CCEA GCSE DOUBLE AWARD SCIENCE

SCIENCE



EXAM QUESTION PACK

CHEMISTRY UNIT C1 FOUNDATION TIER GSD21 PAPERS

STEMUP

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Rewarding Learning

General Certificate of Secondary Education
2016–2017

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

THURSDAY 10 NOVEMBER 2016, MORNING

MARK SCHEME

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General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

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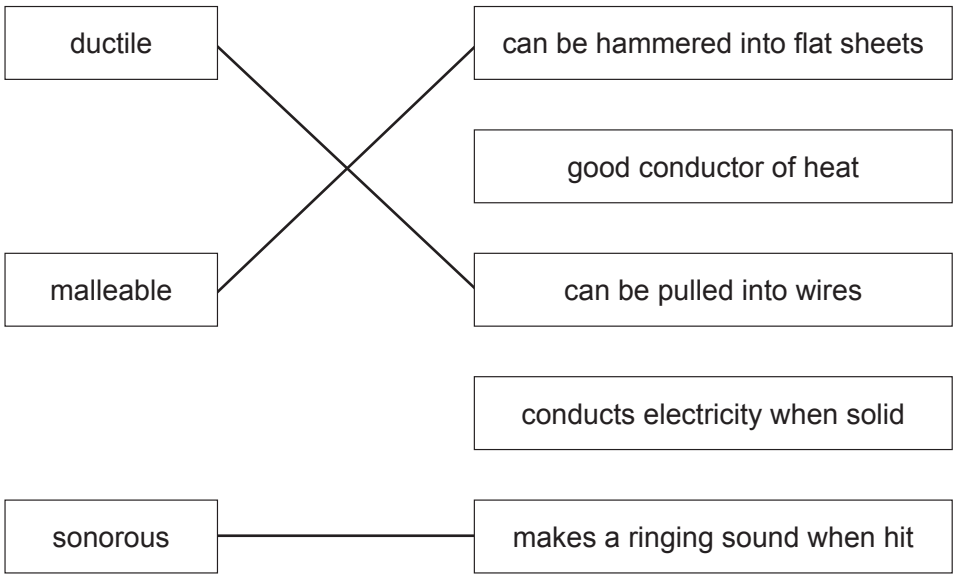
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				AVAILABLE MARKS
1	(a)			



3 × [1] [3]

(b) **(i)** 1. malleable [1] Apply CM
2. sonorous [1] [2]

(ii) light/low density, unreactive with air, strong
any suitable [1] 6

2 **(a)** dissolve [1]

(b) evaporates [1]

(c) condenses [1]

(d) sublime [1]

(e) melt [1], freezes [1] in correct order [2] 6

3 **(a)** A **mixture** of elements – **mixture** essential for any credit
of which at least **one is a metal** [2]
mixture of metals/mixture of elements/mixture containing at least one metal [1] [2]

(b) **(i)** 50p [1]

(ii) 24% (Accept up to 24.5%) [1]

(iii) 94 + 76 + 70 + 76 = 316 [1]
316 ÷ 4 = [1]
79 [1] (apply e.c.f.) [3]

(c) resistance to corrosion/cost/colour/durability/rigidity Accept hard or other suitable
not strength
not malleable [1] 8

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			AVAILABLE MARKS
4	**(a)** transferred	[1]	
	(b) ionic	[1]	
	(c) strong	[1]	
	(d) a giant lattice structure	[1]	4

5 **(a)**

Statement	True	False
Mendeleev arranged elements in order of atomic numbers.		✓ [1]
Newlands wrote the law of octaves.	✓ [1]	
Mendeleev was able to predict the properties of undiscovered elements.	✓ [1]	
An atom with 4 electrons in its outer shell would belong to an element in Group 4.	✓ [1]	
The elements of Group 0 are non-reactive metals.		✓ [1]

[5]

(b) **(i)** alkali metals/Group 1 [1]

(ii) Period 3 [1]

(iii) gas [1] 8

					AVAILABLE MARKS
6	**(a)**	**(i)**	lithium hydroxide [1] + hydrogen [1]	[2]	
		(ii)	12	[1]	
		(iii)	$2Li + Cl_2 \longrightarrow 2LiCl$ LHS [1], RHS [1] correct balancing if formulae all correct [1]	[3]	
		(iv)	Li^+	[1]	
	(b)		lithium: does not catch fire; slower reaction; idea that it does not form a ball/melt; does not explode; or other correct; any 3 × [1] potassium: catches fire/lilac flame; idea of faster reaction; forms a ball/melts; idea of exploding; or other correct; any 3 × [1]	[3]	
	(c)		corrosive to skin [1]/handle with tongs [1] **or** dangerous if gets into eyes [1]/wear goggles [1] or other suitable – risk and management must be linked	[2]	12
7	**(a)**		Q	[1]	
	(b)		S	[1]	
	(c)		P and R both required	[1]	
	(d)		17	[1]	
	(e)		23	[1]	
	(f)		correct 2,8,7 drawing	[1]	6

AVAILABLE MARKS

8 **(a)** C A B in correct order [1]

(b) $CuSO_4$ [1] + H_2O [1] [2]

(c) **(i)** green [1]

(ii) carbon dioxide [1]

(d) **Indicative content**

Apparatus used
- beaker
- spatula
- filter funnel
- filter paper
- evaporating basin/dish
- tripod
- Bunsen
- (retort) stand
- clamp
- (wire) gauze

Maximum [4] IPs for apparatus

Steps
- D idea of **adding until** no more solid dissolves
- C idea of **filtering** to remove excess solid/copper oxide/residue
- A heating to remove water/to evaporate
- B (idea of) cooling to produce crystals

Colours
- copper oxide – black
- copper sulfate – blue
- dilute sulfuric acid – colourless

Safety
- goggles/care in use of Bunsen burner or other

There is a maximum of [12] IPs – apparatus [4], steps [4], colours [3], safety [1]

Response	**Mark**
Candidates must use appropriate scientific terms throughout to to describe the method of making the crystals using **9–12** of the points in the indicative content .They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use **6–8** points from the indicative content to describe the method of making the crystals using some scientific terms. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates use **2–5** of the points from the indicative content to describe the method of making the crystals. They use limited spelling, punctuation and grammar and make little use of scientific terms. The form and style are of a limited standard.	[1]–[2]
One **1 or 0** indicative points correct. Response not worthy of credit	[0]

[6]

11

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					AVAILABLE MARKS
9	(a)	(i)	(As the temperature rises) the solubility falls	[1]	
		(ii)	chlorine	[1]	
		(iii)	carbon dioxide	[1]	
		(iv)	carbon dioxide	[1]	
		(v)	nitrogen, oxygen and chlorine [2] any two correct [1] mark **only** if 4 gases given and 3 are correct award [1] two correct and one incorrect [0]	[2]	
		(vi)	chlorine	[1]	
	(b)	(i)	thermal	[1]	
		(ii)	oxygen	[1]	9
				Total	**70**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Chemistry

Unit C1
Foundation Tier

[GSD21]

GSD21

THURSDAY 19 MAY 2016, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **9**.
A Data Leaflet, which includes a Periodic Table of the elements is provided.

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1 Many chemical compounds are white but some are not.
Draw a line to match each chemical compound to its colour.

chemical compound	colour
hydrated copper sulfate	black
aluminium oxide	white
copper oxide	red
copper carbonate	green
	blue

[4]

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[Turn over

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2 Sulfuric acid is a strong acid.

(a) What pH would you expect for sulfuric acid?
Circle the correct value.

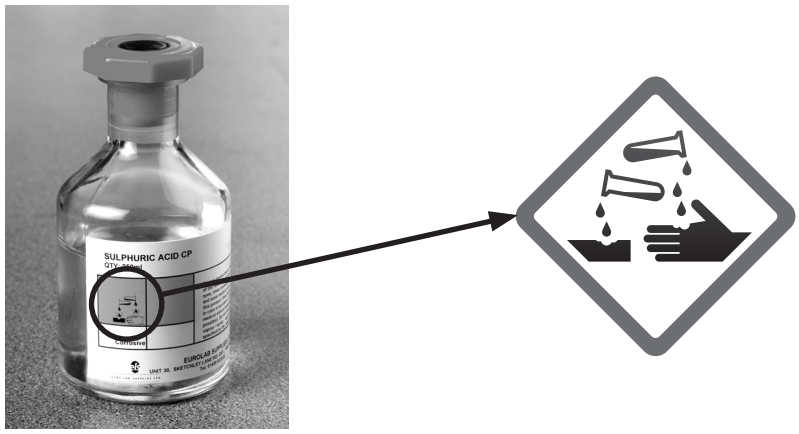
1 5 7 9 10

[1]

(b) Four drops of universal indicator are placed into a sample of sulfuric acid.
What colour will be seen?

_____ [1]

(c) Bottles of sulfuric acid are labelled with the hazard symbol as shown in the photograph below.



© Martyn F. Chillmaid / Science Photo Library

(i) Name the hazard symbol shown.

_____ [1]

(ii) Give two reasons why hazard symbols are shown on bottles of chemicals.

1. _____

_____

2. _____

_____ [2]

(d) A molecule of sulfuric acid contains 4 oxygen atoms, 2 hydrogen atoms and 1 sulfur atom.
What is the formula for sulfuric acid?
Circle the correct formula.

HSO_4 $H_2(SO_2)_2$ H_2SO_4 $H_2S(O_2)_2$

[1]

[Turn over

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3 Four sets of apparatus, **A**, **B**, **C** and **D** are given below.

A beaker, stirring rod, thermometer	**B** filter paper, filter funnel, conical flask
C tripod stand, heatproof mat, wire gauze, evaporating dish	**D** separating funnel, retort stand, clamp

(a) Which set of apparatus, **A**, **B**, or **D**, would be used to separate sand from water?

_____ [1]

(b) A student selects apparatus set **C** to evaporate water from a mixture of sand and water.
Name one other piece of apparatus which would be needed to make the evaporation happen quickly.

_____ [1]

(c) Water is a compound containing the elements hydrogen and oxygen.

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

_____

_____ [1]

(ii) Why can water be described as a **compound**?

_____

_____ [2]

(iii) Write the formula for water.

_____ [1]

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(d) Complete the sentence below which describes the test for carbon dioxide.

When carbon dioxide gas is bubbled through _____,

the solution changes from _____ to

a _____ colour. [3]

[Turn over

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4 This question is about electrolysis.

Circle the correct answer to each part.

(a) In electrolysis the electrodes are sometimes made out of:

graphite polythene sulfur

[1]

(b) Electrodes need to be inert. This means that they are:

light colourless unreactive

[1]

(c) In electrolysis the particles which move and carry the charge are called:

ions electrons atoms

[1]

(d) When molten lithium chloride undergoes electrolysis the products are lithium and:

chloride chlorine water

[1]

(e) When aluminium is extracted by electrolysis the metal forms at:

the anode the cathode both electrodes

[1]

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5 This question is about atomic structure.

(a) Complete the table below to show the relative charge and mass of the different particles found in an atom and whether or not each particle is found in the nucleus.

Particle	Relative Charge	Relative Mass	Found in nucleus Yes or No?
electron	–1		
neutron			Yes
proton		1	

[6]

(b) Complete the table below about the atomic structure of three elements, by filling in the missing information. You may find your Data Leaflet helpful.

Element	Number of protons	Number of neutrons	Number of electrons	Electronic configuration
carbon	6	6		2,4
	11	12	11	
aluminium		14	13	2,8,3

[4]

[Turn over

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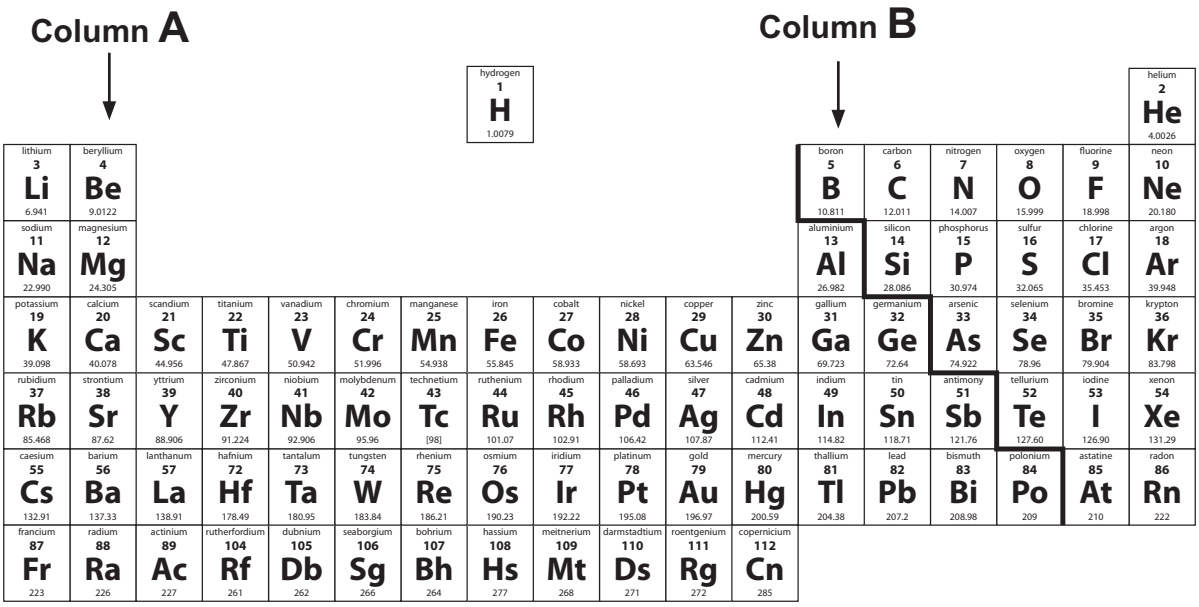
6 Many chemists contributed to the modern Periodic Table including Newlands and Mendeleev.

(a) Complete the table below to show the contribution of each chemist. Place a tick (✓) in each correct box.

Contribution	Newlands ***only***	Mendeleev ***only***	***Both*** Newlands and Mendeleev	***Neither*** Newlands nor Mendeleev
stated the Law of Octaves				
arranged elements in order of relative atomic mass				
included noble gases				
left gaps for undiscovered elements				

[4]

(b) A student is given a Periodic Table.



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For each of the five questions below three answers are given. Only one is correct. Circle the correct answer.

(i) The elements in **Column A** are:

alkali metals Group 2 Period 2

[1]

(ii) The physical state at room temperature of all the elements in **Column B** is:

solid liquid gas

[1]

(iii) The elements N, O, F, Cl, Br and I are all:

gases diatomic inert

[1]

(iv) The elements in **Column B** all have:

only 3 electrons 3 electrons in outer shell 3 electrons in first shell

[1]

(v) The solid black line separates:

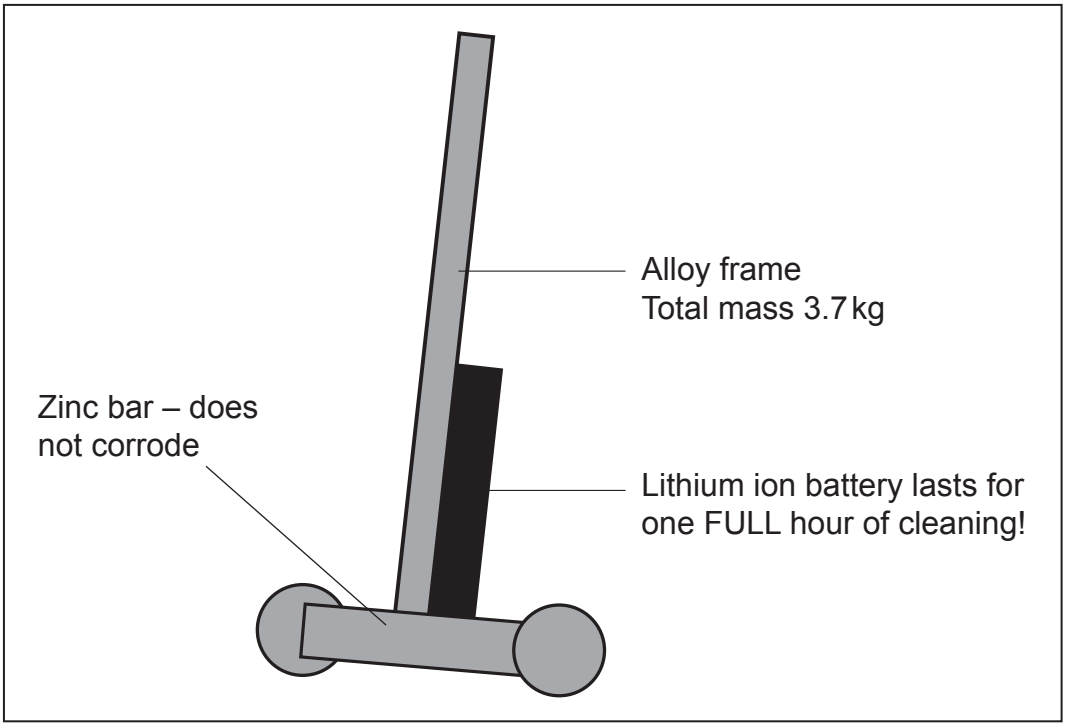
metals and gases solids and liquids metals and non-metals

[1]

[Turn over

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7 A labelled diagram, used in an advertisement for a cordless vacuum cleaner, is shown below.



