CCEA GCSE CHEMISTRY (2003 SPECIFICATION)

CHEMISTRY



EXAM QUESTION PACK

PAPER 1 FOUNDATION TIER G1401 PAPERS

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012

Science: Chemistry

Paper 1
Foundation Tier

G1401

[G1401]

TUESDAY 12 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 **3(b)(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	
Total Marks	

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Examiner Only	
Marks	Remark

1 In the Periodic Table elements with similar properties are placed in the same group. In Group I(1) the similarity between elements is very obvious. However the properties of the elements in Group IV(4) vary significantly.

(a) (i) Complete the table for some of the elements of Group IV(4) by inserting the correct **atomic number** and decide if the element is a **metal** or **non-metal**.
You may find your Data Leaflet useful in answering this question.

Element	Atomic number	Metal or Non-metal
Carbon		
Tin		
Lead		

[3]

(ii) What is meant by the term **element**?

_____

_____ [2]

(iii) What do you understand by the term **atomic number**?

_____

_____ [1]

(b) The element carbon has three naturally occurring **isotopes** ^{12}C, ^{13}C and ^{14}C.

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

Isotope	Number of protons	Number of electrons	Number of neutrons
^{12}C			
^{13}C			
^{14}C			

[3]

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

_____

_____ [2]

(c) Graphite is one of the **allotropes** of carbon and is used as an electrode in the electrolysis of sodium chloride solution.

(i) Explain what you understand by the term **allotropes**.

_____

_____ [2]

(ii) Explain, using full electronic structures, how atoms of sodium and atoms of chlorine form ions and bond to form sodium chloride. You must give the charge on each ion.

[6]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

2 Many sodium compounds are added to food to enhance flavour. Salt (sodium chloride) is one of the most commonly used flavour enhancers.



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(a) Sodium reacts directly with chlorine to form sodium chloride.

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

_____ [3]

(ii) Describe the appearance of sodium chloride.

_____ [2]

(iii) Sodium is a soft metal which is cut easily with a knife. Describe the appearance of a piece of freshly cut sodium.

_____ [1]

(iv) What is observed when a freshly cut piece of sodium is left exposed to air for a few minutes?

_____

_____ [1]

(v) How is sodium metal stored safely in the laboratory?

_____ [1]

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(b) A small piece of sodium metal is added to a trough of deionised water which contains universal indicator. The piece of sodium floats on the surface and melts to produce a silvery grey ball, before disappearing. The universal indicator changes colour from green to blue.

Examiner Only	
Marks	Remark

(i) Explain why sodium floats on the surface of the water.

_____

_____ [1]

(ii) What evidence in the information above would suggest that the reaction is exothermic?

_____

_____ [1]

(iii) Explain fully why the universal indicator changed colour to blue.

_____

_____

_____ [2]

(iv) Write a balanced symbol equation for the reaction of sodium with water.

_____ [3]

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3 A label from a bottle of lemonade is shown below.



Ingredients:
carbonated water
citric acid
ascorbic acid
sucrose
preservative (sodium benzoate)
flavourings

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(a) (i) Complete the passage using the words in the box below. Each word may be used once, more than once or not at all.

hydrogen	**carbon dioxide**	**high**	**low**
nitrogen	**citric acid**	**sodium benzoate**	**ascorbic acid**

Carbonated water is made by dissolving _____ gas in water. More of the gas dissolves in water when the temperature is _____. A substance in the ingredients list which produces hydrogen ions when dissolved in water is _____. [3]

(ii) Sucrose is used in lemonade as a sweetener. Sucrose is a **solute** which dissolves very well in water and is said to have a high **solubility**.

Explain what is meant by the terms **solute** and **solubility**.

Solute: _____

_____ [1]

Solubility: _____

_____

_____

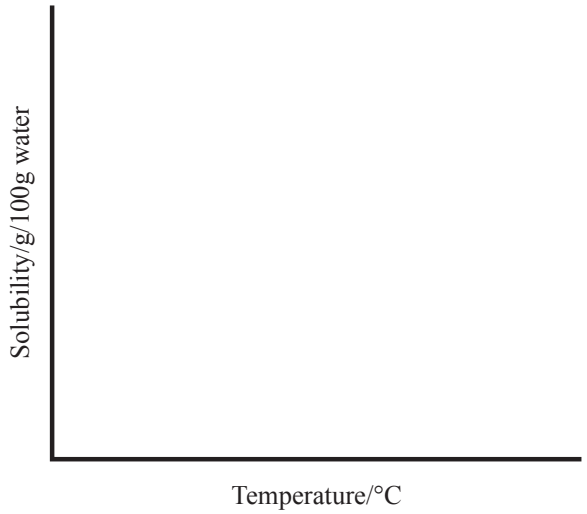
_____ [4]

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Marks	Remark

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(iii) On the axes below sketch a graph to show the change in solubility of sucrose with increasing temperature.



[1]

(b) To prevent tooth decay, it is better to drink mineral water, rather than lemonade. Mineral water may be described as hard water. The table below shows information from the labels of three different mineral waters **A**, **B** and **C**.

	Composition (mg/dm^3)		
Ions present	**A**	**B**	**C**
calcium	47.5	78.0	27.0
magnesium	16.5	24.0	6.9
sodium	5.7	5.0	6.6
potassium	0.4	1.0	0.8
hydrogen carbonate	206.0	357.0	103.0
chloride	9.0	4.5	6.4
sulphate	8.0	10.0	9.6
nitrate	3.5	3.8	2.0
pH	7.8	7.2	4.6

(i) What is meant by the term **hard water**?

_____

_____ [2]

(ii) Which mineral water (**A**, **B** or **C**) is the hardest mineral water? Explain your choice.

_____

_____

_____ [2]

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Marks	Remark

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(iii) Describe an experiment you would carry out to determine which of the three mineral waters is the hardest.

Examiner Only

Marks	Remark

_____

_____

_____

_____

_____

_____

_____ [3]

Quality of written communication [2]

(iv) Describe how you would experimentally determine the pH of mineral water.

_____

_____ [2]

(v) Which mineral water (**A**, **B** or **C**) is the most acidic? Explain your choice.

_____

_____ [2]

(vi) Use the information from the table to give the name and formula of one compound which could be present in mineral water **A**.

Name: _____

Formula: _____ [2]

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Marks	Remark

4 The Olympic Torch is ignited several months before the opening ceremony of the Olympic Games at the site of the ancient Olympics in Greece and is then carried by a relay of people to the host city.



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(a) Different fuels have been used for the Olympic torch. For example, kerosene, obtained from the fossil fuel crude oil, was used in the torch for the 1964 Olympics in Tokyo.

Name two other fossil fuels.

1. _____

2. _____ [2]

(b) The most recent fuels to be used in the Olympic torch are **hydrocarbon** fuels as they give a strong flame with little smoke, producing mainly carbon dioxide and water. Increased levels of carbon dioxide in the atmosphere may lead to the greenhouse effect.

(i) What is meant by the term **hydrocarbon**?

_____

_____ [2]

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Marks	Remark

(ii) State two environmental problems which are linked to the greenhouse effect.

1. _____

_____

2. _____

_____ [2]

(c) For the Sydney Olympics in 2000 the Olympic flame was carried up Mount Everest where there is less oxygen present in the atmosphere. The fuel used for the torch was propane (C_3H_8).

