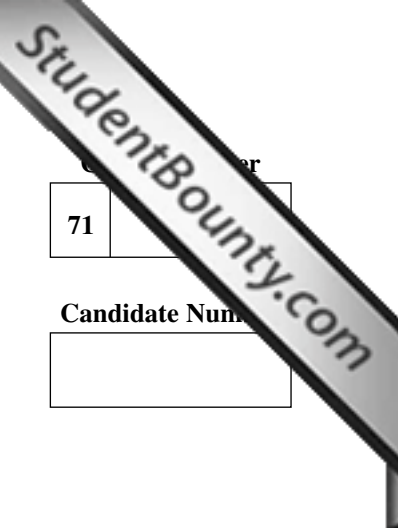
General Certificate of Secondary Education
2009

Science: Chemistry

Paper 1
Foundation Tier

[G1401]

THURSDAY 4 JUNE, MORNING



TIME

1 hour.

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 five** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.
Quality of written communication will be assessed in question 4(b)(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	
Total Marks	

- 1 (a) All playstations and games consoles contain a microchip made from the **element** silicon which has the symbol Si and **atomic number** 14.



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

[2]

- (ii) What is meant by the term **atomic number**?

[1]

- (b) (i) An atom of silicon contains protons, electrons and neutrons. Complete the table below to show the relative mass and relative charge of each particle and their position in the atom.

Particle	Relative mass	Relative charge	Position
proton			
electron			
neutron			

[6]

Examiner Only

Marks Remark

(ii) Draw the electronic structure of a silicon atom.

Examiner Only

Marks Remark

[2]

(c) Silicon has 3 stable **isotopes**, ^{28}Si , ^{29}Si and ^{30}Si .

(i) Complete the table below to give the number of protons, electrons and neutrons present in one atom of each of the isotopes of silicon.

Isotope	Number of protons	Number of electrons	Number of neutrons
^{28}Si			
^{29}Si			
^{30}Si			

[3]

(ii) Explain what you understand by the term **isotope**.

_____ [2]

(d) Silicon is rarely found in nature in its uncombined form but is found as silicon dioxide (sand). Silicon dioxide contains covalent bonds.

(i) Suggest a formula for silicon dioxide.

_____ [1]

(ii) What is a covalent bond?

_____ [2]

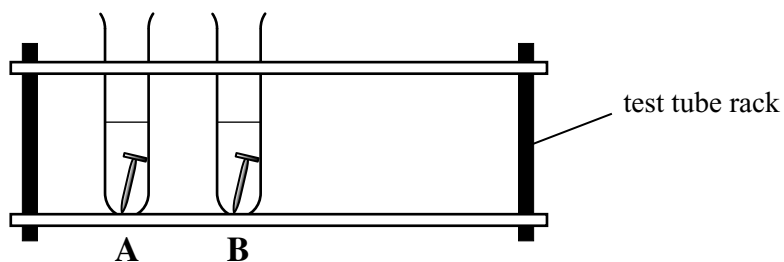
- (e) Silicon dioxide is heated with sodium carbonate and magnesium oxide to make glass. Sodium carbonate and magnesium oxide contain ionic bonding.

Explain using full electronic structures how atoms of magnesium and atoms of oxygen form ions and bond to produce magnesium oxide.

[6]

Examiner Only	
Marks	Remark

- 2 (a) Two iron nails were placed in separate test tubes containing water. The nail in test tube **A** was galvanised but the nail in test tube **B** was not. After a few days, the nail in test tube **B** had rusted.



- (i) State **one** observation which would indicate that rusting is a chemical reaction.

_____ [1]

- (ii) What material is used to galvanise iron?

_____ [1]

- (iii) State **two** other methods which could be used to prevent iron from rusting.

1. _____ [1]

2. _____ [1]

- (iv) The chemical name for rust is hydrated iron(III) oxide. What is meant by the term hydrated?

_____ [1]

Examiner Only

Marks Remark

(c) Magnesium reacts with copper(II) sulphate solution.

(i) Write a balanced symbol equation for the reaction.

_____ [2]

(ii) State one term used to describe this type of reaction.

_____ [1]

(iii) State **two** observations you would make during this reaction.

_____ [2]

(iv) Name one other metal which reacts **safely** with copper(II) sulphate solution.

_____ [1]

Examiner Only

Marks

Remark

- (b) During the electrolysis of copper(II) sulphate solution, the ions present in the solution are attracted to the electrodes where they may be discharged.

The table below gives some of the details of the ions and the electrode to which they are attracted. Complete the table.

You may find your Data Leaflet useful in answering this question.

Name of ion	Formula of ion (including charge)	Attracted to positive electrode	Attracted to negative electrode
Copper(II)		X	✓
	SO_4^{2-}		
	H^+		
Hydroxide		✓	X

[6]

Examiner Only

Marks Remark

4 Group VII of the Periodic Table is a group of reactive non-metals known as the halogens.

(a) (i) Complete the table below giving the colour and physical state at room temperature of some of the halogens.

Element	Physical state at room temperature	Colour
Fluorine		
Chlorine	gas	
Bromine		red-brown
Iodine		

[6]

(ii) All of the halogens exist as diatomic molecules. What is meant by the term diatomic?

_____ [1]

(iii) Why is chlorine added to drinking water?

_____ [1]

(iv) Which of the elements in the table above is the **least** reactive?

_____ [1]

Examiner Only

Marks Remark

5 (a) The table below shows information about different minerals.

(i) Complete the table.

(Relative atomic masses: C = 12; O = 16; S = 32; Ca = 40;
Fe = 56; Hg = 201)

Mineral	Name of compound	Formula of compound	Relative Formula Mass
Calcite	calcium carbonate		
Haematite		Fe ₂ O ₃	
Cinnabar		HgS	

[6]

(ii) The mineral titania is mainly composed of titanium oxide, TiO₂.
The calculation below shows how the percentage of titanium in titania may be calculated.

$$\% \text{ Titanium in titania} = \frac{\text{Relative atomic mass of Ti}}{\text{Relative formula mass of TiO}_2} \times 100$$

Calculate the percentage of titanium in titania.

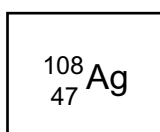
(Relative atomic masses: O = 16; Ti = 48)

_____ [2]

Examiner Only

Marks Remark

- (b) The element silver forms many compounds containing the silver(I) ion, Ag^+ . Silver(I) oxide is used in batteries for submarines and in torpedoes. An atom of silver may be written:



- (i) Write the formula of silver(I) oxide.

_____ [1]

- (ii) What is the atomic number of silver?

_____ [1]

- (iii) State the name and mass of the atom to which the mass of all other atoms is compared.

Name _____

Mass _____ [2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only

Marks

Remark

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