(a) Give the symbol for a lithium ion.

_____ [1]

(b) What is an alloy?

_____

_____ [2]

(c) Give one property needed for the alloy used in the frame of the vacuum cleaner.

_____ [1]

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8 Water has a melting point of 0 °C and is an excellent solvent.

(a) What is meant by the chemical terms:

(i) solvent?

_____

_____ [1]

(ii) melting point?

_____

_____

_____ [2]

(b) Give two physical properties of water apart from the fact that it has a melting point of 0 °C and is an excellent solvent.

1. _____

2. _____ [2]

Compound A is soluble in water. It has a solubility of 2.9 g/100 g of water at 20 °C.

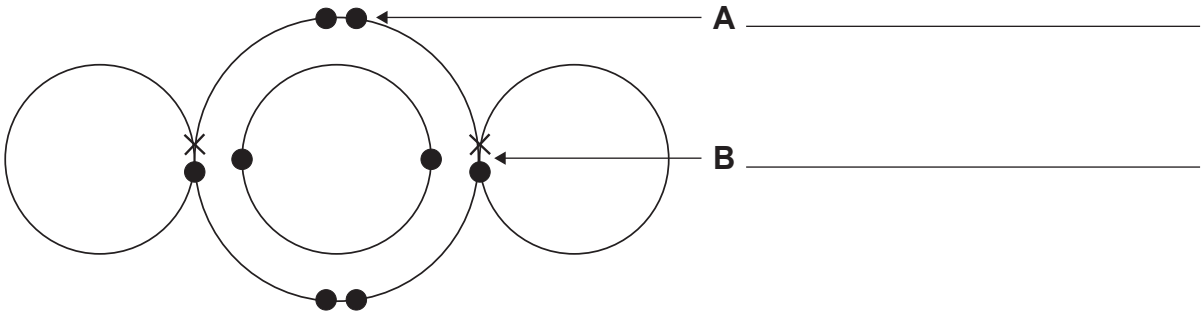
(c) Why must the temperature be stated when giving the solubility of a substance in water?

_____

_____ [1]

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(d) A dot and cross diagram of the bonding in water is shown below.



(i) Fill in the correct labels for the pairs of electrons labelled **A** and **B**. [2]

(ii) Name the type of bonding in water.

_____ [1]

(iii) Choose two compounds from the list below which have the same type of bonding as water.

Tick (✓) the two correct boxes.

potassium iodide ☐

carbon dioxide ☐

copper sulfate ☐

calcium carbonate ☐

hydrogen sulfide ☐

[2]

[Turn over

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20GSD2115

9 In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

Magnesium forms a 2^+ ion and oxygen forms a 2^- ion.
Compare and contrast the Mg^{2+} ion and the O^{2-} ion.

You should include information about:

- the number and type of the particles present in each ion
- the electron configuration of each ion and
- how the ions are formed from their atoms.

[6]

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10 Metal oxides and metal carbonates will react with acids to form salts.

(a) Complete the word equation for the reaction between copper oxide and sulfuric acid.

copper oxide + sulfuric acid → + [2]

(b) Balance the symbol equation below.

HCl + CuO → $CuCl_2$ + H_2O [1]

(c) Write a balanced symbol equation for the reaction between copper carbonate and hydrochloric acid.

_____ [3]

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

Examiner Number

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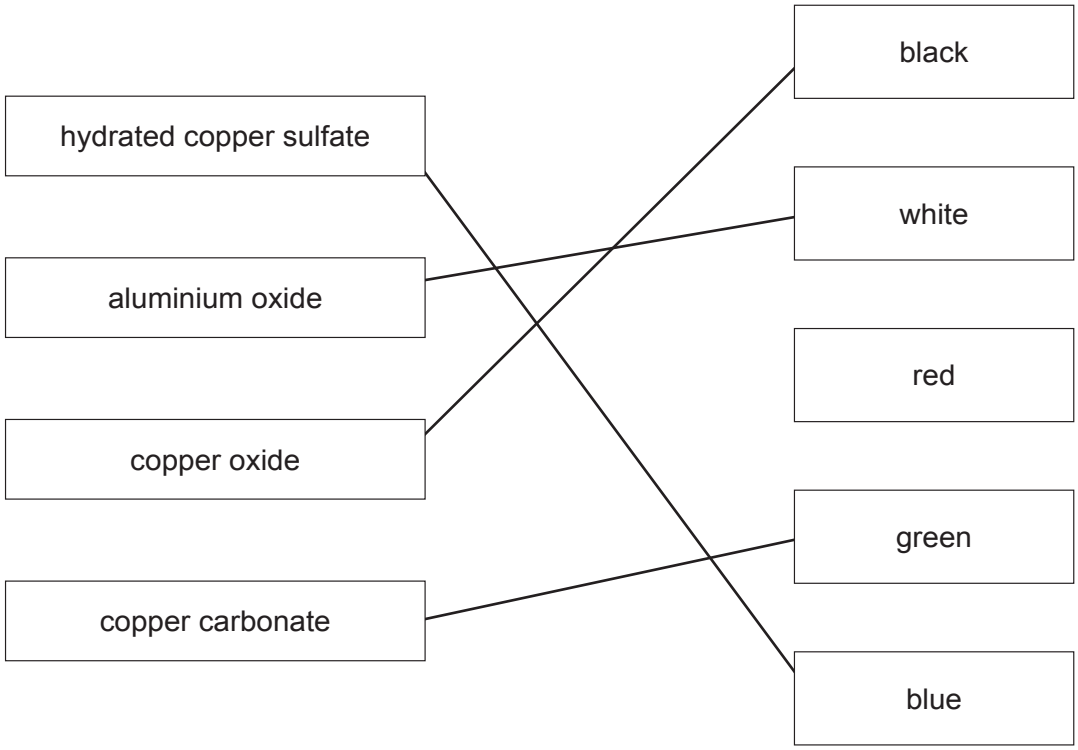
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			AVAILABLE MARKS
1	**chemical compound**	**colour**	



4 × [1] [4] 4

2 **(a)** 1 [1]

(b) red **not** orange-red, **not** orange [1]

(c) **(i)** corrosive [1]

(ii) Any **two** from:
to warn of danger/eye-catching/universally agreed/universally understood/people who can't read
2 × [1] [2]

(d) H_2SO_4 [1] 6

3 **(a)** B [1]

(b) Bunsen Burner [1]

(c) **(i)** An element is a substance which contains (only) one type of atom/ cannot be broken down into anything *simpler* (by chemical means) [1]

(ii) Idea of chemical combination/joining/bonding [1] of 2 (or more) elements/hydrogen and oxygen/different types of atoms [1]
2nd mark dependent on first [2]

(iii) H_2O – must be completely correct. Do **not** accept equation [1]

(d) limewater [1]
colourless **not** clear/transparent [1] (to a) milky/cloudy/white [1] colour [3] 9

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AVAILABLE MARKS

4 **(a)** graphite [1]

(b) unreactive [1]

(c) ions [1]

(d) chlorine [1]

(e) the cathode [1] 5

5 **(a)**

Particle	Relative Charge	Relative Mass	Found in nucleus Yes or No?
electron	–1	* $\frac{1}{1840}$ / 0 [1]	no [1]
neutron	0 [1]	1 [1]	yes
proton	+1 [1]	1	yes [1]

[6]

* Relative mass of electron: 0 or a fraction in the range $\frac{1}{1800} \rightarrow \frac{1}{2000}$
Accept negligible/none
Proton charge must be +1 or 1+ **not** +

(b)

Element	Number of protons	Number of neutrons	Number of electrons	Electronic configuration
carbon	6	6	**6** [1]	2,4
sodium [1]	11	12	11	**2,8,1** [1]
aluminium	**13** [1]	14	13	2,8,3

[4] 10

6 **(a)**

Contribution	Newlands ***only***	Mendeleev ***only***	***Both*** Newlands and Mendeleev	***Neither*** Newlands or Mendeleev
stated the Law of Octaves	✓ [1]			
arranged elements in order of relative atomic mass			✓ [1]	
included noble gases				✓ [1]
left gaps for undiscovered elements		✓ [1]		

[4]

(b) **(i)** Group 2 [1]

(ii) solid [1]

(iii) diatomic [1]

(iv) 3 electrons in outer shell [1]

(v) metals and non-metals [1]

9

7 **(a)** Li^{+} also allow Li^{+1} or Li^{1+} but not li^{+} [1]

(b) For any credit the word "mixture" must be given and must not be wrongly qualified; i.e. if mixture not explicit 0 marks, if mixture given but e.g. answer also refers to bonding/joining, etc. then 0 marks.
The only 2 mark answer must communicate the 2 ideas below.
An alloy is a mixture of elements [1] at least one of which is a metal [1]
1 mark answers are:
an alloy is a mixture of metals [1]
a mixture of metals and non-metals [1]
a mixture of metals and elements [1] [2]

(c) Lightness/strength/hardness/durability/resistance to corrosion [1]
Do **not** credit sturdy/malleable/high melting point and other answers which are correct properties of metals but not relevant to this use.
Mark as wrong answers which refer to conducts electricity/conducts heat
Not rust (ignore if given as a second property) [1]

4

AVAILABLE MARKS

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					AVAILABLE MARKS
8	(a)	(i)	Idea that a solvent is a substance in which something (else) dissolves NOT reacts with the solute NOT a solution which dissolves NOT anything can dissolve in it	[1]	
		(ii)	the temperature [1] at which a solid changes to a liquid [1] 2 errors [0] marks are independent	[2]	
	(b)		Any **two** from: boils at 100 °C – units needed colourless ignore clear/transparent liquid (at RT) odourless density of 1g/cm^3 – units needed tasteless ACCEPT conducts heat or poor heat conductor NOT good heat conductor ACCEPT does not conduct electricity (well) 2 × [1] Ignore reference to pH Accept immiscible with oil	[2]	
	(c)		Idea that solubility **changes** with temperature. Do not credit "rate"	[1]	
	(d)	(i)	A lone pair (of electrons) [1] accept non bonded pair B bonded /shared pair of electrons/bonded pair/shared electrons/ bonded electrons/(single) covalent bond/bond – unless wrongly qualified [1]	[2]	
		(ii)	Bonding: covalent Do not credit "molecular" covalent	[1]	
		(iii)	carbon dioxide hydrogen sulfide	[2]	11

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	AVAILABLE MARKS

9 Indicative content

- magnesium ion has 12 protons
- oxide ion has 8/magnesium ion has 4 more protons
- magnesium ion has 12 neutrons
- oxide ion has 8 neutrons/magnesium ion has 4 more neutrons than oxide ion
- magnesium ion has the electronic configuration 2,8
- oxide ion has the electronic configuration 2,8
  (for both ions have the same electronic configuration or both ions have 10 electrons, unstated, allow 1IP, not 2)
- magnesium ion is formed from its atom by losing electrons
- oxide ion is formed from its ion by gaining electrons
- 2 electrons lost/gained

Response	Mark
Candidates make reference to **7–9** of the main points above to compare and contrast the two ions. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates make reference to **4–6** of the main points above to compare and/or contrast the two ions. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates make reference to **2–3** of the main points above using limited spelling, punctuation and grammar. The form and style are of limited standard and they have made no use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

[6] 6

10 (a) copper oxide + sulfuric acid → copper sulfate [1] + water [1] [2]

(b) $2HCl + CuO \rightarrow CuCl_2 + H_2O$ [1]

(c) $CuCO_3 + 2HCl \rightarrow CuCl_2 + H_2O + CO_2$
LHS [1] RHS [1]
[1] balancing – if all formulae correct [3] 6

Total **70**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Chemistry

GSD21

Unit C1
Foundation Tier

[GSD21]

THURSDAY 25 FEBRUARY 2016, 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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **9**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** When copper is mixed with other metals new substances are produced which have particular properties.

Use lines to link each substance to the use you think is best.

Substance	Use
Brass Copper, zinc Strong, can be polished to look shiny	**coins**  © moodboard / Thinkstock
Duralumin Copper, aluminium Strong and very light	**candlesticks**  © Zoonar RF / Zoonar / Thinkstock
Cupronickel Copper, nickel Light and cheap. Can be easily carried	**aircraft bodies**  © Purestock / Thinkstock
Bronze Copper, tin Resists corrosion. Lasts a long time	**statues**  © William Perry / iStock / Thinkstock

[3]

(b) How many different **elements** are named in these four substances? Circle the correct answer.

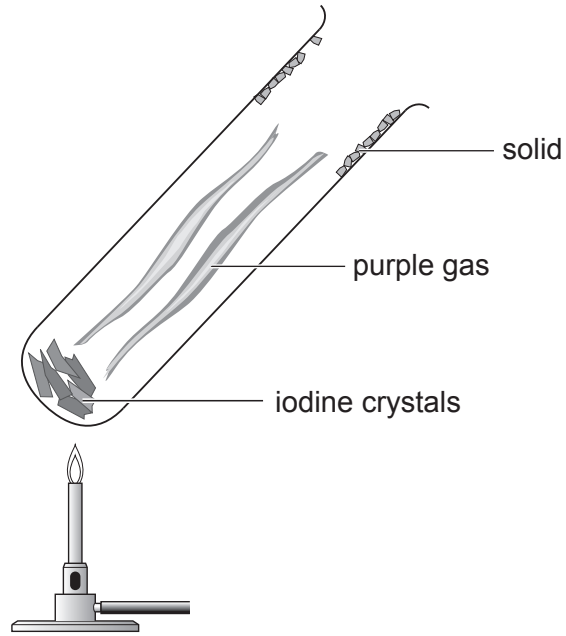
4 **5** **6** **8**

[1]

(c) The substances above are mixtures which each include at least one metal. What name is given to this type of mixture?

_____ [1]

2 The diagram below shows the apparatus used to heat iodine crystals.



Source: Principal Examiner

(a) What name is given to the process in which a solid changes to a gas without forming a liquid?

_____ [1]

(b) Name the solid formed near the top of the boiling tube.

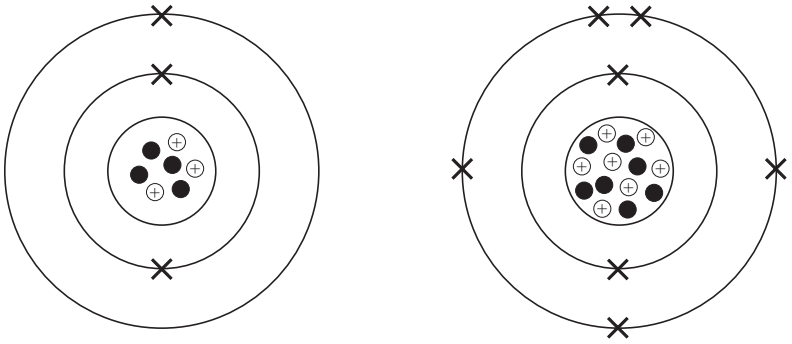
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 The diagrams below show the structures of two different atoms.



A **B**

(a) Complete each of the sentences below by choosing one of the words from the list below.

molecule **nucleus** **electrons** **protons** **shells** **core**

(i) The centre of an atom is called the _____. [1]

(ii) The particles in the centre of an atom are called neutrons and _____. [1]

(iii) The electrons are arranged in _____. [1]

(b) What is the **atomic number** of atom **B**?

_____ [1]

(c) What is the **mass number** of atom **A**?

_____ [1]

(d) Explain fully why diagram **A** represents an **atom** and not an **ion**.

_____

_____ [2]

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4 Many chemical elements are used in making smart phones.



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Read the passage and answer the questions which follow.

The screen on a smart phone is made of indium oxide mixed with tin oxide and is strengthened using potassium. The batteries have lithium oxide anodes and carbon cathodes. The wiring is made of copper. The alloys which are used for the outer casing include magnesium.

(a) Name an alkali metal compound used in making smart phones.

_____ [1]

(b) Name a **Group II** element used in making smart phone cases.

_____ [1]

(c) What **Group IV** element is used in the battery?

_____ [1]

(d) Name a **transition** element used in wiring the phone.

_____ [1]

(e) Indium is an element in Group III of the Periodic Table.

(i) How many electrons would you expect it to have in its outer shell?

_____ [1]

(ii) Suggest the formula for indium oxide.

_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

5 Complete the following sentences by using words from the boxes. Circle the correct answers.

(a) When hydrated copper sulfate is heated strongly its colour changes

to | black / blue / white | [1]

(b) Anhydrous copper sulfate becomes | yellow / white / blue | when added to water. [1]

(c) Copper carbonate is a | blue / black / green | solid. [1]

(d) Blue solutions usually contain | aluminium / sodium / copper | salts. [1]

(e) The compounds of Group 2 elements are

usually | red / silver / white | in colour. [1]

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6 The table below gives information about five compounds, A, B, C, D and E which dissolve in water to give either acidic, neutral or alkaline solutions.