(i) Complete the word equation below giving the names of the two products of combustion in a **limited supply of oxygen**.

propane + oxygen ⟶ _____ + _____ [2]

(ii) How many atoms are present in one molecule of propane?

_____ [1]

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(d) At the end of the relay, the last torchbearer enters the stadium and lights the Olympic cauldron, signalling the start of the games. For the London 2012 Olympics, the fuel in the cauldron which undergoes **combustion** will be a **renewable** fuel.



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(i) What is meant by the term **combustion**?

_____

_____

_____ [3]

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

_____

_____ [2]

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Marks	Remark

(e) During the 2012 Olympics a new range of vehicles which use clean fuels will be used in London. Taxis that run on hydrogen have been developed.



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(i) Write a balanced symbol equation for the combustion of hydrogen.

_____ [3]

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

_____

_____ [1]

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Marks	Remark

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(Questions continue overleaf)

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Marks	Remark

5 The Periodic Table lists all known elements. Many scientists were involved in its development.

(a) Complete the following paragraph.

The Russian scientist _____ is credited with having made the greatest contribution to the development of the Periodic Table.

He commenced his work in 1869. A few years previous to this, the British chemist John _____ had started to arrange elements in order of increasing atomic _____.

He found that every eighth element was very similar and he called this observation the Law of _____.

The horizontal rows of the Periodic Table are called _____. [5]

(b) Part of the Periodic Table is shown below.

Li	Be														O	F	Ne
Na	Mg														S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr															I	Xe
Cs	Ba															At	Rn

Using ONLY the elements in the table above:

(i) Name the most reactive metal.

_____ [1]

(ii) Name the most reactive non-metal.

_____ [1]

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(iii) Name an element which is a liquid at room temperature and pressure.

_____ [1]

(iv) Name **one** colourless gas.

_____ [1]

(v) The elements in the last group of the table are very unreactive. Explain why these elements are unreactive.

_____

_____ [1]

(c) The element astatine, At, is found in the same group of the Periodic Table as fluorine, chlorine, bromine and iodine. Very little is known about astatine as it is radioactive and unstable.

(i) Predict the physical state of astatine at room temperature and pressure.

_____ [1]

(ii) Suggest the number of electrons which are found in the outer shell of an atom of astatine.

_____ [1]

(iii) Astatine forms a simple ion called astatide. What is the charge on the astatide ion?

_____ [1]

(iv) Write the formula of the compound formed when astatine reacts with hydrogen.

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2012

Science: Chemistry

Paper 1
Foundation Tier

[G1401]

TUESDAY 12 JUNE, MORNING

MARK SCHEME

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AVAILABLE MARKS

1 **(a)** **(i)**

Element	Atomic number	Metal or Non-metal
Carbon	6	non-metal [1]
Tin	50	metal [1]
Lead	82	metal [1]

[1] each row [3]

(ii) substance which consists of one type of atom [2]
or substance which **cannot be broken down into anything simpler** [1]
by chemical means [1] [2]

(iii) number of protons [1]

(b) **(i)**

Isotope	Number of protons	Number of electrons	Number of neutrons
^{12}C	6	6	6
^{13}C	6	6	7
^{14}C	6	6	8

[1] for each column [3]

(ii) atoms of the same element/same atomic number/same number of protons [1]
different number of neutrons/different mass number [1] [2]

(c) **(i)** different forms/structures of the same element [1]
in the same (physical) state [1] [2]

(ii) 2,8,1 [1]
2,8,7 [1]
Na^+ [1] 2,8 [1]
Cl^- [1] 2,8,8 [1]
ions held by attraction between opposite charges [1] Maximum [6]

19

2 **(a)** **(i)** $2Na + Cl_2 \rightarrow 2NaCl$ [3]

(ii) white [1] crystalline [1] solid [1] Maximum [2]

(iii) shiny/grey [1]

(iv) goes dull/tarnishes [1]

(v) under/in oil [1]

(b) **(i)** lower density **than** water [1]

(ii) (the sodium) melts [1]

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					AVAILABLE MARKS
		(iii)	sodium hydroxide/OH^-/hydroxide ions produced [1] alkaline [1] solution	[2]	
		(iv)	$2Na + 2H_2O \rightarrow 2NaOH + H_2$	[3]	15
3	**(a)**	**(i)**	carbon dioxide [1] low [1] citric acid/ascorbic acid/carbonated water [1]	[3]	
		(ii)	Solute = solid which dissolves	[1]	
			Solubility = mass [1] of solid which saturates [1] **100 g water** [1] at a particular temperature [1] allow idea of **maximum** mass for saturate	[4]	
		(iii)	Increasing solubility with increasing temperature	[1]	
	(b)	**(i)**	water which does not lather with soap [1] water which does not lather readily with soap [2]	[2]	
		(ii)	B [1] contains largest calcium and/or magnesium ion concentration/mass [1]	[2]	
		(iii)	equal volumes of mineral water [1] **add soap and shake** [1] most soap for lather/most scum/least or no lather = hardest water [1]	[3]	
			Quality of written communication	[2]	
		(iv)	pH paper/Universal Indicator [1] compare to colour chart [1]	[2]	
		(v)	C [1] lowest pH [1]	[2]	
		(vi)	any compound containing one positive and one negative ion from the lists below: positive ions: calcium/magnesium/sodium/potassium negative ions: hydrogen carbonate/chloride/sulphate/nitrate [1] correct formula of named compound [1]	[2]	24

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				AVAILABLE MARKS
4	(a)	any **two** from: natural gas, LPG, petrol, diesel, paraffin, candlewax, peat, lignite, coke, coal	Maximum [2]	
	(b) (i)	contains **only** [1] **carbon and hydrogen** [1]	[2]	
	(ii)	any **two** from: global warming ice caps melt flooding rise in sea level climate change	[2]	
	(c) (i)	carbon monoxide [1] water [1]	[2]	
	(ii)	11	[1]	
	(d) (i)	reaction [1] of a substance/fuel with oxygen [1] forming oxides [1] releasing energy [1]	Maximum [3]	
	(ii)	can be replaced [1] in a limited period of time [1]	[2]	
	(e) (i)	$2H_2 + O_2 \rightarrow 2H_2O$	[3]	
	(ii)	produces water/product is non-polluting	[1]	18
5	(a)	Mendeleev [1] Newlands [1] mass [1] octaves [1] periods [1]	[5]	
	(b) (i)	caesium	[1]	
	(ii)	fluorine	[1]	
	(iii)	bromine	[1]	
	(iv)	oxygen/neon/argon/xenon/krypton/radon	[1]	
	(v)	full outer shell of electrons	[1]	

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			AVAILABLE MARKS
(c)	**(i)** solid	[1]	
	(ii) 7	[1]	
	(iii) 1–/–	[1]	
	(iv) HAt	[1]	14
		Total	**90**

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011

Science: Chemistry

Paper 1
Foundation Tier

G1401

[G1401]

FRIDAY 27 MAY, 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(a)(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	
Total Marks	

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Examiner Only	
Marks	Remark

1 Periodic Tables are available which show the symbol of each element and some of its uses. Two elements from such a Periodic Table are shown below.

Li
Lithium
Uses:
Batteries
Aircraft alloys

Be
Beryllium
Uses:
Watch springs
Golf clubs

(a) Complete the table below by inserting the name of the element beside its use and state the group number for the group to which the element belongs.

