

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 the	playstations an element silicon	nd games consoles n which has the syn	contain a microch nbol Si and atomic	ip made from number 14.	Examiner C Marks Re	Only emark
				PLAYETATION BOOM	on Images			
		(i)	What is mean	t by the term elem	ent?			
						[2]		
		(ii)	What is mean	t by the term aton	nic number?	[1]		
	(b)	(i)	An atom of sil Complete the charge of each	licon contains pro table below to sho n particle and their	tons, electrons and ow the relative mas position in the ato	neutrons. s and relative om.		
			Particle	Relative mass	Relative charge	Position		
			proton					
			electron					
			neutron					
						[6]		

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

[2]

Examiner Only Marks

Ren

- (c) Silicon has 3 stable isotopes, ²⁸Si, ²⁹Si and ³⁰Si.
 - (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.

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

[2]

_____[1]

- (i) Suggest a formula for silicon dioxide.
- (ii) What is a covalent bond?

[2]

[Turn over

(e) Silicon dioxide is heated with sodium carbonate and magnesium oxide Examiner Only Marks Remar 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]

2	(a)	Two The not.	b iron nails were placed in separate test tubes containing water. a nail in test tube A was galvanised but the nail in test tube B was After a few days, the nail in test tube B had rusted. $\frac{1}{A} = \frac{1}{B} = $	\$	Examine Marks	er Only Remark
		(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.	om [1] [1]		
		(iv)	The chemical name for rust is hydrated iron(III) oxide. What is meant by the term hydrated?	[1]		

(1)	Write a balanced symbol equation for the reaction of copper wi oxygen in the air forming copper(II) oxide.	th
		[3]
(ii)	Write a balanced symbol equation for the reaction of copper(II) oxide with carbon dioxide forming copper(II) carbonate.	
		[2]
(iii)	State the colours of:	
	copper	
	copper(II) oxide	
	copper(II) carbonate	[3]
(iv)	Name the acid which reacts with copper(II) carbonate to form a solution of copper(II) sulphate.	ı
		[1]

(c)	Mag	gnesium reacts with copper(II) sulphate solution.	Examine Marks	er Only Remark
	(i)	Write a balanced symbol equation for the reaction.	marito	Komark
		[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]		
			[Turr	1 over

(a) The diagram below shows the apparatus used to carry out the Examiner Only Marks Rema electrolysis of copper(II) sulphate solution. Graphite electrodes are used. A-- copper(II) sulphate solution (i) What is meant by the term electrolysis? [2] (ii) State the name given to electrode A. _____ [1] (iii) What term is used to describe the copper(II) sulphate solution in this experiment? _____ [1] (iv) State two reasons why graphite is used for the electrodes. 1._____ 2._____[2]

3

(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.

Name of ion	Formula of ion (including charge)	Attracted to positive electrode	Attracted to negative electrode
Copper(II)		×	1
	SO_{4}^{2-}		
	H+		
Hydroxide		1	×

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

[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		

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

_____[1]

_____[1]

- (iii) Why is chlorine added to drinking water?
- (iv) Which of the elements in the table above is the **least** reactive?
 - _____ [1]

[6]

Examiner Only Marks Remark

(b)	Chl	orine gas reacts with hydrogen gas to form hydrogen chloride.	N	Examiner C Iarks Re	Dnly mark
	(i)	Write a balanced symbol equation for the reaction between chlorine gas and hydrogen gas.			
			[3]		
	(ii)	Suggest two safety measures which should be taken when carry out the reaction.	ing		
		1			
		2	[2]		
	(iii)	Hydrogen chloride is an acidic gas. What colour will damp universal indicator paper change to in the presence of hydrogen chloride?			
			[1]		
	(iv)	Describe a chemical test for hydrogen chloride gas and state the result for a positive test.			
			[4]		
		Quality of written communication	[2]		

[Turn over

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]

Examiner Only Marks Rema

(ii) The mineral titania is mainly composed of titanium oxide, TiO_2 . The calculation below shows how the percentage of titanium in titania may be calculated.

% 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]

(b)	The ion, torp	element silver forms many compounds containing the silver(I) Ag ⁺ . Silver(I) oxide is used in batteries for submarines and in edoes. An atom of silver may be written:		Examin Marks	er Only Remark
	loip	$\begin{bmatrix} 108\\ 47 \end{bmatrix} Ag$			
	(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]		
-	THI	S IS THE END OF THE QUESTION PAPER			

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