Examiner Only

Marks	Remark

compound	produces H^+ ions in water	produces OH^- ions in water	pH	colour of universal indicator in the solution
A	no	yes	9	dark green
B			1	red
C	no	yes	14	
D	no	no	7	green
E	yes	no	4	orange

(a) Complete the table above by writing the missing words in the spaces. [3]

(b) Use the information given in the table to identify each of the compounds A, B, C, D and E from the list given below.

sodium hydroxide sodium chloride ammonia

ethanoic acid hydrochloric acid

A _____

B _____

C _____

D _____

E _____ [4]

(c) What units are used to measure the concentration of acids? Circle the correct answer.

mol/dm mol^3/dm mol/dm^3 mol^3/dm^3

[1]

Examiner Only	
Marks	Remark

7 The symbol equation below shows the reaction between sodium and water.

$$2\,Na + 2H_2O \rightarrow 2\,NaOH + H_2$$

(a) Choose the following from the equation:

(i) A **reactant** which is an element: _____ [1]

(ii) A **product** which is a compound: _____ [1]

(iii) A **diatomic** element: _____ [1]

(b) Complete the word equation for the reaction between potassium and water.

potassium + water → + [2]

(c) How is sodium stored in the laboratory?

_____ [1]

(d) Describe the appearance of sodium

when freshly cut: _____ [1]

when left in air for a period of time: _____ [1]

(e) When sodium is added to hydrochloric acid, sodium chloride is formed. Explain why this reaction is not demonstrated in the school laboratory.

_____

_____

_____ [2]

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

8 **(a)** Give an accurate definition of the term **solubility**.

Solubility is _____

_____

_____

_____ [4]

The table below gives information on whether some salts are soluble (S) or insoluble (I) in water.

anion / cation	**nitrate**	**carbonate**	**chloride**	**sulfate**
magnesium	S	I	S	S
potassium	S	S	S	S
lead	S	I	I	I
calcium	S	I	S	S
ammonium	S	S	S	S

(b) Use the information in the table to deduce rules for the solubility of salts by completing the sentences:

(i) **Cations:** All _____ and

_____ salts are soluble.

Anions: Most sulfates are _____ except

for _____.

All **metal** _____ are soluble. [5]

(ii) Predict whether each of the following salts is soluble (S) or insoluble (I) in water.

potassium iodide _____

lead bromide _____

copper nitrate _____ [3]

(c) The chemical formula for ammonium sulfate is $(NH_4)_2SO_4$.

(i) How many elements are present in ammonium sulfate?

_____ [1]

(ii) How many oxygen atoms are present in the formula $(NH_4)_2SO_4$?

_____ [1]

(iii) How many atoms are present in the formula $(NH_4)_2SO_4$?

_____ [1]

(iv) Give the formula of a molecular ion present in ammonium sulfate.

_____ [1]

Examiner Only	
Marks	Remark

9 The modern Periodic Table of the elements has been developed over many years. Newlands and Mendeleev were both involved in finding patterns between the elements and Mendeleev prepared the first Periodic Table.

Describe:

- The key feature of the pattern found by Newlands
- Key features of Mendeleev's Periodic Table
- Ways in which the modern Periodic Table differs from the one proposed by Mendeleev

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

Examiner Only	
Marks	Remark

10 (a) Draw diagrams to show the electronic arrangements for a hydrogen atom and a chlorine atom. **All** electrons should be shown.

Examiner Only

Marks	Remark

hydrogen atom **chlorine atom**

[2]

(b) Explain fully, in terms of the electrons, how hydrogen and chlorine combine to form the gas hydrogen chloride. Your answer should include the type of bonding.

[3]

THIS IS THE END OF THE QUESTION PAPER

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114853

Rewarding Learning

General Certificate of Secondary Education
2015–2016

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

THURSDAY 25 FEBRUARY 2016, MORNING

MARK SCHEME

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General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

				AVAILABLE MARKS
1	**(a)**	brass – candlestick duralumin – aircraft cupronickel – coins bronze – statues } four correct = [3] two or three correct = [2] one correct = [1]	[3]	
	(b)	5	[1]	
	(c)	alloy	[1]	5
2	**(a)**	sublimation	[1]	
	(b)	iodine	[1]	2
3	**(a)**	**(i)** nucleus	[1]	
		(ii) protons	[1]	
		(iii) shells	[1]	
	(b)	7	[1]	
	(c)	7	[1]	
	(d)	Any **two** from: the number of electrons is equal to the number of protons [1] the charges cancel each other out/idea that the atom is neutral [1] idea that an atom has not lost or gained electrons [1]	[2]	7
4	**(a)**	lithium oxide	[1]	
	(b)	magnesium	[1]	
	(c)	carbon	[1]	
	(d)	copper	[1]	
	(e)	**(i)** 3	[1]	
		(ii) In_2O_3	[1]	6
5	**(a)**	white	[1]	
	(b)	blue	[1]	
	(c)	green	[1]	
	(d)	copper	[1]	
	(e)	white	[1]	5

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				AVAILABLE MARKS
6	**(a)**	yes [1]; no [1]; purple/dark blue [1]	[3]	
	(b)	A – ammonia B – hydrochloric acid C – sodium hydroxide D – sodium chloride E – ethanoic acid 5 correct = [4]; 3 or 4 correct = [3]; 2 correct = [2]; 1 correct = [1]	[4]	
	(c)	mol/dm^3	[1]	8
7	**(a)**	**(i)** sodium/Na	[1]	
		(ii) sodium hydroxide/NaOH	[1]	
		(iii) hydrogen/H_2	[1]	
	(b)	potassium + water → potassium hydroxide + hydrogen [1] [1]	[2]	
	(c)	in oil	[1]	
	(d)	when freshly cut: idea of shiny [1] when left in air for a period of time: dull/tranished/grey [1]	[2]	
	(e)	idea of being too dangerous [1] idea of (sodium) being very reactive [1] (mark independently) if idea of reactivity or danger is wrongly qualified do not credit	[2]	10
8	**(a)**	The mass of solid/solute [1] required to saturate [1] 100 g of water [1] at a particular temperature [1] **or** The **maximum** mass of solid/solute [1] which will dissolve in [1] 100 g of water [1] at a particular temperature [1] allow 'amount' as equivalent to 'mass'	[4]	
	(b)	**(i)** Cations – potassium [1] and ammonium [1] (either order) – not sodium Anions: soluble [1] lead [1] – not barium nitrates [1] If potassium, ammonium and sodium are given and then lead and barium are given only penalise once	[5]	
		(ii) potassium iodide – soluble/S [1] lead bromide – insoluble/I [1] copper nitrate – soluble/S [1]	[3]	
	(c)	**(i)** 4	[1]	
		(ii) 4	[1]	
		(iii) 15	[1]	
		(iv) NH_4^+ **or** SO_4^{2-}	[1]	16

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		AVAILABLE MARKS
9	**Indicative content**	
	Newlands: • idea of Law of Octaves/repeating pattern of eight Mendeleev: • arranged in order of atomic mass • left gaps • included Groups and Periods • no noble gases/no actinides/no lanthanides • Hydrogen in Group 1 or other correct Modern: • arranged by atomic number • idea of block of transition elements • more elements or other correct	

Response	**Mark**
Candidates must use appropriate scientific terms throughout to describe the development of the Periodic Table using **7–9** of the points in the indicative content. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use **4–6** of the points in the indicative content to describe the development of the Periodic Table using some scientific terms. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates use **2–3** of the points in the indicative content to describe the development of the Periodic Table. They use limited spelling, punctuation and grammar and make little use of scientific terms. The form and style are of a limited standard.	[1]–[2]
Response not worthy of credit.	[0]

[6] 6

10 **(a)** correct hydrogen atom [1]
correct chlorine atom, i.e. 2, 8, 7 arrangement [1] [2]

(b) **shared pair** of electrons [1]
idea of chlorine and hydrogen each contributing 1 electron by sharing [1]
bonding is covalent [1]
but
if sharing not explicit, then maximum [1/3] for covalent bonding [3] 5

Total **70**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2015–2016

Double Award Science: Chemistry

GSD21

Unit C1
Foundation Tier

[GSD21]

THURSDAY 12 NOVEMBER 2015, 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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **5**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

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Examiner Only	
Marks	Remark

1 Lists of chemical terms and their meanings are given below.

(a) Draw a line to match each chemical term with the correct meaning. One has been done for you.

Chemical term	Meaning
solvent	a substance that is dissolved
saturated solution	contains water of crystallisation
hydrated	can be dissolved
soluble	contains the maximum mass of a dissolved substance
solute	a substance in which other materials can dissolve

[3]

(b) Draw, in the box below, the hazard symbol you would expect to find on a bottle containing a poisonous (toxic) solution.

[1]

Examiner Only

Marks	Remark

2 There are three states of matter, **solid**, **liquid** and **gas**.

(a) Complete the table below which gives 5 properties of solids, liquids and gases. For each property, place a tick (✓) in the correct box. The first one has been done for you.

Property	Solid	Liquid	Gas
Can be compressed			✓
Takes the volume and shape of the container			
Takes only the shape of the container			
Will condense when cooled			
Has a fixed shape			

[4]

The table below lists the melting points and boiling points of four substances **A**, **B**, **C** and **D**.

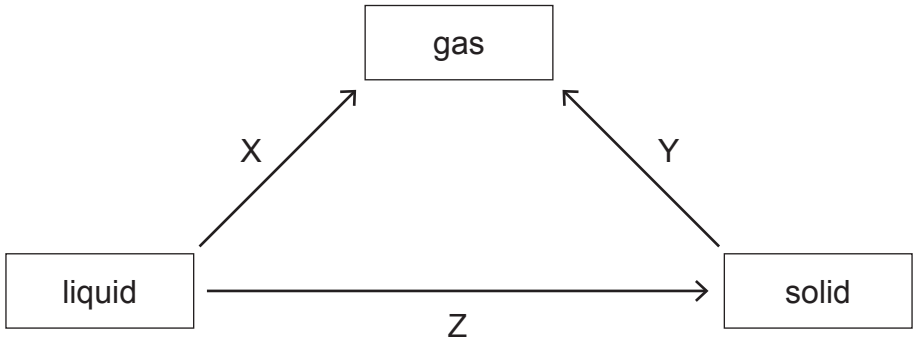
Substance	Melting point/°C	Boiling point/°C
A	114	444
B	–220	–118
C	–7	59
D	3500	4827

(b) Which of the substances **A**, **B**, **C** or **D** is in the liquid state at:

(i) 20 °C? _____ [1]

(ii) 200 °C? _____ [1]

The diagram below shows three **changes of state** labelled X, Y and Z.



(c) Name each change of state:

X _____

Y _____

Z _____ [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 Four substances **E**, **F**, **G** and **H** are described below. Read each description carefully and answer the questions which follow.

Substance **E** is a green solid which when heated produces a black powdery solid and a gas.

(a) Is substance **E** an element, a compound or a mixture?

_____ [1]

(b) Substance **F** is a silvery grey solid which is a good conductor of heat and electricity.

(i) Substance **F** is a mixture of metals. What name is given to this type of mixture?

_____ [1]

(ii) Give two other properties, apart from being a good conductor of heat and electricity, which you would expect a mixture of metals to have.

1. _____

2. _____ [2]

(c) Substance **G** is a colourless gas which forms only water when it burns.

(i) Substance **G** is an element. What is the name of substance **G**?

_____ [1]

(ii) Complete the sentence.

An element is a substance which _____

_____ [1]

(d) Substance **H** is a black liquid which separates easily into different gases and liquids.

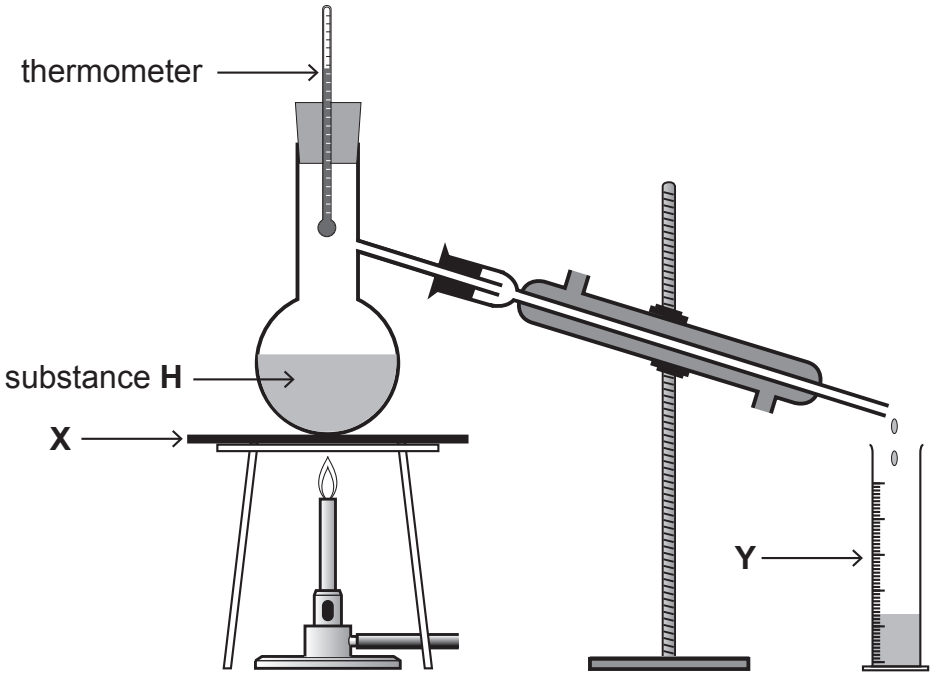
Explain why **H** can be described as a mixture.

_____

_____ [1]

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(e) Substance **H** can be separated using the apparatus below.



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(i) Name the pieces of apparatus labelled **X** and **Y**.

X _____

Y _____ [2]

(ii) What does a thermometer measure?

_____ [1]

(iii) Label the diagram above to show the position of the **distillate**. [1]

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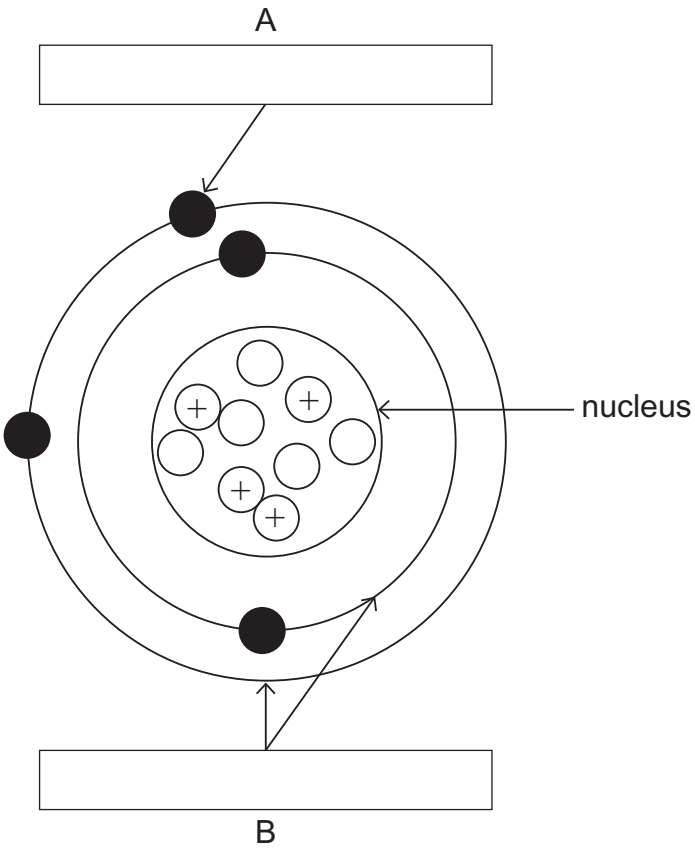
Marks	Remark

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Examiner Only	
Marks	Remark

4 The diagram below represents an atom.

(a) Complete the labels A and B on the diagram.



[2]

(b) The nucleus contains two different types of particles.

(i) Name the type of particle in the nucleus which has a positive (+) charge.

_____ [1]

(ii) What is the atomic number of the atom shown in the diagram?

_____ [1]

(c) This atom is from an element in Group 2 of the Periodic Table. What name is given to Group 2 elements?