Use	Element name	Group number
Gas used in balloons		
Metal used in distress flares		
Gas used in food packaging		
Bleach for cotton and linen		

[8]

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(b) Elements in the Periodic Table are arranged in groups and periods.

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Marks	Remark

(i) The table below gives details of some of the groups of the Periodic Table. Complete the table.

Group number	Name of group	Number of electrons in the outer shell of an atom
I		
	the halogens	
		8

[6]

(ii) Name the element found in Period IV (4) and Group VII (7).

_____ [1]

(c) Complete the table below by placing a tick (✓) in the correct column, to identify the element as a metal or a non-metal. Place only one tick per row.

Element	Metal	Non-metal
Sodium		
Bromine		
Phosphorus		

[3]

(d) Choose words from the box below to complete the sentence.

hydroxides	**acidic**	**neutral**	**oxides**	**basic**

Most metals burn in oxygen to form _____ which

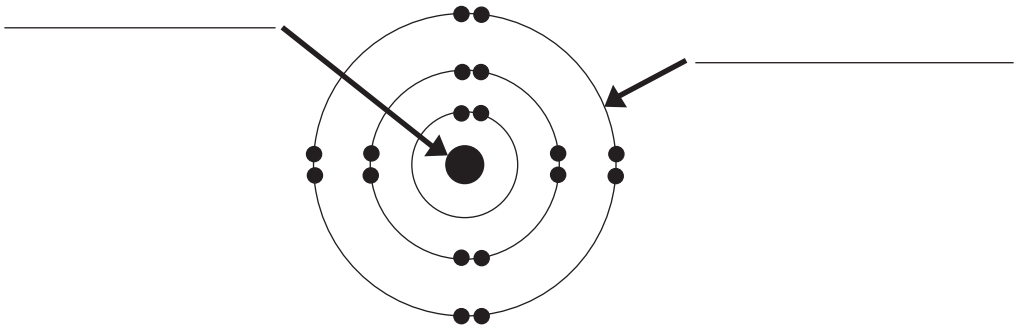
are _____. [2]

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Marks	Remark

2 The reactivity of atoms depends on the arrangement of their electrons. Argon atoms are unreactive whereas atoms of sodium and chlorine are very reactive.

(a) The diagram below shows an atom of argon. Atoms are electrically neutral.



(i) Complete the two labels on the diagram above. [2]

(ii) Explain why atoms are electrically neutral.

_____

_____

_____ [2]

(iii) Using the diagram above, explain why atoms of argon are unreactive.

_____

_____ [1]

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(iv) Complete the table below with the missing details of the subatomic particles.

Relative mass	Relative charge	Name of subatomic particle
	0	
$\frac{1}{1840}$	–1	
1		

[5]

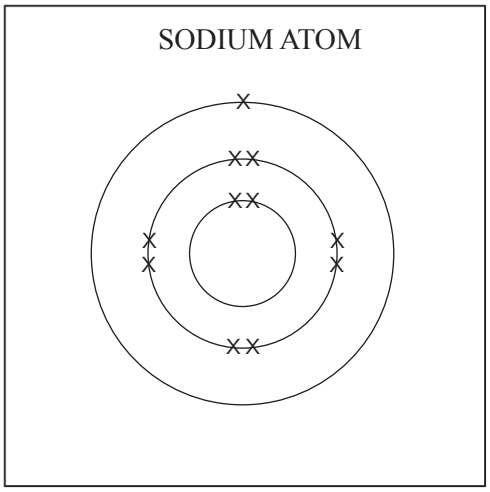
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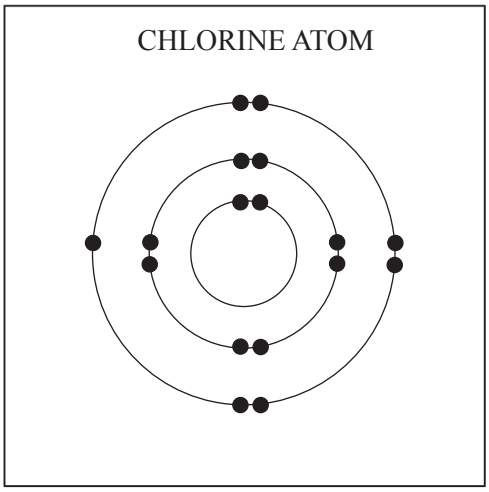
Marks	Remark

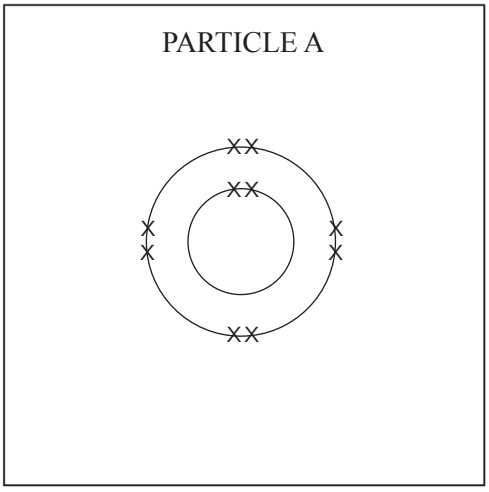
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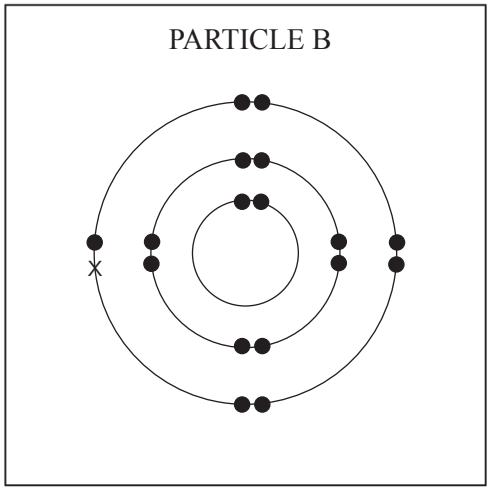
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Marks	Remark

(b) The scheme below shows how atoms of sodium react with atoms of chlorine to form particles A and B. The bonding between particles A and B is ionic.









(i) Write the electronic configurations of the particles shown above. The sodium atom has been completed for you.

Sodium atom 2, 8, 1

Chlorine atom _____

Particle A _____

Particle B _____ [3]

(ii) Name particles A and B

Particle A _____

Particle B _____ [2]

(iii) Write the symbol including charges for particles A and B.

Particle A _____

Particle B _____ [2]

(iv) Explain what you understand by the term ionic bonding.

_____

_____

_____ [2]

(v) From the list below select one other substance in which the bonding is ionic.

magnesium oxide **sulphur dioxide** **calcium chloride**

carbon dioxide **methane** **sodium iodide** **water**

_____ [1]

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Marks	Remark

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Marks	Remark

3 Most of the elements in the Periodic Table are metals.

(a) Use your Periodic Table to complete the table below.

Name of metal	Symbol
Sodium	
	Pb

[2]

(b) Some of the characteristic physical properties and related uses of three metals are given in the table below. Complete the table.

Metal	Physical property	Related use of metal
Silver	Shiny	Jewellery
Copper	Conducts heat	
Aluminium		Overhead power cables

[2]

(c) Magnesium metal burns in air with a brilliant white flame. Write a balanced symbol equation for this reaction.