_____ [1]

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5 Sodium reacts rapidly with water. Given a jar containing lumps of sodium, stored under oil, describe how you could **safely** react a piece of sodium with water and what you would see happening.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

safely carrying out the reaction:

observations:

[6]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

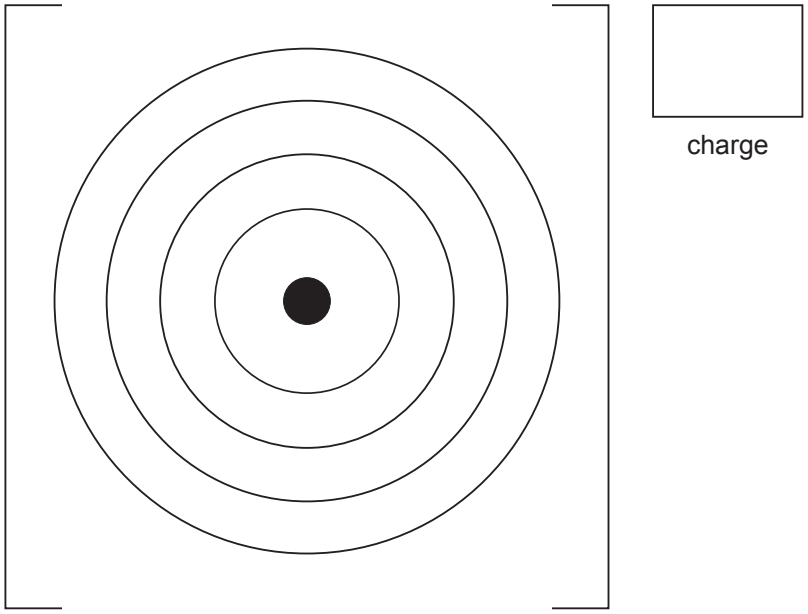
6 Some tap water contains dissolved calcium chloride ($CaCl_2$) and dissolved calcium hydrogen carbonate, $Ca(HCO_3)_2$.

(a) Give two reasons why calcium hydrogen carbonate and calcium chloride could be **ionic** compounds.

1. _____

2. _____ [2]

(b) Draw the electronic configuration of the calcium **ion** and give the charge.



calcium ion

[2]

(c) How many oxygen atoms are there in the formula $Ca(HCO_3)_2$?

_____ [1]

Some tap water can contain dissolved magnesium sulfate or dissolved potassium carbonate.

(d) Write the formulae for magnesium sulfate and potassium carbonate.

magnesium sulfate _____

potassium carbonate _____ [2]

Examiner Only	
Marks	Remark

7 The Periodic Table is used by chemists to help them understand the reactions of the elements. John Newlands was one of the first chemists to notice repeating patterns in the properties and reactions of the elements.

(a) What name did Newlands give to the repeating pattern observed in the properties of the elements?

_____ [1]

(b) Almost a decade after Newlands, Dmitri Mendeleev produced a Periodic Table, part of which is shown below.

H							
Li	Be	B	C	N	O	F	
Na	Mg	Al	Si	P	S	Cl	
K Cu	Ca Zn		Ti	V As	Cr Se	Mn Br	Fe Co Ni

(i) In what order did both Mendeleev and Newlands arrange the elements?

_____ [1]

(ii) Which Group of elements is missing from the Periodic Table developed by Mendeleev?

_____ [1]

(iii) Suggest why Mendeleev placed calcium and zinc in the same position in the Periodic Table.

_____ [1]

(c) Name the element which is in Group 7 and Period 3 of the modern Periodic Table.

_____ [1]

Examiner Only	
Marks	Remark

8 Metal oxides are bases. They react with strong acids to form salts.

(a) What is the pH range of a strong acid?

_____ [1]

Copper oxide reacts with sulfuric acid.

(b) (i) Complete the **word** equation below for this reaction.

copper oxide + sulfuric acid → + [2]

(ii) Why can this reaction be described as a neutralisation reaction?

_____

_____ [2]

(iii) What colour change is observed **in the solution** as this reaction is happening?

from _____ to _____ [2]

Sodium oxide reacts with hydrochloric acid.

(c) (i) Complete a balanced symbol equation for the reaction between sodium oxide and hydrochloric acid.

Na_2O + HCl → + [3]

(ii) Sodium oxide is an alkali. Why could sodium oxide be described as an alkali?

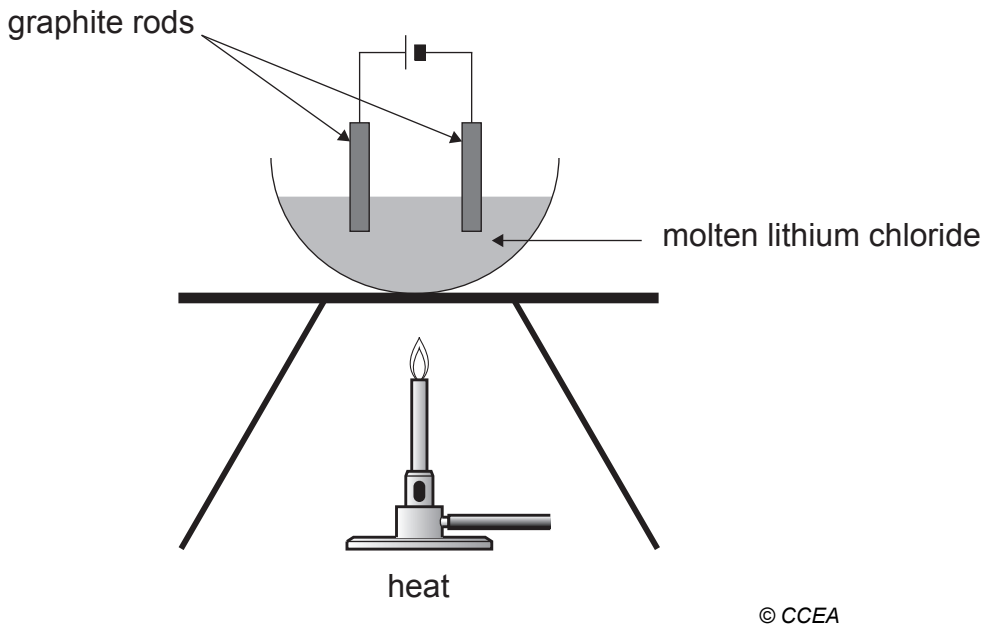
_____

_____ [2]

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Examiner Only	
Marks	Remark

9 The diagram below shows the apparatus used in the laboratory to conduct electricity through molten lithium chloride.



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(a) What is the name given to the graphite rods?

_____ [1]

(b) Give one reason why graphite is used to make these rods.

_____ [1]

(c) Name the **type** of particle which can move and carry the charge in the molten lithium chloride.

_____ [1]

(d) What is formed at the **cathode** when molten lithium chloride undergoes electrolysis?

_____ [1]

10 This question is about covalent structures and covalent bonding.

Examiner Only

Marks	Remark

(a) What is a covalent bond?

_____ [1]

(b) Draw a dot and cross diagram to show the arrangement of electrons in a molecule of hydrogen chloride (HCl). Show outer electrons only.

[3]

(c) Complete the paragraph below which explains why giant covalent structures have much higher melting points than molecular covalent structures.

There are extremely strong forces of attraction between the _____ in a giant covalent structure which take a lot of heat energy to _____. There are weak forces of attraction between the _____ in a molecular covalent structure which do not require a lot of energy to _____. [3]

THIS IS THE END OF THE QUESTION PAPER

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114853

Rewarding Learning

General Certificate of Secondary Education
2015–2016

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

THURSDAY 12 NOVEMBER 2015, MORNING

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

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The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

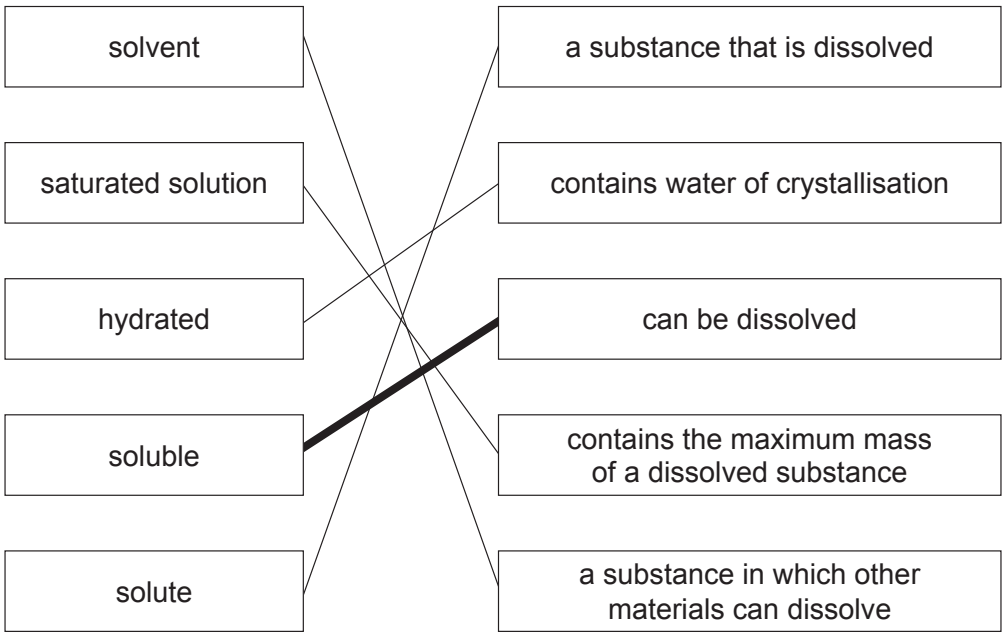
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AVAILABLE MARKS

1 (a)



1 correct = [1]; 2 or 3 correct = [2]; 4 correct = [3] [3]

(b) skull and crossbones symbol [1] 4

2 (a)

Property	Solid	Liquid	Gas
Can be compressed			
Takes the volume and shape of the container			✓ [1]
Takes only the shape of the container		✓ [1]	
Will condense when cooled			✓ [1]
Has a fixed shape	✓ [1]		

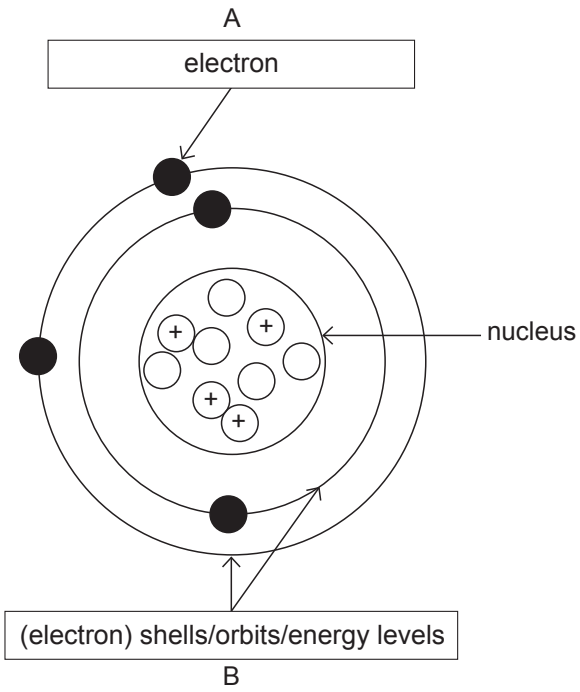
[1] mark per tick [4]

(b) (i) C [1]

(ii) A [1]

(c) X – evaporation [1]
Y – sublimation [1]
Z – freezing [1] [3] 9

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					AVAILABLE MARKS
3	**(a)**	compound		[1]	
	(b)	**(i)**	alloy	[1]	
		(ii)	Any **two** from: ductile/malleable/sonorous/shiny/high melting point/strong 2 × [1]	[2]	
	(c)	**(i)**	hydrogen	[1]	
		(ii)	contains only one type of atom/cannot be broken down into anything simpler (by chemical means)	[1]	
	(d)		idea that it can (easily) be separated (into its individual components)	[1]	
	(e)	**(i)**	X – wire gauze/pipe clay triangle [1] NOT heat mat Y – measuring cylinder [1]	[2]	
		(ii)	temperature (not heat)	[1]	
		(iii)	in measuring cylinder/dripping from the (Liebig) condenser/ clearly labelled in the (Liebig) condenser	[1]	11
4	**(a)**			[2]	
	(b)	**(i)**	proton	[1]	
		(ii)	atomic number = 4	[1]	
	(c)		alkaline earth metals	[1]	5

		AVAILABLE MARKS
5	**Indicative content**	

safely carrying out the reaction
- wearing goggles
- using tongs or tweezers
- removing oil from sodium (with paper)
- using a small piece/cutting a small piece
- use a safety screen
- gloves (safety)

Maximum 3 indicative points

observations
- floats
- melts/forms a ball
- forms an alkaline solution/colourless solution
- can catch fire/orange-yellow flame
- gives off a gas/fizzing/bubbles
- dissolves/disappears/gets smaller
- heat produced
- idea of a fast/vigorous reaction
- moves on surface

Maximum 4 indicative points

Response	Mark
Candidates make reference to **6 or 7** of the indicative points above to describe the safety precautions and observations made during the experiment. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates make reference to **4–5** of the indicative points above to describe the safety precautions and observations made during the experiment. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates make reference to **2–3** of the main points above using limited spelling, punctuation and grammar. The form and style are of a limited standard and they have made no use of specialist terms.	[1]–[2]
Candidates make **fewer than 2** references to the main points and offer no other suitable response.	[0]

[6] 6

6 **(a)** soluble (in water)/idea that they dissolve [1]
idea of being formed from a metal and a non-metal [1] [2]

(b) candidates draw the electronic configuration of a calcium ion 2,8,8 [1]
charge +2 (This should be placed in the box provided but mark it correct wherever it is placed.) [1] [2]

(c) 6 [1]

(d) $MgSO_4$ [1]
K_2CO_3 [1] [2] 7

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					AVAILABLE MARKS
7	**(a)**	The Law of Octaves	[1]		
	(b)	**(i)** in order of (increasing) atomic mass	[1]		
		(ii) Noble gases/group 8/group 0	[1]		
		(iii) idea that these elements have (very) similar **chemistry**/have (very) similar **chemical reactions**	[1]		
	(c)	chlorine	[1]		5
8	**(a)**	0–2 (NOT 1–2)	[1]		
	(b)	**(i)** copper sulfate [1] water [1] any order	[2]		
		(ii) it (is a reaction between an acid and a base which) forms a salt and water [1] only (clearly implied) [1] idea of hydrogen ions forming water gets [1]	[2]		
		(iii) colourless [1] to blue [1]	[2]		
	(c)	**(i)** $Na_2O + 2HCl \rightarrow 2NaCl + H_2O$ NaCl [1] H_2O [1] if a third product is given maximum mark is [1] balancing [1]	[3]		
		(ii) it is a base [1] it is soluble [1]	[2]		12
9	**(a)**	electrodes allow anode and cathode – both required	[1]		
	(b)	graphite: is a (good) conductor of **electricity**/is inert/high melting point **or** idea that graphite is inert **or** high melting point	[1]		
	(c)	ion	[1]		
	(d)	lithium	[1]		4

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			AVAILABLE MARKS
10	**(a)**	sharing (a pair of) electrons unless wrongly qualified e.g. not elements sharing electrons [1]	
	(b)	correct sharing between one hydrogen atom and one chlorine atom [1] correct number of outer electrons for each atom [1] this mark is awarded only when 1st mark is given correct dot and cross representation [1] [3]	
	(c)	atoms [1] break* molecules [1] break* * [1] if break given twice [3]	7
		Total	**70**

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Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Chemistry

Unit C1
Foundation Tier

[GSD21]

GSD21

THURSDAY 14 MAY 2015, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **7(a)**.
A Data Leaflet, which includes a Periodic Table of the elements is provided.

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1 **(a)** Lists of substances and statements are given below.
Draw a line from each substance to the correct statement about that substance.

Substance	Statement
	Is a white solid
hydrogen	
	Turns limewater milky white
copper oxide	
	Makes a popping sound with a lighted splint
aluminium sulfate	
	Reacts with sulfuric acid to produce a salt and water only
copper carbonate	
	Is a green solid
carbon dioxide	
	Relights a glowing splint

[5]

(b) In the box below draw the hazard symbol that would be found on a bottle of a **corrosive** substance, such as sulfuric acid.

[1]

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2 Below is a list of words which are often used in chemistry.

melts	**sublimes**	**condenses**	**dissolves**
evaporates	**boils**	**freezes**	**mixes**

Complete each of the sentences below by choosing a correct word from the list.

(i) Sugar _____ when it is put into hot tea.

(ii) Water _____ on the cold surface of windows in hot kitchens.

(iii) Ice cream _____ when it is taken out of the freezer.

(iv) An iodine crystal _____ when it changes from solid to gas. [4]

[Turn over

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3 Read the information below and then answer the questions which follow.

*Potassium iodide crystals dissolve in water to form colourless solution **A**.*
*Lead nitrate crystals dissolve in water to form colourless solution **B**.*

(a) From the information above name:

(i) a solute _____

(ii) a solvent _____ [2]

*If solutions **A** and **B** are mixed together two new substances are formed.*

One of these substances is a yellow solid, lead iodide, which lies at the bottom of the beaker. The other substance is potassium nitrate which forms a colourless solution.

(b) From the information above name an insoluble substance.