_____ [3]

(d) **(i)** Magnesium metal reacts very slowly with cold water but readily with steam. Draw a labelled diagram of the assembled apparatus used to react magnesium with steam **and** to collect the gaseous product.

[5]

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(ii) Write a balanced symbol equation for the reaction of magnesium with steam.

_____ [2]

(iii) Name a metal which **does not** react with cold water but does react with steam.

_____ [1]

(e) **(i)** Describe what is observed when a strip of magnesium metal is added to dilute hydrochloric acid.

_____

_____

_____ [3]

(ii) When magnesium reacts with dilute hydrochloric acid a compound and an element are formed. Name the compound and the element.

Compound: _____

Element: _____ [2]

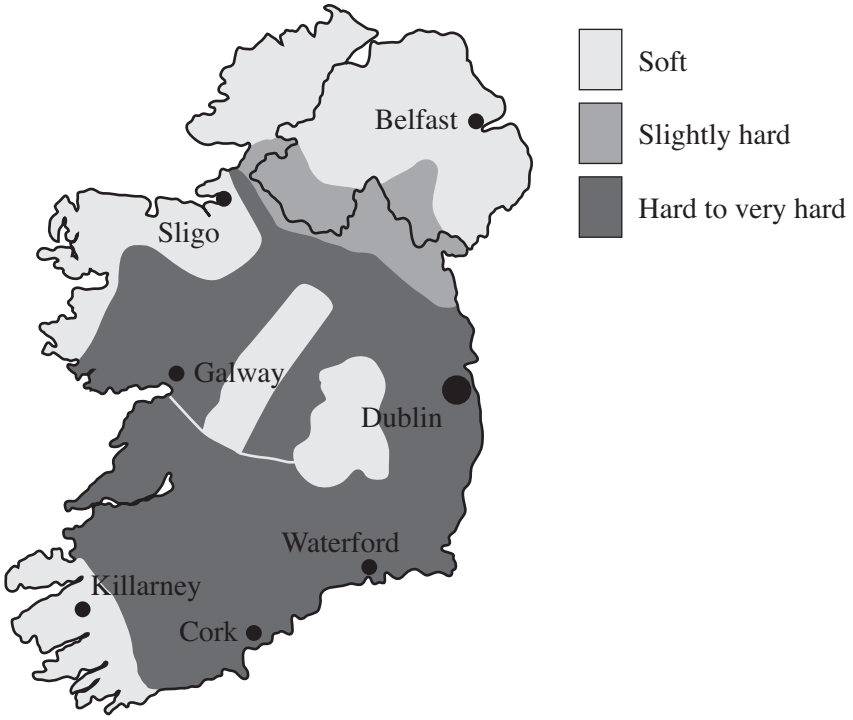
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Marks	Remark

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Marks	Remark

4 **(a)** Various regions of Ireland have hard water. The map below shows the hardness of water throughout Ireland.



(i) What is meant by the term hard water?

_____

_____ [2]

(ii) Name two physical features you would expect to find in a hard water region.

_____

_____ [2]

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(iii) Explain, giving practical details, how you would test a sample of tap water to prove that it was hard water.

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Marks	Remark

_____

_____

_____

_____

_____

_____ [3]

Quality of Written Communication [2]

(iv) State one disadvantage of hardness in water.

_____ [1]

(b) Hard water is used for brewing beer. In soft water regions a soluble calcium compound is added to the water used for brewing to make it hard.

Due to copyright, an image of a beer bottle has been removed which is not essential to answer the question.

(i) Name one calcium compound which could be added to the soft water to make it hard.

_____ [1]

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(ii) Complete the following passage using the words below. Each word may be used once, more than once or not at all.

Examiner Only	
Marks	Remark

solute **hydrated** **solvent**

solution **dissolves** **saturated**

The soluble calcium compound _____ in the

water to form a _____.

The soluble calcium compound is the _____ and

the water is the _____. [4]

(iii) Apart from brewing beer, state another advantage of hardness in water.

_____ [1]

(c) Hardness in water can be either temporary or permanent.

(i) State one method which will only remove temporary hardness from water.

_____ [1]

(ii) Name a chemical which will remove hardness when added to both types of hard water.

_____ [1]

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Marks	Remark

5 **(a)** Fill in the gaps in the following sentence.

The masses of all atoms are compared to the mass of a single isotope of the element _____ which has a mass of _____. [2]

(b) Most metals are found naturally in rocks called ores. Some examples are shown in the table below.

Metal ore	Formula of ore
Galena	PbS
Haematite	Fe_2O_3
Chalcocite	Cu_2S

Calculate the relative formula mass (RFM) of each of the ores below.
(Relative atomic masses: O = 16; S = 32; Fe = 56; Pb = 207)

(i) Galena

RFM _____ [1]

(ii) Haematite

RFM _____ [1]

(c) Chalcocite contains the element copper. Copper has two stable isotopes, $^{63}_{29}Cu$ and $^{65}_{29}Cu$.

(i) What is meant by the term isotopes?

_____

_____

_____ [2]

(ii) How many neutrons are there in an atom of $^{63}_{29}Cu$?

_____ [1]

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Examiner Only	
Marks	Remark

(d) (i) The relative formula mass of another metal ore was calculated to be 102.
The molecular formula of this ore can be represented as X_2O_3. Use this information to calculate the relative atomic mass of metal X.

Relative atomic mass = _____ [2]

(ii) Use your Periodic Table to identify metal X.

_____ [1]

(e) The equations below are for reactions involved in the extraction of metals from their ores. Balance the equations.

(i) $CuO + C \rightarrow Cu + CO_2$ [1]

(ii) $TiCl_4 + Na \rightarrow Ti + NaCl$ [1]

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2011

Science: Chemistry

Paper 1
Foundation Tier

[G1401]

FRIDAY 27 MAY, MORNING

MARK SCHEME

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Guidelines for marking equations

Equations where the stoichiometry is 1 gain [2] maximum

[1] for correct formula of reactant/s
[1] for correct formula of product/s

e.g. $CaO + H_2O \rightarrow Ca(OH)_2$ [2]
[1] [1]

$CaO + \mathbf{2}H_2O \rightarrow Ca(OH)_2$ [1]
[0] [1]

However:
$2CaO + 2H_2O \rightarrow 2Ca(OH)_2$ [2]
[1] [1]

Equations where the stoichiometry is more than 1 gain [3]

[1] for correct formula of reactant/s
[1] for correct formula of product/s
[1] for correct balancing

e.g. $2Na + 2H_2O \rightarrow 2NaOH + H_2$
[1] [1]

+ [1] for balancing = [3]

$2Na + H_2O \rightarrow 2NaOH + H_2$
[1] [1]

No balancing mark = [2]

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AVAILABLE MARKS

1 **(a)** Helium [1] 0/8/VIII [1]
Magnesium [1] 2/II [1]
Nitrogen [1] 5/V [1] or Argon [1] 0/8/VIII [1]
Chlorine [1] 7/VII [1]
Apply CM for group of incorrect element [8]

(b) **(i)**

Group number	Name of group	Number of electrons in the outer shell of an atom
I	**alkali metals** [1]	**1** [1]
7/VII [1]	the halogens	**7** [1]
8/0/VIII [1]	**noble gases** [1]	8