_____ [1]

(c) Draw a **labelled** diagram of the assembled apparatus you would use to separate the yellow solid formed from the colourless solution.

[4]

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(Questions continue overleaf)

[Turn over

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4 This question is about alloys.

(a) Read the passage below and then answer the questions which follow.

Chromium is used in making stainless steel to help keep the steel shiny.
Solder is used to help join metals together.
Electrum, known as white gold is an alloy of gold, silver, and copper.

(i) Name four metal elements mentioned in the passage.

1. _____

2. _____

3. _____

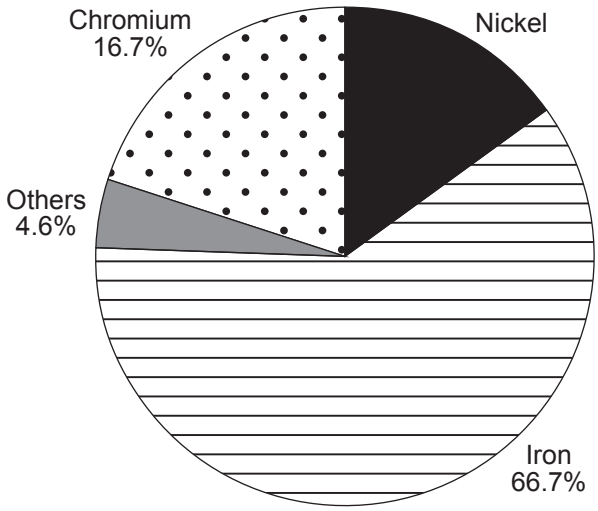
4. _____ [2]

(ii) Why can white gold be described as an alloy?

_____

_____ [2]

(b) The pie chart below shows the composition of stainless steel.



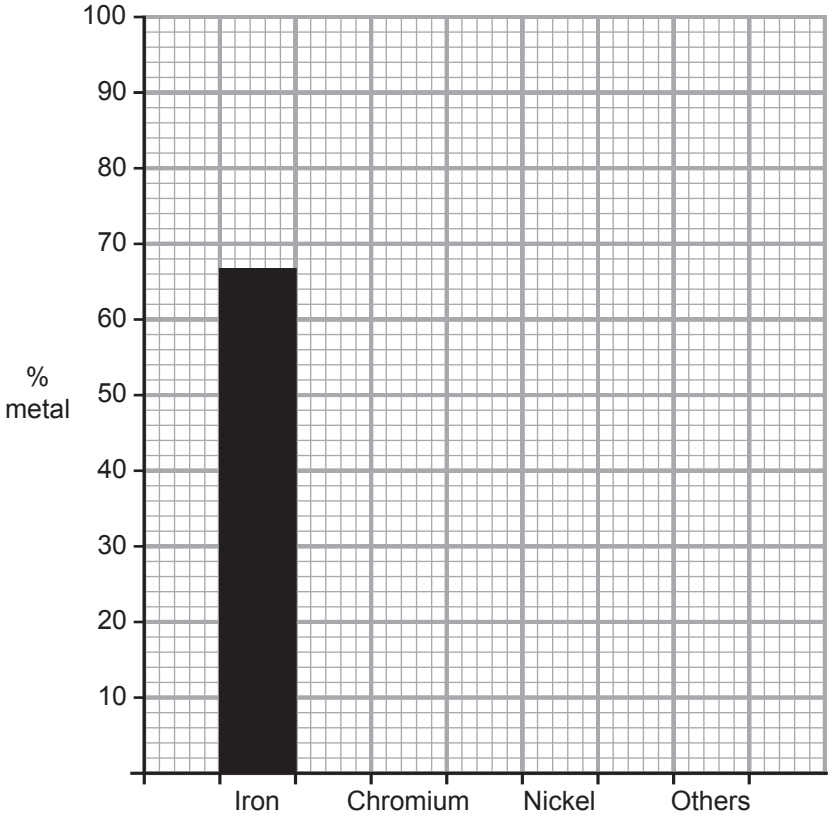
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(i) Calculate the percentage of nickel in stainless steel.

Show your working out.

Answer _____ % [2]

(ii) Use the information in the pie chart to complete the bar chart below.



[2]

[Turn over

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(c) Give one important use for:

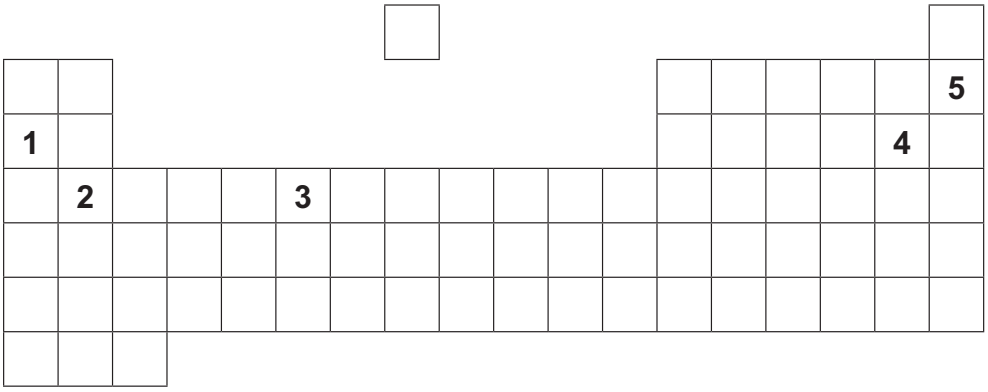
iron: _____

copper: _____ [2]

(d) Suggest one reason why aluminium alloys are used in aircraft manufacture.

_____ [1]

5 An outline of part of the Periodic Table is shown below. The numbers **1**, **2**, **3**, **4** and **5** represent the position of five elements.



(a) Which element **1**, **2**, **3**, **4** or **5** is:

(i) an alkali metal? _____ [1]

(ii) a halogen? _____ [1]

(iii) a transition metal? _____ [1]

(iv) calcium? _____ [1]

(b) **(i)** Which of the electronic structures below is that of an element in the same Group as element **4**? Circle the correct answer.

2, 8, 2 **2, 7** **2, 8, 6** **2, 8, 1**

[1]

(ii) In which Period are elements **1** and **4**?

_____ [1]

(c) Explain, **in terms of its electronic configuration**, why element **5** is very unreactive.

_____

_____ [1]

[Turn over

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6 **(a)** Complete the table below which gives information about acids and alkalis.

	solution	pH range	Colour with universal indicator	Strength acid/alkali
A	sodium hydroxide	12–14		strong alkali
B	hydrochloric acid		red	strong acid
C	ammonia	8–11	blue	
D		3–6	orange	weak acid

[4]

(b) Explain why blue litmus paper could not be used to distinguish between solutions **B** and **D**.

_____

_____ [2]

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7 **(a)** Describe in words the structure of an atom of carbon with an atomic number of 6 and a mass number of 14.

Your answer should include the number and position of all the different particles in this carbon atom.

You will be assessed on your written communication skills including the use of specialist science terms.

[6]

(b) Carbon also has atoms with a mass number of 12.
What name is given to atoms with the same atomic number but different mass numbers?

[1]

(c) When carbon atoms join together to form molecules they share electrons.
What name is given to this type of bonding?

[1]

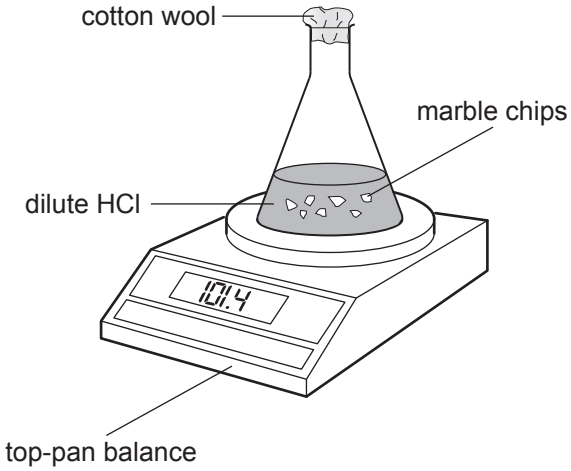
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8 A pupil investigated the reaction between calcium carbonate (marble chips) and dilute hydrochloric acid. He used excess calcium carbonate.

The equation for this reaction is:

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$$



The student measured the mass of the flask and its contents every minute for 8 minutes. The results are shown in the table below.

Mass/g	102.8	101.4	100.3	99.5	99.3	99.2	99.1	99.0	99.0
Time/min	0	1	2	3	4	5	6	7	8

(a) What is the name of the salt produced during the reaction?

_____ [1]

(b) What caused the mass of the flask and contents to decrease?

_____ [1]

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(c) Suggest why the student used **excess** calcium carbonate.

_____

_____ [1]

(d) Give an **accurate** way of checking that the resulting solution was neutral.

_____ [1]

(e) Another student in the same class used calcium oxide instead of calcium carbonate. She observed no drop in mass. Explain why this would be the case.

_____

_____ [2]

[Turn over

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9 **(a)** The following table shows the solubilities of three gases in water, at different temperatures:

Gas	solubility (mg per 100 g water)* at:			
	0 °C	20 °C	40 °C	50 °C
carbon dioxide	348	169	97	76
nitrogen	2.9	1.9	1.5	1.2
oxygen	7.0	4.3	3.0	2.7

* mg = milligrams

(i) What is the solubility of carbon dioxide at 20 °C?

_____ mg/100 g water [1]

(ii) Which gas is **least** soluble at 50 °C?

_____ [1]

(iii) How does the solubility of the three gases change as the temperature increases?

_____ [1]

(iv) Use the table to help you explain why fish may die if the water in a river becomes too warm.

_____

_____

_____

_____ [2]

(b) How does the solubility of most solids in water change as the temperature increases?

_____ [1]

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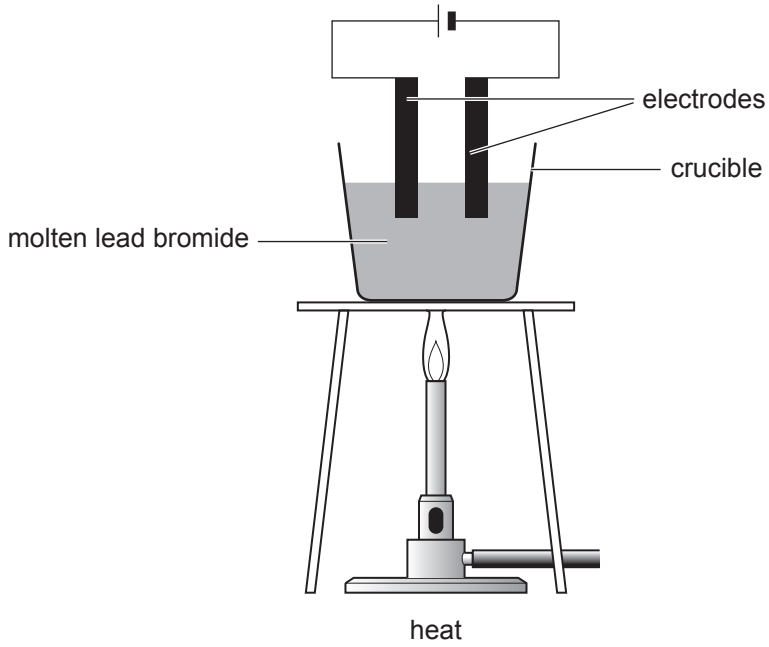
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10 The diagram below shows the apparatus used to pass an electric current through molten lead bromide.



(a) What name is given to the process which happens in the crucible?

_____ [1]

(b) What is the **electrolyte** in this experiment?

_____ [1]

(c) Give **two** reasons, other than cost, why graphite is a suitable material for making the electrodes.

1. _____

2. _____ [2]

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(d) Complete the table below by predicting the products and observations at the electrodes for the molten salts given.

name of substance	observations at anode	observations at cathode	product at anode	product at cathode
lead bromide		beads of metal	bromine	lead
lithium chloride	bubbles of greenish/ yellow gas	beads of metal		lithium
potassium iodide	bubbles/purple vapour			

[5]

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

Examiner Number

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				AVAILABLE MARKS
1	**(a)**	hydrogen – popping sound copper oxide – reacts to produce a salt + water only aluminium sulfate – white solid copper carbonate – green solid carbon dioxide – turns limewater milky	[5]	
	(b)	correct symbol accept diagram which shows liquid dropping on to hand/surface	[1]	6
2	**(i)**	sugar – dissolves	[1]	
	(ii)	water – condenses	[1]	
	(iii)	ice cream – melts	[1]	
	(iv)	iodine crystals – sublime	[1]	4
3	**(a)**	**(i)** lead nitrate/potassium iodide	[1]	
		(ii) water	[1]	
	(b)	lead iodide	[1]	
	(c)	Apparatus shows filter paper [1] filter funnel [1] flask/beaker/test tube [1] 3 correct labels – at least 2 for apparatus [1] If apparatus unassembled: 1 piece = 0 2 pieces = 1 3 pieces = 2	[4]	7

					AVAILABLE MARKS
4	**(a)**	**(i)**	gold, silver, copper and chromium all four correct [2] two or three correct [1]	[2]	
		(ii)	it is a **mixture** of two (or more) **elements** [1] including a **metal** [1] Mixture of metals allowed for [1] Mixture must be explicit for any credit	[2]	
	(b)	**(i)**	66.7 + 16.7 + 4.6 = 88.0 [1] 100 – 88 = 12% [1]	[2]	
		(ii)	Three correct columns [2] any two correct [1] apply cm for nickel	[2]	
	(c)		Iron: bridges, structures or other correct [1] Copper: wiring, plumbing, coinage or other correct [1]	[2]	
	(d)		idea of being light/low density or idea of not corroding/reacting or other correct, e.g. strong **Not** cost related answer Ignore malleable/ductile **Not** does not rust	[1]	11
5	**(a)**	**(i)**	1 **or** sodium **or** Na	[1]	
		(ii)	4 **or** chlorine **or** Cl	[1]	
		(iii)	3 **or** chromium **or** Cr	[1]	
		(iv)	2	[1]	
	(b)	**(i)**	2,7	[1]	
		(ii)	Period 3	[1]	
	(c)		It has 8 electrons in its outer shell/it has a full outer shell	[1]	7

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AVAILABLE MARKS

6 (a)

	solution	pH range	Colour with universal indicator	Strength acid/ alkali
A	sodium hydroxide	12–14	**purple**** [1]	strong alkali
B	hydrochloric acid	**0/1–2** [1]	red	strong acid
C	ammonia	8–11	blue	**weak alkali** [1]
D	**ethanoic acid*** [1]	3–6	orange	weak acid

* or any other correct weak acid, e.g. citric acid, carbonic acid
allow vinegar; do not allow orange juice or lemon juice
** accept dark blue, violet, indigo [4]

(b) B and D are both acids [1] they will both turn red/both turn the same colour [1] [2]

6

7 (a) Indicative Content

- Protons
- Electrons
- Neutrons
- Correct numbers of protons
- Correct number of electrons
- Correct number of neutrons
- Protons in nucleus
- Neutrons in nucleus
- Electrons in shells

Response	**Mark**
Candidates must use appropriate scientific terms throughout to describe the structure of a carbon atom using 7–9 of the points in the indicative content. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use 5 or 6 points from the indicative content to describe the structure of a carbon atom using some scientific terms. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates use 3 or 4 of the points from the indicative content to describe the structure of a carbon atom. They use limited spelling, punctuation and grammar and make little use of scientific terms.	[1]–[2]
Response not worthy of credit.	[0]

[6]

(b) isotopes [1]

(c) covalent; **Not** simple molecular; **Not** simple covalent; **Not** giant covalent [1]

8

				AVAILABLE MARKS
8	**(a)**	calcium chloride	[1]	
	(b)	the gas/carbon dioxide leaves the flask/escapes **Not** gas released/given off/produced	[1]	
	(c)	idea of making sure all the acid was used up/neutralised	[1]	
	(d)	use a pH meter/sensor/probe **Not** pH paper/scale	[1]	
	(e)	No gas would be formed [1] a salt and water is produced [1] **or** no gas would be formed [1] ∴ nothing could escape [1] **or** it would **only** produce a salt and water [1] – only is explicit	[2]	6
9	**(a)**	**(i)** 169 (mg per 100 g water)	[1]	
		(ii) nitrogen	[1]	
		(iii) it decreases	[1]	
		(iv) explicit idea that fish need **oxygen** to breathe/respire [1] allow idea of suffocation idea that warm water contains less **oxygen** (not less gas) [1]	[2]	
	(b)	it increases	[1]	6

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10 (a) electrolysis [1]

(b) (molten) lead bromide [1]

(c) conducts **electricity** [1]
does not react/idea of high melting point [1] [2]

(d)

name of substance	observations at anode	observations at cathode	product at anode	product at cathode
lead bromide	**bubbles of reddish brown gas*** [1]	beads of metal	bromine	lead
lithium chloride	bubbles of greenish/yellow gas	beads of metal	**chlorine** [1]	lithium
potassium iodide	bubbles of purple vapour	**beads of metal** [1]	**iodine** [1]	**potassium** [1]

* Brown/orange-brown/yellow-brown/orange
Not yellow; **Not** red [5]

Total

AVAILABLE MARKS

9

70

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Chemistry

GSD21

Unit C1
Foundation Tier

[GSD21]

WEDNESDAY 25 FEBRUARY 2015, 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 nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **8**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** Metals have many uses. Draw a line to match each use to a metal.
One has been done for you.

use	metal
bridges	magnesium
plumbing	iron
flares	copper
jewellery	aluminium
overhead cables	silver

[3]

(b) An alloy is a mixture of elements at least one of which is a metal.
Coins are good examples of materials made from alloys.
Which **two** of the following statements are true?
Tick two correct boxes.

In an alloy the elements are chemically bonded together. ☐

A mixture of carbon and sulfur could be described as an alloy. ☐

An alloy would be expected to conduct electricity. ☐

A mixture of copper and zinc could be described as an alloy. ☐

[2]

(c) How would you separate a mixture of iron and sulfur?

_____

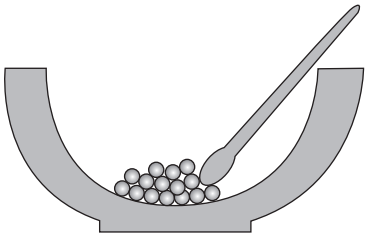
_____

_____

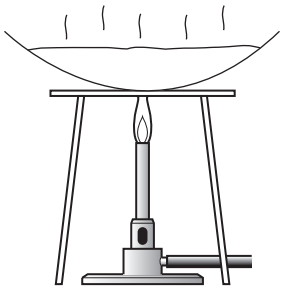
_____ [2]

Examiner Only	
Marks	Remark

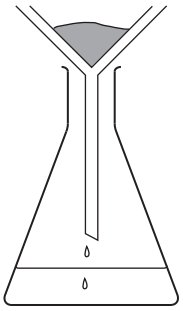
2 The diagrams below show different steps in the separation of a sample of pure salt from rock salt which is a mixture of salt and sand. The steps shown are **not** in the correct order.



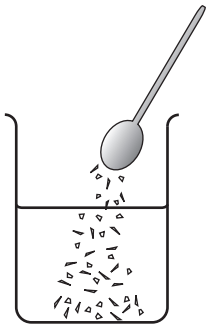
A



B



C



D

(a) Starting from grinding up the rock salt in Step **A**, put the other three steps **B**, **C** and **D** in the correct order for preparing pure salt from rock salt.

Step A is followed by Step _____ then by Step _____

and finally Step _____. [2]

(b) **(i)** Label a **filtrate** on one of the diagrams **A**, **B**, **C** or **D**.

(ii) Label a **residue** on one of the diagrams **A**, **B**, **C** or **D**. [2]

(c) In which Step, **A**, **B**, **C** or **D** is the process of evaporation taking place?

_____ [1]

(d) Give one hazard or risk when carrying out Step **B** and give a safety precaution you would take to remove this hazard or risk.

Hazard or risk:_____

Safety precaution: _____ [2]

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Examiner Only	
Marks	Remark

3 **(a)** The following question is about potassium.

Circle the correct word from each box below to complete the sentences.

Potassium has to be stored in | oil / water / acid | because it is very | dense. / reactive. / soft.

When taken out of the container potassium appears | yellow / dull / shiny | on the surface.

Potassium looks | shiny / dull / white | when freshly cut.

[4]

(b) Describe **four** things that happen when potassium is added to cold water.

1. _____

2. _____

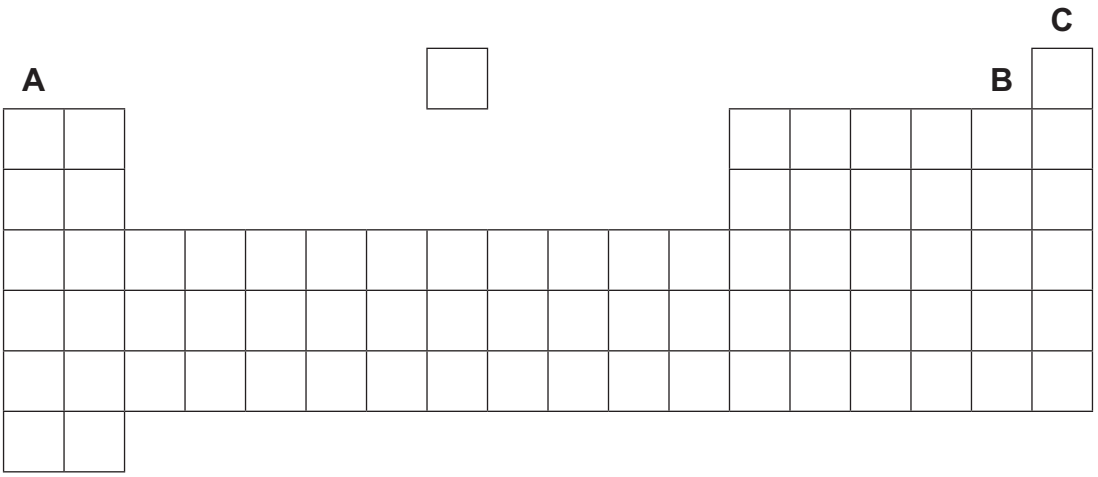
3. _____

4. _____ [4]

(c) Potassium is corrosive. In the space below draw the hazard symbol which would be found on a bottle of potassium.

[1]

4 The diagram below shows an outline of the Periodic Table.



(a) Give the names of the Groups in the Periodic Table which are labelled **A**, **B** and **C**.

Group **A** _____

Group **B** _____

Group **C** _____ [3]

(b) On the diagram shade the area of the Periodic Table where the **transition metals** are found. [1]

(c) Circle the word, from the list below, which is needed to complete the sentence:

Mendeleev arranged the elements in order of their atomic _____.

mass **structure** **number** **size**

[1]

(d) Give **two** other features of the Periodic Table developed by Mendeleev.

1. _____

2. _____ [2]

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Marks	Remark

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5 The table below gives the colours of four indicators at different pH values.

Indicator \ pH	1	3	5	7	9	11	13
Red litmus	R	R	R	R	B	B	B
Blue litmus	R	R				B	B
Universal	R	O	Y	G	B	I	V
Methyl red	R	R	Y	Y	Y	Y	Y

Key: R – red; O – orange; Y – yellow; G – green; B – blue; I – indigo; V – violet

(a) Use the information given to answer the following questions:

(i) Use the letters in the key to complete the table for blue litmus. [1]

(ii) What colour is universal indicator in sodium chloride solution (pH 7)?

_____ [1]

(iii) Explain why methyl red indicator cannot be used to tell you if a solution is a weak alkali or a strong alkali.

_____ [1]

(iv) A chemist has a solution that is strongly acidic. He wants to add an alkali to neutralise the acid and end up with pH 7. Which indicator would be best for this task? Explain your answer.

Indicator: _____

Explanation: _____ [2]

(b) Suggest a way of measuring the pH of a solution which is more accurate than using an indicator.

_____ [1]

(c) Complete the equation for neutralisation.

acid + alkali → + [2]

Examiner Only

Marks	Remark

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6 This question is about atomic structure.

Examiner Only

Marks	Remark

(a) Use your knowledge of atomic structure to complete the table below.

Atom/ion	Mass number	Number of protons	Number of electrons	Number of neutrons
A		3	3	3
B	27	13	13	
C	11		5	6
D		11	10	12
E		17	18	18

[5]

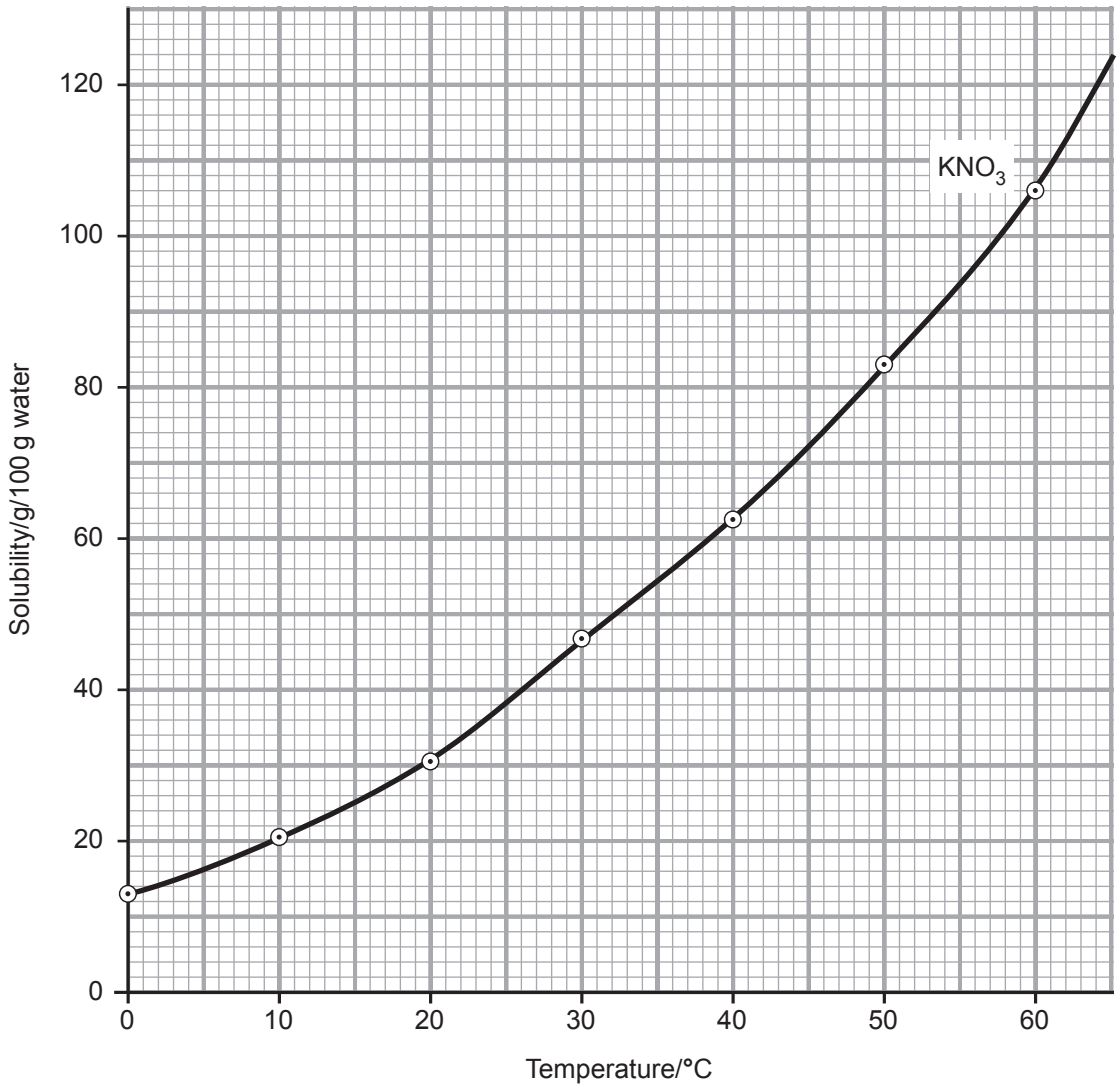
(b) Give the chemical symbol for each of the particles A, D and E.
They may be atoms or ions.

	Symbol
A	
D	
E	

[3]

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7 The graph below shows the solubility curve for potassium nitrate, KNO_3.



(a) Use the data given in the table below to plot a solubility curve for potassium chloride, KCl, on the same grid as the solubility curve for potassium nitrate.

Temperature/°C	0	10	20	30	40	50	60
Solubility of potassium chloride/g/100 g water	28	31	33	36	39	42	45

[3]

Examiner Only

Marks	Remark

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(b) Describe and compare the trends in solubility for potassium nitrate and potassium chloride.

_____

_____

_____

_____ [2]

(c) At what temperature do both salts have the same solubility?

_____ [1]

(d) **(i)** What is the solubility of potassium nitrate in 100 g of water at 43 °C?

_____ [1]

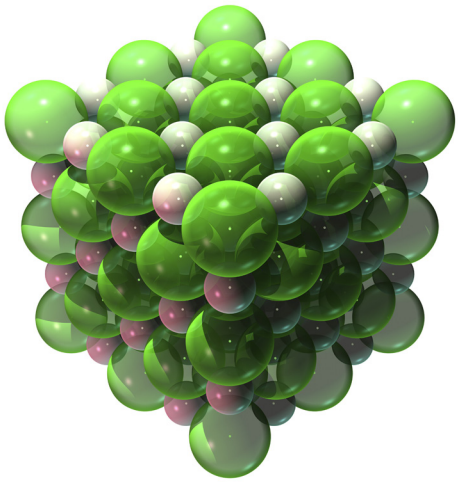
(ii) Calculate the difference in solubility between potassium nitrate and potassium chloride in 100 g of water at 43 °C.

_____ [2]

Examiner Only	
Marks	Remark

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8 Sodium chloride has an ionic crystal lattice structure like that shown in the diagram below.



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In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

Predict and explain the physical properties you would expect sodium chloride to have.

[6]

Examiner Only

Marks	Remark

9 The table below gives information about the salts formed when metal carbonates react with acids.

Metal carbonate	Acid used	Cation in salt	Anion in salt	Formula of salt produced
calcium	hydrochloric	Ca^{2+}		$CaCl_2$
sodium		Na^+	SO_4^{2-}	
	sulfuric	Cu^{2+}		$CuSO_4$
magnesium	nitric			$Mg(NO_3)_2$

(a) Complete the table. [4]

(b) One of the reactions shown in the table involves a colour change. Give the **colours** of the starting metal carbonate and the salt solution produced:

metal carbonate colour: _____

colour of salt solution produced: _____ [2]

(c) All of the reactions shown in the table produce the same gas. Name this gas and describe a test that is used to identify it.

Name: _____

Test: _____

_____

_____ [3]

THIS IS THE END OF THE QUESTION PAPER

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Marks	Remark

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114853

Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

WEDNESDAY 25 FEBRUARY 2015, MORNING

MARK SCHEME

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General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

				AVAILABLE MARKS
1	**(a)**	bridges – iron plumbing – copper flares – magnesium overhead cables – aluminium 4 correct = [3] 2 or 3 correct = [2] 1 correct = [1]	[3]	
	(b)	An alloy would be expected to conduct electricity [1] A mixture of copper and zinc could be described as an alloy [1]	[2]	
	(c)	idea of using a magnet [1] idea that iron will be attracted – sulfur will not implied [1]	[2]	7
2	**(a)**	D then C then B allow [1] for D then B then C	[2]	
	(b)	**(i)** filtrate correctly labelled [1]		
		(ii) residue correctly labelled [1]	[2]	
	(c)	B	[1]	
	(d)	spitting of hot solid/risk of getting burnt/clothing catching fire/or other correct [1] wear goggles/stand well back/tuck in clothing/or other correct N.B. safety precaution must link to the hazard or risk [1]	[2]	7
3	**(a)**	oil [1] reactive [1] dull [1] shiny [1]	[4]	
	(b)	ignites lilac flame floats idea of movement idea of vigorous/violent reaction gas given off/hydrogen formed dissolves/disappears idea of alkaline solution formed/potassium hydroxide idea of heat being given off forms a ball/melts or any other correct any 4 × [1]	[4]	
	(c)	corrosive sign	[1]	9

AVAILABLE MARKS

4 **(a)** Group A – alkali metals **Not** alkaline metals
Group B – halogens
Group C – noble gases
If answers are by Group NUMBER i.e. 1, 7, 0 and all correct, award [1]
3 × [1] [3]

(b) centre part correctly labelled [1]

(c) mass [1]

(d) left gaps for undiscovered elements,
arranged elements in groups/periods
idea of having elements swapped, e.g. iodine and tellurium
idea of having no noble gases
or other correct
any 2 × [1] [2] 7

5 **(a)** **(i)** R, B, B – all needed [1]

(ii) green [1]

(iii) idea that it is yellow in all alkali solutions [1]

(iv) universal [1]
idea that it is the only one which changes colour at pH 7, e.g. it turns green when neutral/at pH 7 [1] [2]

(b) pH meter or probe [1]

(c) salt [1] water [1] either order [2] 8

6 **(a)**

Atom/ion	Mass number	Number of protons	Number of electrons	Number of neutrons
A	**6** [1]	3	3	3
B	27	13	13	**14** [1]
C	11	**5** [1]	5	6
D	**23** [1]	11	10	12
E	**35** [1]	17	18	18

[5]

(b) A – Li [1]
D – Na^+ [1]
E – Cl^- [1] [3] 8

	AVAILABLE MARKS

7 **(a)** six or seven points correctly plotted [2]
four or five points correct [1]
appropriate line through points [1] [3]

(b) As temperature increases, solubility increases [1]
idea (potassium nitrate) increases more steadily [1]
potassium chloride increases steadily/slightly [1]
Any 2 from 3 [2]

(c) 22 °C ± 0.5 °C [1]

(d) **(i)** 68 g/100 g H_2O [1]

(ii) 68–40 [1] 28 [1] g [1]
Any two from three. Unit dependent on 1st/2nd mark
in (ii) apply ecf, e.g. 65/66 – 39 [1] → 26/27 [1] g [1] [2]

9

8 **Indicative Content**

Prediction

- High melting point
- Solid
- Conducts electricity when molten/in solution
- Doesn't conduct as solid
- Soluble in water
- Brittle

Explanation

High melting point

- Strong forces of attraction between ions

Electric conductivity

- Ions can carry charge
- Ions free to move in molten/aqueous state
- Ions not free to move in solid state

Response	Mark
Candidates must use appropriate scientific terms throughout to describe the physical properties, using 7 or more of the points in the indicative content, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use 4–6 points from the indicative content to describe the physical properties in a logical sequence using some scientific terms. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates use 1–3 of the points from the indicative content to describe the physical properties. However these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and make little use of scientific terms. The form and style are of a limited standard.	[1]–[2]
Response not worthy of credit.	[0]

[6]

6

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9 **(a)**

Metal carbonate	Acid used	Cation in salt	Anion in salt	Formula of salt produced
calcium	hydrochloric	Ca^{2+}	**Cl^-**	$CaCl_2$
sodium	**sulfuric**	Na^+	SO_4^{2-}	**Na_2SO_4**
copper	sulfuric	Cu^{2+}	**SO_4^{2-}**	$CuSO_4$
magnesium	nitric	**Mg^{2+}**	**NO_3^-**	$Mg(NO_3)_2$

7 correct = [4]; 5–6 correct = [3]; 3–4 correct = [2]; 2 correct = [1] [4]

(b) metal carbonate – green [1]
salt solution – blue [1] [2]

(c) carbon dioxide [1]
limewater [1] turns milky [1] [3]

Total

AVAILABLE MARKS

9

70

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2014–2015

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

GSD21

THURSDAY 13 NOVEMBER 2014, 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 nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **7**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

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Examiner Only	
Marks	Remark

1 The list below contains the name of five substances.

aluminium **copper** **diamond**

graphite **magnesium**

(a) Choose two **metals** from the list.