[6]

(ii) bromine/Br/Br_2 [1]

(c)

Element	Metal	Non-metal
Sodium	✓ [1]	
Bromine		✓ [1]
Phosphorus		✓ [1]

[3]

(d) oxides [1]
basic [1] [2]

20

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AVAILABLE MARKS

2 **(a)** **(i)** Label on left = nucleus [1]
Label on right = shell [1] [2]

(ii) equal number [1]
of *protons and electrons* [1] [2]

(iii) idea of full outer shell (of electrons) [1]

(iv)

Relative mass	Relative charge	Name of subatomic particle
1 [1]	0	**neutron** [1]
$\frac{1}{1840}$	**–1**	**electron** [1]
1	**+1** [1]	**proton** [1]

[5]

(b) **(i)** chlorine atom 2, 8, 7 [1]
particle A 2, 8 [1]
particle B 2, 8, 8 [1] [3]

(ii) particle A = sodium ion [1]
particle B = chloride ion [1] [2]

(iii) particle A = Na^+ [1]
particle B = Cl^- [1] [2]

(iv) attraction [1] of oppositely charged [1] ions [2]
or electrostatic [1] attraction [1]

(v) magnesium oxide/calcium chloride/sodium iodide
any one [1] 20

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AVAILABLE MARKS

3 **(a)**

Name of metal	Symbol
Sodium	**Na** [1]
lead [1]	Pb

[2]

(b)

Metal	Physical property	Related use of metal
Silver	Shiny	Jewellery
Copper	Conducts heat	**saucepans** [1]
Aluminium	**low density/ conducts electricity** [1]	Overhead power cables

[2]

(c) $2Mg + O_2 \rightarrow 2MgO$ [3]

(d) **(i)** magnesium in a boiling tube or suitable container
mineral wool soaked in water
heat
} max [2] for all 3 labels

delivery tube [1] for connection

collection vessel [1]
collection over water [1]
} [2] for collection

[5]

(ii) $Mg + H_2O \rightarrow MgO + H_2$ [2]

(iii) zinc/aluminium/iron [1]

(e) **(i)** bubbles/gas given off [1]
heat released [1]
colourless solution forms [1]
magnesium disappears [1]
max [3]

(ii) compound: magnesium chloride [1]
element: hydrogen [1]
[2]

20

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				AVAILABLE MARKS
4	(a)	(i)	water which does not lather readily with soap [2] water which does not lather with soap [1] [2]	
		(ii)	caves/stalactites/stalagmites/limestone pavements any **two** [2]	
		(iii)	add soap [1] shake [1] no (immediate) lather/scum forms/a lot of soap needed to form a lather/correct comparison [1] [3]	
			Quality of Written Communication [2]	
		(iv)	wastes soap/limescale/furring inside (hot water) pipes [1]	
	(b)	(i)	calcium nitrate/calcium chloride/calcium sulphate [1]	
		(ii)	dissolves [1] solution [1] solute [1] solvent [1] [4]	
		(iii)	good for teeth and bones/tastes better/reduces heart disease/tanning leather [1]	
	(c)	(i)	boiling [1]	
		(ii)	washing soda/(hydrated) sodium carbonate [1]	18

		AVAILABLE MARKS
5	**(a)** Carbon [1] 12 [1] [2]	
	(b) **(i)** Galena 207 + 32 = 239 [1]	
	(ii) Haematite 2(56) + 3(16) = 160 [1]	
	(c) **(i)** atoms of the same element/same number of protons/same atomic number [1] different mass numbers/different number of neutrons [1] [2]	
	(ii) 34 [1]	
	(d) **(i)** $X_2O_3 = 102$ $2X = 102 - 3(16) = 54$ [1] $X = \frac{54}{2} = 27$ [1] [2]	
	(ii) Aluminium [1]	
	(e) **(i)** $2CuO + C \rightarrow 2Cu + CO_2$ [1]	
	(ii) $TiCl_4 + 4Na \rightarrow Ti + 4NaCl$ [1]	12
	Total	**90**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2010

Science: Chemistry

Paper 1
Foundation Tier

[G1401]

G1401

WEDNESDAY 26 MAY, 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 **2(a)(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	

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Examiner Only	
Marks	Remark

1 **(a)** The modern Periodic Table has been in use for over 100 years. Its development included the work of several chemists including John Newlands and Dmitri Mendeleev.

(i) What name was given to the law developed by John Newlands?

_____[1]

(ii) State **three** features of the Periodic Table developed by Mendeleev which are different from the modern Periodic Table.

1. _____

_____

2. _____

_____

3. _____

_____[3]

(b) The modern Periodic Table is made up of Groups and Periods. What name is given to the following Groups?

Group I _____

Group VII _____[2]

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(c) Often a short form of the Periodic Table like the one shown below is used.

Group	I	II	III	IV	V	VI	VII	0
	H							He
	Li	Be	B	C	N	O	F	Ne
	Na	Mg	Al	Si	P	S	Cl	Ar
	K	Ca	Ga	Ge	As	Se	Br	Kr

Using ONLY the elements in the table above:

(i) Name one noble gas.

_____ [1]

(ii) Name one element which is a liquid at room temperature and pressure.

_____ [1]

(iii) Name one diatomic gas.

_____ [1]

(iv) Name one non-metal which is a solid at room temperature and pressure.

_____ [1]

(v) Name one element which forms a simple ion with a charge of 2–

_____ [1]

(vi) Suggest one reason why hydrogen may be placed in Group I.

_____

_____ [1]

Examiner Only

Marks	Remark

(d) Group III of the Periodic Table contains the elements boron, aluminium and gallium.

Group III
$^{11}_{5}B$
$^{27}_{13}Al$
$^{70}_{31}Ga$

All of these elements form compounds with oxygen and chlorine.

(i) Write the formula of aluminium oxide.

_____ [1]

(ii) Write a balanced symbol equation for the reaction of aluminium with chlorine.

_____ [3]

(iii) In which period of the Periodic Table is gallium found?

_____ [1]

(iv) Group III contains one non-metallic element. Name this element.

_____ [1]

(v) The elements of Group III can form a simple ion with a 3+ charge. Name one other element, apart from those in Group III, which forms an ion with a 3+ charge. You may use your Data Leaflet to help answer this question.

_____ [1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

2 Water is essential for life and is made up of two elements. Water melts at 0 °C and boils at 100 °C.

(a) (i) Write the chemical formula of water.

_____ [1]

(ii) State **two** other physical properties of water.

_____

_____ [2]

(iii) Name the **two** elements that make up water.

_____ [2]

(iv) Describe a chemical test for water and state the result for a positive test.

_____

_____

_____ [3]

Quality of written communication [2]

(b) Many substances, such as sodium hydroxide and anhydrous calcium chloride, interact with moist air.

(i) Describe the observations made when some pellets of sodium hydroxide are left on a watch glass in the laboratory for several days.

_____

_____

_____

_____ [3]

(ii) What do you understand by the term anhydrous?

_____

_____ [2]

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(c) Some substances dissolve very well in water and are said to have high solubility.

(i) Explain what is meant by the term solubility.

_____

_____

_____

_____[4]

(ii) A student wants to dissolve some crystals in water. State two things the student could do to ensure the crystals dissolved quickly.