_____

_____ [2]

(b) Choose a substance from the list above which can be used:

(i) as a pencil lead _____ [1]

(ii) for flares _____ [1]

(iii) to make coins _____ [1]

(iv) in cutting tools _____ [1]

(c) What is the chemical symbol for aluminium?
Circle the correct answer.

AL al Al Al_2 [1]

Magnesium and graphite can be used to produce a useful alloy.

(d) Complete the sentence below to explain what is meant by the term **alloy**.

An **alloy** is a _____ of elements, at least one

of which is a _____. [2]

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Examiner Only	
Marks	Remark

2 Crystals of iodine sublime when heated.

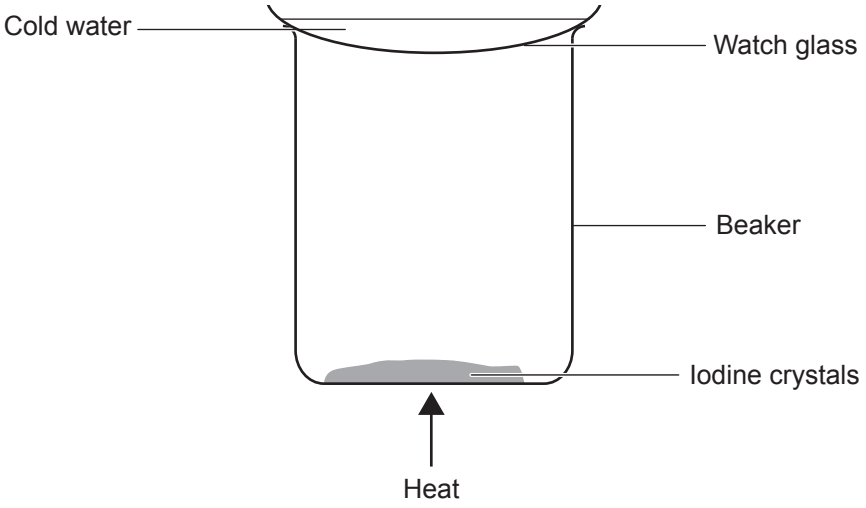
(a) Complete the sentence below to explain what is meant by the term **sublime**.

When iodine is heated it changes from a _____

to a _____ without becoming

a _____. [3]

(b) Describe what you would observe when crystals of iodine are heated using the apparatus below. Your answer should include the colour of the iodine crystals.



_____

_____

_____

_____

_____ [3]

(c) Iodine is an element in Group 7 of the Periodic Table.
What is the name given to Group 7 elements?

_____ [1]

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Examiner Only	
Marks	Remark

3 The element hydrogen is a gas at room temperature. It is flammable and lighter than air.

(a) Explain what is meant by the term **element**.

_____

_____ [1]

(b) Choose **two** phrases from the list below which could be used to describe hydrogen gas.
Place a tick (✓) in the two correct boxes.

Hydrogen gas has a constant volume. ☐

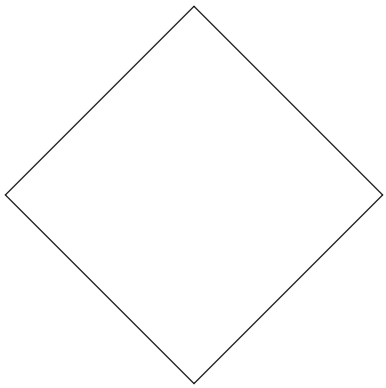
Hydrogen gas floats on water. ☐

Hydrogen gas can be compressed. ☐

Hydrogen gas takes the volume of the container it is in. ☐

Hydrogen gas takes the shape of the bottom of the container it is in. ☐ [2]

(c) Draw the hazard symbol which should be placed on a cylinder of hydrogen.



[1]

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(d) Hydrogen exists as diatomic molecules. Atoms of hydrogen are held together by a covalent bond in the molecule.

(i) What is the chemical formula for a molecule of hydrogen? Circle the correct answer.

2H H_2 H H^2 [1]

(ii) Draw a dot and cross diagram to show the covalent bond in a molecule of hydrogen.

[3]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

4 Testing acidity is an important part of commercial beer production.

(a) The method below can be used to find the acidity of the brewing mixture at different stages in the brewing process.

Step 1 **Filter** a sample of the brewing mixture into a test tube.

Step 2 Test the **filtrate** with an indicator.

(i) Draw a labelled diagram, in the space below, of the assembled apparatus used to carry out Step 1.

[3]

(ii) Label the **filtrate** on your diagram. [1]

(b) **(i)** Name an indicator which could show that the brewing mixture is a **weak** acid.

_____ [1]

(ii) Name an indicator which would **only** show that the brewing mixture is acidic.

_____ [1]

(iii) Explain how you would use an indicator to find out the pH of the mixture.

_____

_____

_____ [2]

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(c) A pH meter can be placed directly into the brewing mixture.

Which of the following could be a reading from a pH meter used to find the acidity of beer?

Circle the correct reading.

pH = 2–6	pH = 11.42	
pH = 5	pH = 8–12	pH = 5.34

[2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

5 The scientists Mendeleev and Newlands were involved in the development of the Periodic Table.

(a) Mendeleev and Newlands arranged the elements in order of:
Place a tick (✓) in the box beside the correct answer.

increasing atomic number ☐

increasing atomic mass ☐

increasing mass number ☐

increasing reactivity ☐ [1]

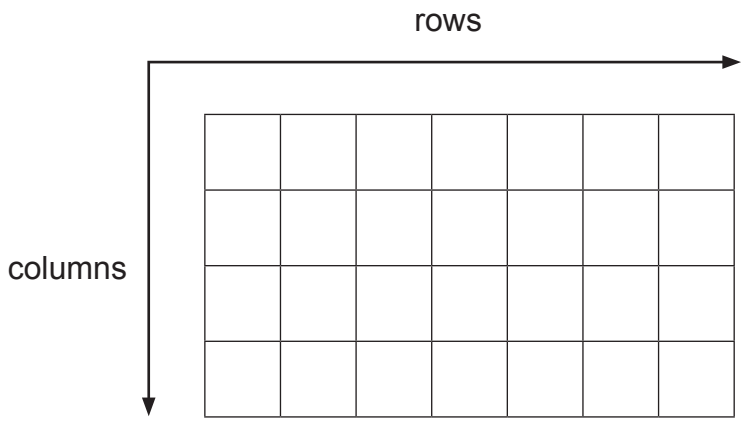
(b) Complete the sentence below to describe Newlands' Law of Octaves.

Every 8th element as arranged by Newlands has

similar _____ properties. [1]

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Mendeleev further arranged the elements into rows and columns as shown in the diagram below.



(c) Which **two** of the following statements apply to the Periodic Table developed by Mendeleev?
Place a tick (✓) in the boxes beside the two correct statements.

Gaps were left for undiscovered elements. ☐

A separate row for transition metals was included. ☐

Elements in each row were chemically similar. ☐

There were no noble gases. ☐

All the metals were placed on the right hand side of the table. ☐ [2]

Examiner Only

Marks	Remark

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Marks	Remark

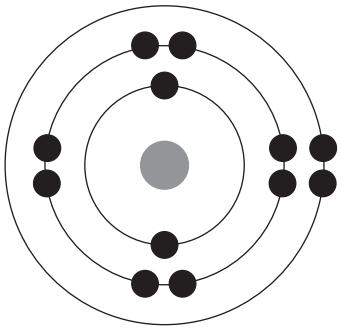
6 Magnesium reacts with fluorine to form a solid white compound.

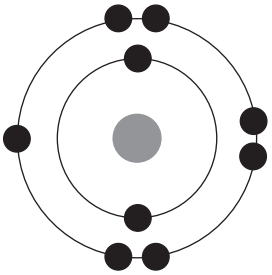
(a) **Name** the solid formed when magnesium reacts with fluorine.

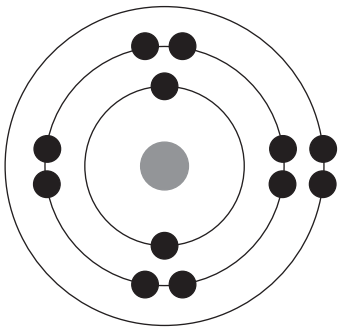
_____ [1]

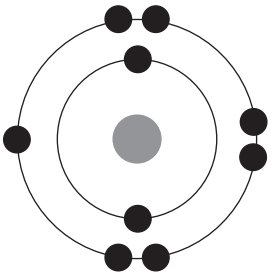
The diagrams below represent the electronic structures of two atoms of magnesium and two atoms of fluorine.

(b) Use arrows in the diagrams below, to show the movement of electrons when magnesium and fluorine react.
Although two magnesium atoms and two fluorine atoms are shown, you will need to work out whether you have to use 2, 3 or all 4 diagrams in order to answer the question.









magnesium atoms fluorine atoms

[3]

(c) Name the **type** of particles present in the compound formed when magnesium reacts with fluorine.

_____ [1]

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7 Water is a colourless liquid but there are other colourless liquids or liquid mixtures, such as ethanol and petrol.
You are given a test tube containing 10cm^3 of a liquid labelled 'water'.

Describe a **chemical test** and a **physical test** you could use to prove that the liquid actually is water. Include in your answer the full chemical name of any substances used.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

Examiner Only

Marks	Remark

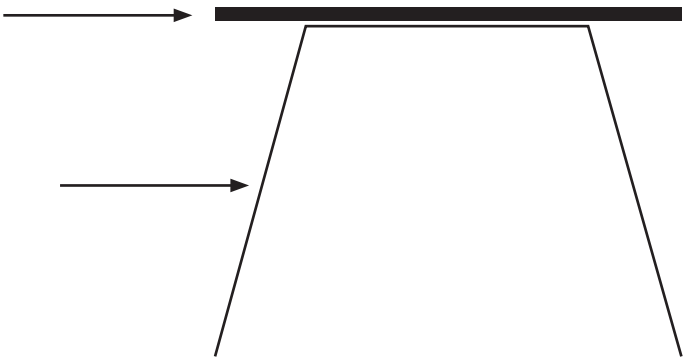
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Examiner Only	
Marks	Remark

8 Lead(II) bromide, $PbBr_2$, is a white powder with a low solubility in water. It will conduct electricity when molten, but not as a solid.

(a) Complete, below, a **labelled** diagram of the **assembled** apparatus that can be used to show that lead(II) bromide conducts electricity when molten. Two pieces of the apparatus have already been drawn, but not labelled.

Your diagram must include:
- an electric circuit
- a crucible
- a method of heating and
- at least 5 labels.



[5]

(b) Complete the sentence below **to explain why** the lead(II) bromide will only conduct electricity when it is molten.
Circle the correct answers.

The | electrons / molecules / ions | in the molten lead(II) bromide

are | charged / delocalised / free to move | and carry the | charge / liquid / compound | .

[3]

(c) Complete the table below which shows the products of electrolysis of molten lead(II) bromide and of molten lithium chloride.

electrolyte	**products**	
	at the anode	**at the cathode**
lead(II) bromide		
lithium chloride		lithium

[3]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

9 The solubility of a substance is defined as the maximum mass of a substance which will dissolve in 100 g of water at a given temperature.

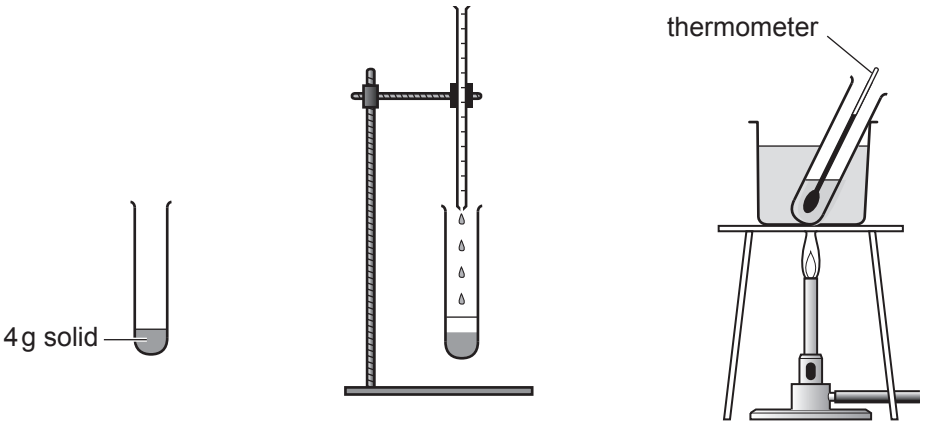
(a) Why is it essential to state the **temperature of the water** when giving the solubility of a substance?

_____

_____ [1]

(b) The first three steps in an investigation to find the solubility of a solid in water at different temperatures are shown in the diagrams below.

Complete the instructions which set out the seven practical steps needed to carry out the investigation.



Step 1 **Step 2** **Step 3**

Step 1 Place 4 g of solid into a boiling tube.

Step 2 Add _____

_____ [2]

Step 3 Place the boiling tube into a water bath and heat until all the solid has dissolved.

Step 4 Remove the boiling tube from the water bath and then wait

until _____

_____ [1]

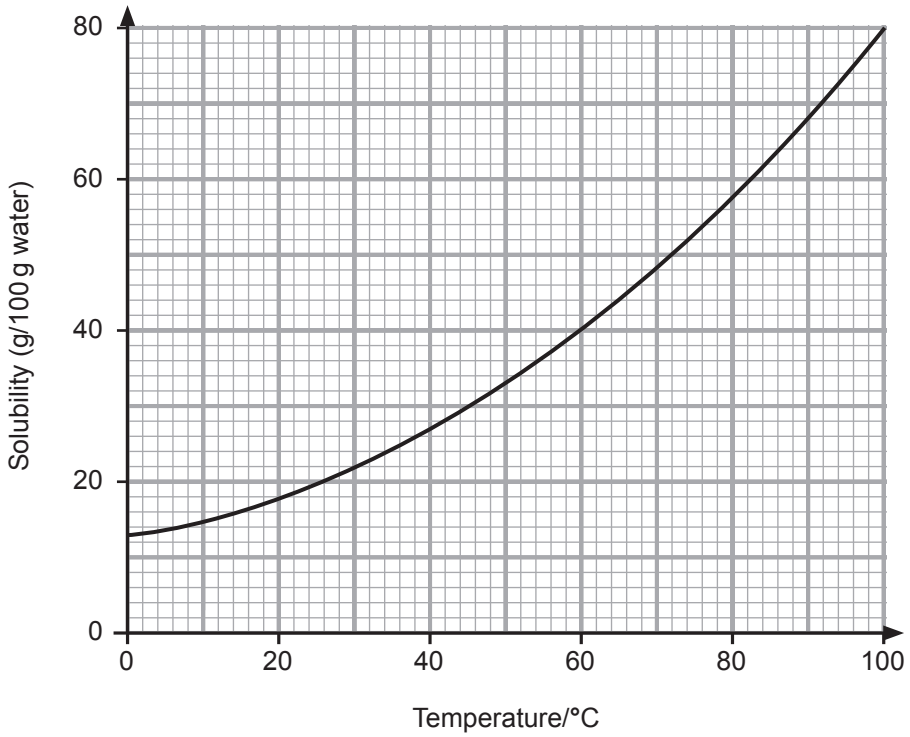
Step 5 Record the temperature.