1. _____

2. _____[2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

3 **(a)** Use the words from the following list to complete the passage below about the element sulphur. Each may be used once, more than once, or not at all.

metal **allotropes** **graphite** **monoclinic** **yellow** **soluble**

plastic **blue** **insoluble** **isotopes** **non-metal**

The element sulphur is a _____. It has an atomic number of 16.

Sulphur exists in three different solid forms known as _____.

One form is known as rhombic sulphur whilst the other two forms are known as _____ sulphur and _____ sulphur. Sulphur is _____ in colour and is _____ in water. [6]

(b) Sulphur undergoes combustion when heated in air.

(i) Write a balanced symbol equation for the combustion of sulphur.

_____[2]

(ii) Describe what would be observed when sulphur undergoes combustion.

_____

_____

_____[3]

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(c) Air pollution is caused by the presence of substances which are bad for health. One of the main pollutants in air is sulphur dioxide.

Examiner Only	
Marks	Remark

(i) Name one source of sulphur dioxide pollution.

_____[1]

(ii) Sulphur dioxide reacts with water vapour in the air to form acid rain. Write a balanced symbol equation for this reaction.

_____[2]

(iii) Acid rain is a weak acid. Suggest the pH value of a sample of acid rain.

_____[1]

(iv) State two effects of acid rain.

1. _____

_____

2. _____

_____[2]

(v) Suggest two ways of preventing the formation of acid rain.

1. _____

_____

2. _____

_____[2]

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(Questions continue overleaf)

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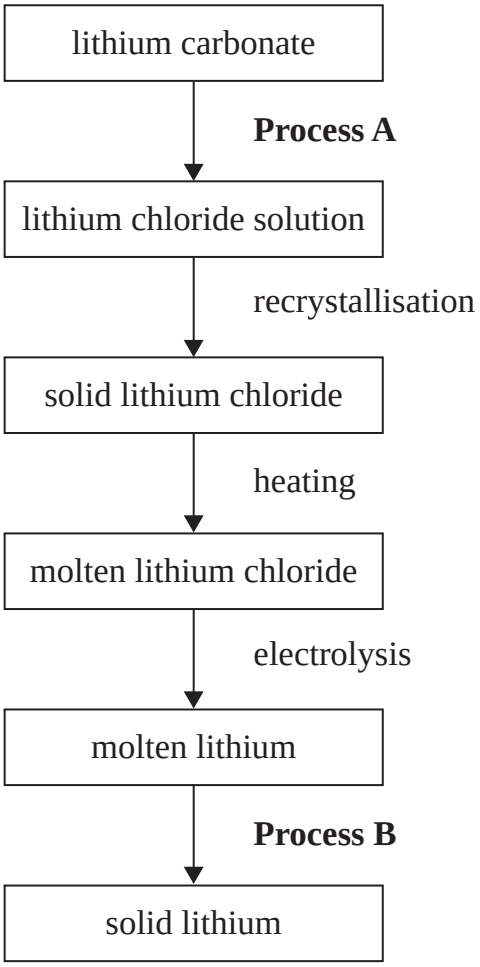
4 Lithium is a metal which is used in LCD televisions, computer monitors and mobile phones.

Examiner Only	
Marks	Remark



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(a) Most lithium is obtained from lithium carbonate. The diagram below shows how solid lithium is produced from lithium carbonate.



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(i) Name the acid which would be added to lithium carbonate in **Process A** to make lithium chloride solution.

_____[1]

(ii) Write the chemical formula for lithium chloride.

_____[1]

(iii) What must be done to convert molten lithium to solid lithium in **Process B**?

_____[1]

(iv) Explain what is meant by the term electrolysis.

_____

_____[2]

(b) Complete the table below by placing a tick (✓) to indicate if the substance conducts electricity or does not conduct electricity. Place only one tick for each substance.

Substance	Conducts electricity	Does not conduct electricity
solid lithium		
molten lithium		
molten lithium chloride		
solid lithium chloride		
lithium chloride solution		

[5]

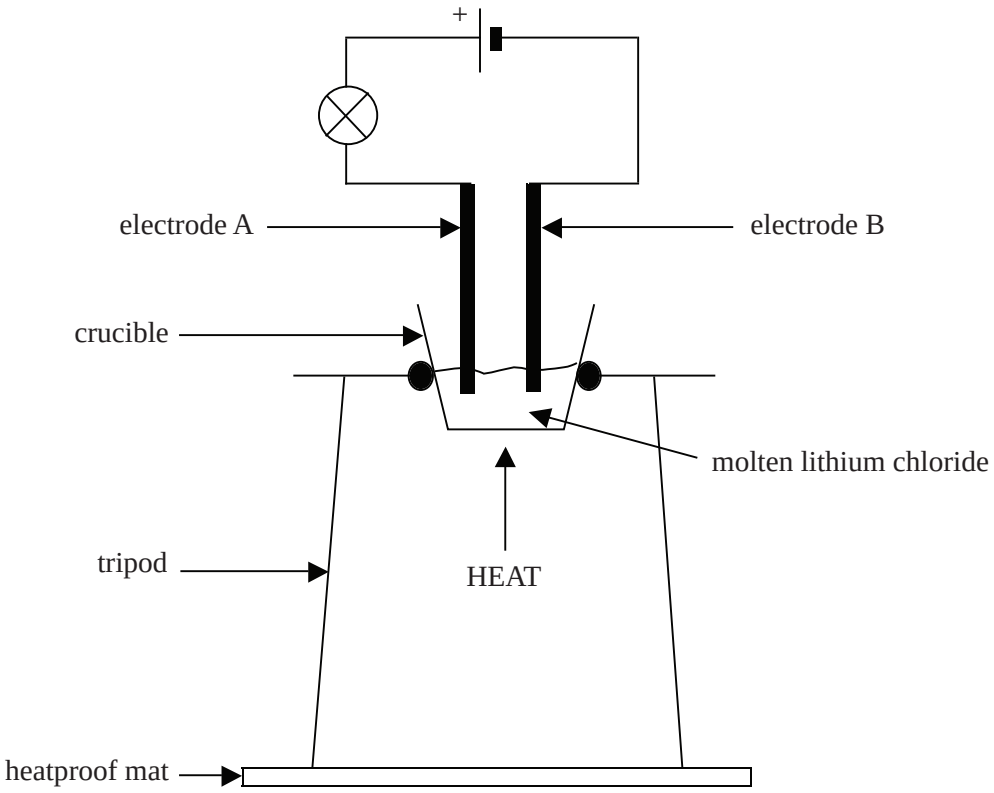
Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

(c) The electrolysis of molten lithium chloride may be carried out using the apparatus shown below.



(i) Name electrode A and electrode B.

Electrode A _____

Electrode B _____ [2]

(ii) What material is used to make the electrodes?

_____ [1]

(iii) State one reason why this material is chosen to make the electrodes.

_____ [1]

(iv) At which electrode, A or B, is lithium produced?

_____ [1]

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(Questions continue overleaf)

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5 Fossil fuels are formed when dead plants and animals are subjected to heat and pressure over millions of years. They are non-renewable fuels.

Examiner Only	
Marks	Remark

(a) (i) Name three fossil fuels.

1. _____

2. _____

3. _____ [3]

(ii) Explain the meaning of the term non-renewable.

_____

_____

_____ [2]

(b) Fossil fuels undergo combustion when heated in air. The hydrocarbon methane is a widely used fuel.

(i) What do you understand by the term combustion?

_____

_____

_____ [3]

(ii) Explain what is meant by the term hydrocarbon.

_____

_____ [2]

(iii) Write a balanced symbol equation for the complete combustion of methane.

_____ [3]

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(iv) State two environmental problems caused by the combustion of fossil fuels.

1. _____

_____

2. _____

_____[2]

(c) If methane burns in a limited supply of air, a toxic product forms. Name this product.

_____[1]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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1847-029-1

GCSE

Science: Chemistry

Summer 2010

Mark Schemes

Issued: October 2010

Rewarding Learning

General Certificate of Secondary Education
2010

Science: Chemistry

Paper 1
Foundation Tier

[G1401]

WEDNESDAY 26 MAY, MORNING

MARK SCHEME

STEMUP.CO.UK

					AVAILABLE MARKS
1	**(a)**	**(i)**	(law of) octaves	[1]	
		(ii)	**any three from** no noble gases/fewer groups gaps (for undiscovered elements) order of atomic mass no mass number no atomic number some elements in different position no **block** of transition metals/no d-block no lanthanides/no actinides/no f-block less elements	[3]	
	(b)		alkali metals [1] halogens [1]	[2]	
	(c)	**(i)**	helium/neon/argon/krypton	[1]	
		(ii)	bromine	[1]	
		(iii)	hydrogen/nitrogen/oxygen/fluorine/chlorine	[1]	
		(iv)	boron/carbon/silicon/phosphorus/sulphur/arsenic/selenium	[1]	
		(v)	oxygen/sulphur/selenium	[1]	
		(vi)	forms H^+ ion/valency = 1/forms HX with halogens/1 e^- in outer shell/ correct formula pattern	[1]	
	(d)	**(i)**	Al_2O_3	[1]	
		(ii)	$2Al + 3Cl_2 \rightarrow 2AlCl_3$	[3]	
		(iii)	4	[1]	
		(iv)	boron	[1]	
		(v)	iron/chromium/vanadium/scandium	[1]	19

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				AVAILABLE MARKS
2	(a)	(i)	H_2O [1]	
		(ii)	colourless [1] liquid [1] density 1 g cm^{-3} [1] odourless [1] does not conduct electricity [1] neutral [1] max [2]	
		(iii)	hydrogen [1] and oxygen [1] [2]	
		(iv)	white [1] anhydrous copper(II) sulphate [1] changes to blue [1] **or** blue [1] anhydrous cobalt(II) chloride/cobalt(II) chloride paper [1] changes to pink [1] [3]	
			Quality of written communication 2 → 3 max [2] / 1 max [1] / 0 [0] [2]	
	(b)	(i)	white pellet/solid/substance [1] colourless [1] solution/liquid [1] which forms white crust/flakes/powder [1] max [3]	
		(ii)	contains no water [1] contains no water of crystallisation [2] max [2]	
	(c)	(i)	mass [1] of substance that dissolves in and saturates [1] <u>100 g of water</u> [1] at a particular temperature [1] **or** maximum [1] mass [1] of substance that dissolves in <u>100 g of water</u> [1] at a particular temperature [1] [4]	
		(ii)	stirring/shaking [1] heat the water [1] crush the crystals [1] add more water [1] max [2]	21

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		AVAILABLE MARKS
3 **(a)**	The element sulphur is a NON-METAL [1]. It has an atomic number of 16. Sulphur exists in three different solid forms known as ALLOTROPES [1]. One form is known as rhombic sulphur whilst the other two forms are known as PLASTIC [1] sulphur and MONOCLINIC [1] (either order) sulphur. Sulphur is YELLOW [1] in colour and is INSOLUBLE [1] in water. [6]	
(b) **(i)**	$S + O_2 \rightarrow SO_2$ [2]	
(ii)	melts/liquid formed [1] dark red/brown [1] blue [1] flame [1] more viscous [1] colourless/misty [1] pungent/bad smell [1] gas [1] max [3]	
(c) **(i)**	fossil fuels burning/vehicle exhausts/power stations/volcanic gases/ burning rubber tyres [1]	
(ii)	$SO_2 + H_2O \rightarrow H_2SO_3$ [2]	
(iii)	3–6.9 [1]	
(iv)	corrodes limestone statues and buildings [1] kills fish (in rivers and lakes)/acidifies waterways [1] defoliates trees/damages vegetation [1] max [2]	
(v)	remove sulphur from fuels before use [1] treat emissions from power stations and factories [1] burning less fossil fuels/use renewable fuels/use alternative energy sources [1] catalytic convertors [1] max [2]	19

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AVAILABLE MARKS

4 **(a)** **(i)** hydrochloric acid [1]

(ii) LiCl [1]

(iii) cooling [1]

(iv) decomposition [1]
using (a direct current of) electricity [1] [2]

(b)

Substance	Conducts electricity	Does not conduct electricity
solid lithium	✓ [1]	
molten lithium	✓ [1]	
molten lithium chloride	✓ [1]	
solid lithium chloride		✓ [1]
lithium chloride solution	✓ [1]	

[5]

(c) **(i)** A = anode [1]
B = cathode [1] [2]

(ii) graphite/carbon/platinum [1]

(iii) unreactive/(good) conductor of electricity [1]

(iv) B/cathode [1] 15

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					AVAILABLE MARKS
5	**(a)**	**(i)**	oil/coal/natural gas/petrol/LPG/diesel/paraffin/candle wax/ peat/lignite/coke any **three** from the list above	[3]	
		(ii)	cannot be replaced [1] idea of in a limited period of time [1] **or** will run out [1] eventually [1]	[2]	
	(b)	**(i)**	reaction [1] (of a substance/fuel) with oxygen [1] to release energy [1] forming oxides [1] max [3]/[4]	[3]	
		(ii)	substance containing carbon and hydrogen [1] only [1]	[2]	
		(iii)	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$	[3]	
		(iv)	greenhouse effect [1] global warming/melting polar caps [1] rising sea levels/flooding [1] climate change [1] acid rain [1] photochemical smog [1]	max [2]	
	(c)		carbon monoxide	[1]	16
				Total	**90**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2009

Science: Chemistry

Paper 1
Foundation Tier

[G1401]

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	

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Examiner Only	
Marks	Remark

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]

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

[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]

Examiner Only

Marks	Remark

STEMUP.CO.UK

(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.

Examiner Only	
Marks	Remark

_____

_____

_____

_____

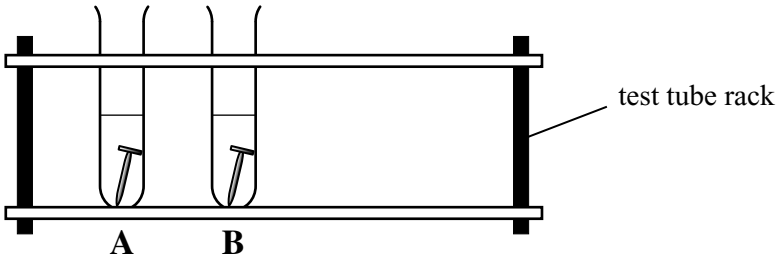
_____

_____

_____ [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]

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Marks	Remark

(b) Copper metal is used for roofing. Copper reacts over time forming copper(II) oxide which reacts further with carbon dioxide in the air to form copper(II) carbonate. Acids will react with copper(II) carbonate.

(i) Write a balanced symbol equation for the reaction of copper with oxygen in the air forming copper(II) oxide.

_____ [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.

_____ [1]

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

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Marks	Remark

(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]

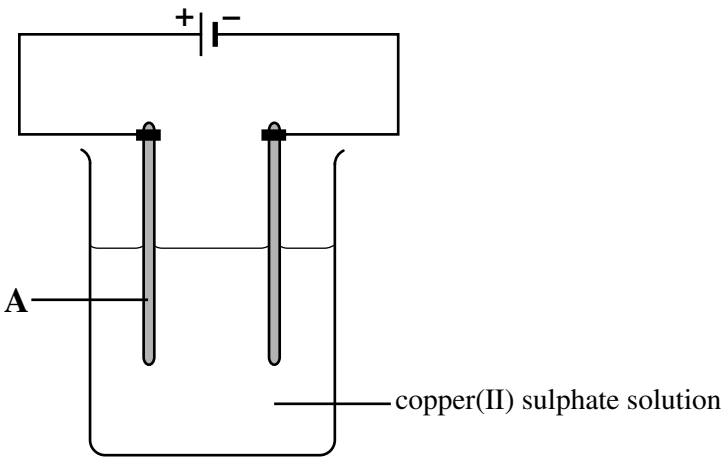
(iv) Name one other metal which reacts **safely** with copper(II) sulphate solution.

_____ [1]

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3 **(a)** The diagram below shows the apparatus used to carry out the electrolysis of copper(II) sulphate solution. Graphite electrodes are used.



(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]

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(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)		✗	✓
	SO_4^{2-}		
	H^+		
Hydroxide		✓	✗

[6]

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Marks	Remark

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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]

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(b) Chlorine gas reacts with hydrogen gas to form hydrogen chloride.

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Marks	Remark

(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 carrying out the reaction.

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]

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_2O_3	
Cinnabar		HgS	

[6]

(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.

$$\% \text{ Titanium in titania} = \frac{\text{Relative atomic mass of Ti}}{\text{Relative formula mass of } TiO_2} \times 100$$

Calculate the percentage of titanium in titania.
(Relative atomic masses: O = 16; Ti = 48)

_____ [2]

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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:

$$^{108}_{47}Ag$$

(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]

THIS IS THE END OF THE QUESTION PAPER

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GCSE

Science: Chemistry

Summer 2009

Mark Schemes

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Rewarding Learning

General Certificate of Secondary Education
2009

Science: Chemistry

Paper 1
Foundation Tier

[G1401]

THURSDAY 4 JUNE, MORNING

MARK SCHEME

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AVAILABLE MARKS

1 (a) (i) substance which consists of one type of atom [2] **or**
substance which cannot be broken down into anything simpler [1]
by chemical means [1] [2]

(ii) number of protons [1]

(b) (i)

Particle	Relative mass	Relative charge	Position
proton	1	+1	nucleus
electron	$\frac{1}{1840}$ accept range $\frac{1}{1800} \rightarrow \frac{1}{2000}$ or approximately zero **do NOT accept zero**	−1	shells
neutron	1	0	nucleus

Max [6]: subtract [1] for each error to minimum of [0] [6]

(ii) drawn inner electrons 2,8 [1]
outer shell containing 4 electrons [1] [2]

(c) (i)

Isotope	Number of protons	Number of electrons	Number of neutrons
^{28}Si	14	14	14
^{29}Si	14	14	15
^{30}Si	14	14	16

[1] each row [3]

(ii) atoms of same element/with same atomic number/same number of protons [1] different number of neutrons/different mass number [1] [2]

(d) (i) SiO_2 [1]

(ii) shared electrons [1] idea of pair of electrons [1] [2]

(e) Mg E.C. = 2,8,2 [1]
O E.C. = 2,6 [1]
2 electrons transferred from magnesium to oxygen [1]
Mg^{2+} [1] E.C. = 2,8 [1]
O^{2-} [1] E.C. = 2,8 [1]
Attraction of oppositely charged ions held together by (strong) electrostatic forces [1] **max** [6]

25

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					AVAILABLE MARKS
2	**(a)**	**(i)**	colour change/reddish-brown (solid) forms	[1]	
		(ii)	zinc/Zn	[1]	
		(iii)	greasing/oiling/sacrificial protection/painting/suitable metal plating/plastic coating any **two**	[2]	
		(iv)	contains water (of crystallisation)/water bonded in the crystals	[1]	
	(b)	**(i)**	$2Cu + O_2 \rightarrow 2CuO$	[3]	
		(ii)	$CuO + CO_2 \rightarrow CuCO_3$	[2]	
		(iii)	red-pink/red-brown [1] black [1] green [1]	[3]	
		(iv)	sulphuric acid	[1]	
	(c)	**(i)**	$Mg + CuSO_4 \rightarrow MgSO_4 + Cu$	[2]	
		(ii)	displacement/redox/exothermic	[1]	
		(iii)	blue [1] solution changes to colourless [1] heat given out [1] solid [1] appears magnesium disappears [1] any **two**	[2]	
		(iv)	zinc/iron/aluminium/calcium any metal above copper in reactivity series **not** Group I metal or magnesium	[1]	20

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AVAILABLE MARKS

3 **(a)** **(i)** decomposition/breakdown [1]
using electricity [1] [2]

(ii) electrode A = anode [1] [1]

(iii) electrolyte [1]

(iv) conducts electricity [1]
inert/does not react with copper(II) sulphate solution [1] [2]

(b)

Name of ion	**Formula of ion (including charge)**	**Attracted to positive electrode**	**Attracted to negative electrode**
	Cu^{2+} [1]		
sulphate [1]		✓ [1]	✗
hydrogen [1]		✗	✓ [1]
	OH^- [1]		

[6] 12

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AVAILABLE MARKS

4 **(a)** **(i)**

Name	Physical state at room temperature	Colour
Fluorine	**gas** [1]	**yellow** [1]
Chlorine	gas	**green** [1]
Bromine	**liquid** [1]	red-brown
Iodine	**solid** [1]	**grey/black** [1]

[6]

(ii) molecule containing two atoms [1] (covalently bonded together) [1]

(iii) kills bacteria/sterilise [1]

(iv) Iodine/I_2 [1]

(b) **(i)** $H_2 + Cl_2 \rightarrow 2HCl$ [3]

(ii) safety glasses/fume cupboard/carry out in dark
Any **two** [2]

(iii) red [1]

(iv) glass rod [1]
dipped in concentrated [1] ammonia [1]
white [1]
smoke [1]
Any **four** [4]

Quality of written communication [2] 21

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AVAILABLE MARKS

5 **(a)** **(i)**

Mineral	Name of compound	Formula of compound	Relative Formula Mass
Calcite	Calcium carbonate	**$CaCO_3$** [1]	**100** [1]
Haematite	**iron(III) oxide** [1]	Fe_2O_3	**160** [1]
Cinnabar	**mercury sulphide** [1]	HgS	**233** [1]

[6]

(ii) $\frac{48}{80}$ [1] × 100 = 60 [1] % [2]

(b) **(i)** Ag_2O [1]

(ii) 47 [1]

(iii) carbon [1] 12 [1] [2] 12

Total **90**

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