Step 6 Add _____

_____ [2]

Step 7 Repeat steps 3 to 6 five times.

(c) Use the solubility curve for copper(II) sulfate shown below to answer the questions which follow.



(i) What is the solubility of copper(II) sulfate at 60 °C?

_____ g/100 g H_2O [1]

(ii) State whether the following mixture contains a **saturated** or **unsaturated** solution and explain your answer.

Mixture: 18 g of copper(II) sulfate added to 50 g of water at 40 °C.

Saturated or unsaturated? _____

Explanation: _____

_____

_____ [3]

Examiner Only

Marks	Remark

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Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

THURSDAY 13 NOVEMBER 2014, MORNING

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions

Introduction

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It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

				AVAILABLE MARKS
1	(a)	Any **2** from: aluminium/copper/magnesium 2 × [1]	[2]	
	(b)	**(i)** graphite	[1]	
		(ii) magnesium	[1]	
		(iii) copper	[1]	
		(iv) diamond	[1]	
	(c)	Al	[1]	
	(d)	an alloy is a **mixture** [1] of elements at least one of which is a **metal** [1]	[2]	9
2	(a)	solid [1] gas [1] liquid [1]	[3]	
	(b)	dark grey (solid) **or** grey-black **or** black [1] purple vapour [1] which reform crystals on the watch glass [1]	[3]	
	(c)	halogens	[1]	7
3	(a)	an element contains (only) one type of atom **or** an element cannot be broken into anything **simpler** (by chemical means)	[1]	
	(b)	can be compressed [1] takes the volume of the container it is in [1]	[2]	
	(c)		[1]	
	(d)	**(i)** H_2	[1]	
		(ii) correct sharing [1] correct no of electrons (dependent on first mark) [1] dot and cross notation [1]	[3]	8

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					AVAILABLE MARKS
4	**(a)**	**(i)**	diagram of recognisable assembled apparatus filter paper, filter funnel, test-tube – test tube is essential as mentioned in the question = 1 mark 3 apparatus labels = 2 2 or 1 apparatus label = 1 apply cm to container label if apparatus mark lost, e.g. if conical flask drawn and labelled	[3]	
		(ii)	filtrate labelled correctly as liquid in test-tube	[1]	
	(b)	**(i)**	universal indicator	[1]	
		(ii)	**blue** litmus	[1]	
		(iii)	(add universal indicator) observe colour [1] compare to a (standard colour) chart [1]	[2]	
	(c)		candidates must recognise • an acid pH • pH meter gives accurate readings to 2 decimal places pH 5 = [1] pH 5.34 = [2]	[2]	10
5	**(a)**		in order of increasing atomic mass	[1]	
	(b)		chemical	[1]	
	(c)		he left gaps for undiscovered elements [1] there were no noble gases [1]	[2]	4
6	**(a)**		magnesium fluoride	[1]	
	(b)		correct direction of transfer of electrons [1] one magnesium atom loses 2 electrons [1] two fluorine atoms each gain 1 electron. [1]	[3]	
	(c)		ions	[1]	5

7 Indicative content

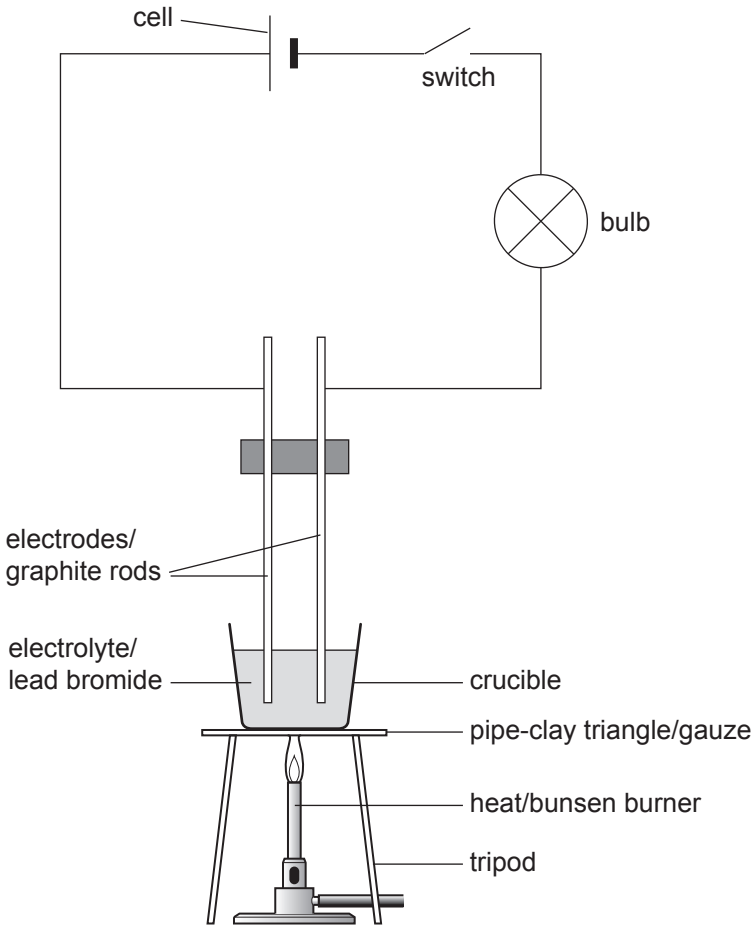
- Anhydrous
- Copper(II) sulfate (OR Cobalt(II) chloride (paper))
- White (OR blue)
- Blue (in water) (OR pink (in water))
- Test boiling point/freezing point
- If BP = 100 °C/freezing point = 0 °C (liquid is water)

Band	Response	Mark
A	Candidates make reference to 5–6 of the main points above to describe good tests to find out which liquid is water. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates make reference to 3–4 of the main points above to describe test(s) to find out which liquid is water. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates make reference to 1–2 of the main points above using limited spelling, punctuation and grammar. The form and style are of limited standard and they have made no use of specialist terms.	[1]–[2]
D	Candidates make no reference to the main points and offer no other suitable response.	[0]

AVAILABLE MARKS

6

8 (a)



recognisable electrical circuit (bulb and switch not required but rods essential) [1]
crucible with substance [1] rods dipping into lead bromide (thus connecting substance to circuit) [1]
method of heating below crucible [1]
3 labels [1]
5 or more labels [2] (graphite rods/electrodes/1 label, label anode and cathode/2 labels)
ANY [5] out of [6] [5]

(b) ions [1]
free to move [1]
charge [1] [3]

(c) $PbBr_2$ at the anode brom**ine** [1]
at the cathode lead [1]
LiCl at the cathode chlor**ine** [1] [3]

AVAILABLE MARKS

11

			AVAILABLE MARKS
9	**(a)**	solubility changes with temperature [1]	
	(b)	step 2 (add) a known volume [1] of water [1] Max 20 cm^3 step 4 (wait until) crystals form [1] step 6 (add) another known volume [1] of water [1] accept or another known mass [1] of solid [1] no credit if both water and solid added [5]	
	(c) **(i)**	40 [1]	
	(ii)	Saturated [1] 100 g of water is saturated when 27 g of solid is added [1]; idea that 50 g is saturated when 13.5 g of solid is added **or** idea that there would be 36 g of $CUSO_4$ added to 100 g of water [1] [3]	10
		Total	**70**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

GSD21

THURSDAY 15 MAY 2014, 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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **5**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

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1 A list of substances and their uses is given below.
Draw a line from each substance to the correct use.

Substance	Use
anhydrous copper sulfate	chemical test for water
magnesium	test for an alkali
blue litmus paper	test for an acid
copper	cutting tool
diamond	high strength alloys for aircraft
	electrical wiring

[5]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

2 Iodine is a solid at room temperature. It changes to a gas when heated.

(a) What is the name given to the change of state from solid to gas?

_____ [1]

(b) Complete the table below by choosing **one** other property of solid iodine and **one** other property of iodine gas.
Place a tick (✓) in both of the correct places in the table.

Property	Iodine	
	Solid	**Gas**
has a fixed shape	✓	
takes the shape of the bottom of the container		
takes the volume and shape of the container		
can be compressed easily		✓
cannot be compressed easily		

[2]

(c) Name the Group in the Periodic Table where iodine is placed.

_____ [1]

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Examiner Only	
Marks	Remark

3 Hydrated copper(II) sulfate is added to a beaker of water and stirred until some solid copper(II) sulfate remains at the bottom of the beaker.

(a) What colour is hydrated copper(II) sulfate?

_____ [1]

(b) Explain what is meant by the term **hydrated**.

_____ [1]

(c) Draw a labelled diagram with assembled apparatus to show how the solid copper(II) sulfate, which is left at the bottom of the beaker, is separated from the solution.

[4]

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Examiner Only	
Marks	Remark

4 When electricity is passed through water containing some acid, the water decomposes (breaks down) to form the gases hydrogen and oxygen.

(a) What is the name given to the process of decomposing a compound using electricity?

_____ [1]

(b) **Balance** the equation below which describes the decomposition of water.

$$2H_2O \rightarrow H_2 + O_2$$

[1]

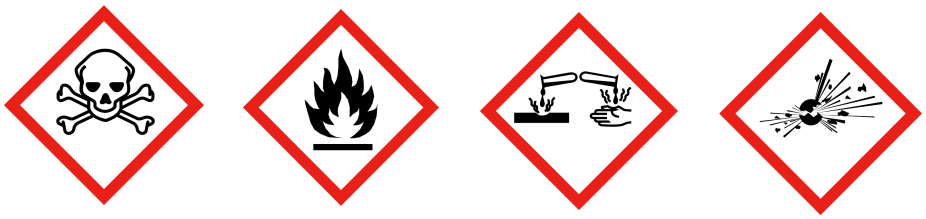
(c) Describe a test for hydrogen gas.

_____

_____

_____ [2]

(d) **(i)** Hydrogen is a **flammable** gas. Which hazard symbol shown below should be placed on a cylinder of hydrogen gas? Circle the correct hazard symbol.



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[1]

(ii) Give two reasons why hazard symbols are important.

1. _____

_____

2. _____

_____ [2]

5 Describe **in words** the structure of an atom of boron whose atomic number is 5.
You may find your Data Leaflet helpful.

Your answer should include the number and position of all of the different types of particles in a boron atom.

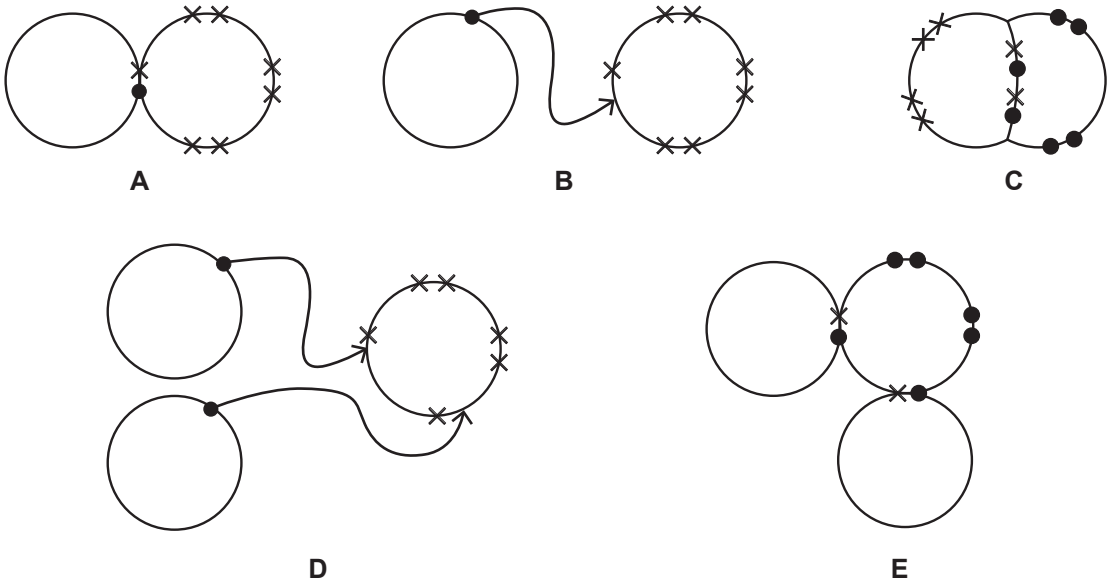
You will be assessed on your written communication skills including the use of specialist science terms.

Examiner Only	
Marks	Remark

[6]

Examiner Only	
Marks	Remark

6 Five bonding diagrams, A–E, are drawn below. **Outer electrons are shown.**



(a) Which diagram, **A**, **B**, **C**, **D** or **E**, is a dot and cross diagram of a substance with one single covalent bond?

_____ [1]

(b) **(i)** Which diagram, **A**, **B**, **C**, **D** or **E**, could show the transfer of electrons between atoms of sodium and oxygen to form the ionic compound sodium oxide?

_____ [1]

(ii) Name the type of particles formed when electrons are **transferred** between atoms. Circle the correct answer in the list below.

neutrons **allotropes** **ions** **isotopes**

[1]

(c) Which diagram, **A**, **B**, **C**, **D** or **E**, could show the covalent bonding between atoms of hydrogen and chlorine in hydrogen chloride?

_____ [1]

(d) Which diagram, **A**, **B**, **C**, **D** or **E**, could show the sharing of electrons in a molecule of oxygen?

_____ [1]

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Examiner Only	
Marks	Remark

7 Potassium is a soft metal which can be cut with a knife. It reacts violently with chlorine to form potassium chloride.

(a) Complete and balance the symbol equation below for the reaction of potassium with chlorine.

$$K \quad + \quad Cl_2 \quad \rightarrow$$

[2]

(b) Describe the appearance of a piece of freshly cut potassium.

_____

_____ [1]

(c) What happens to the freshly cut potassium when it is left in the air for a few minutes?

_____

_____ [1]

(d) Why is potassium stored under oil in the laboratory?

_____

_____ [1]

(e) Before reacting Group 1 elements with water a risk assessment is carried out.
Give two safety precautions, apart from wearing safety glasses, which must be included in the risk assessment.

1. _____

_____

2. _____

_____ [2]

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(f) Equal sized pieces of three Group 1 metals are added to separate troughs of water which contain universal indicator.
The observations made are recorded in the table below.

Name of Group 1 metal	Observation when the metal is added to water	Colour of universal indicator
potassium	• catches fire • burns with a lilac flame on the surface of the water • quickly disappears	• changes colour from green to blue
lithium	• floats • moves about the surface of the water • eventually disappears	• changes colour from green to blue
sodium	• melts into a silvery ball on the surface of the water • disappears	• changes colour from green to blue

Read the information in the table carefully.

(i) What happens to the reactivity of the Group 1 elements as the Group is descended? You may find your Data Leaflet helpful.

_____ [1]

(ii) Explain fully why the universal indicator changed colour from green to blue.

_____

_____

_____

_____ [3]

(iii) Give one more observation which could be added to the table for **all three** reactions.

_____ [1]

(iv) Write a **word** equation to describe the reaction between sodium and water.

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

8 Mendeleev was one of the scientists involved in the development of the Periodic Table.

(a) He placed elements which reacted in a similar way into Groups. Explain what is meant by the term **element**.

_____

_____ [1]

Complete the sentence.

(b) In his Periodic Table, Mendeleev arranged the elements in order of

increasing _____ . [1]

(c) Complete the table below which gives information about two elements in Group 5 of the Periodic Table.

Name	Symbol	Metal/Non-metal
phosphorus		
	Bi	

[2]

(d) Nitrogen is also a Group 5 element. What Period is nitrogen in?

Period _____ [1]

(e) Element X has an electronic configuration 2, 8, 7. Explain why it is **not** an element in Group 5 of the Periodic Table.

_____

_____

_____ [2]

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Examiner Only	
Marks	Remark

9 Magnesium chloride is produced in one type of fire extinguisher by the reaction of acid A and the base, magnesium hydroxide.

(a) Name acid A which reacts with magnesium hydroxide to produce magnesium chloride.

_____ [1]

(b) Suggest a reason why magnesium hydroxide is described as a base and not as an alkali.

_____ [1]

(c) Explain why the reaction between acid A and magnesium hydroxide is a neutralisation reaction.

_____

_____ [1]

Magnesium chloride is also formed by the reaction of magnesium oxide and acid A.

(d) What would you expect to observe when acid A is added to magnesium oxide?

_____

_____ [2]

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(e) A solution of 0.05 mol/dm^3 acid Y was tested using a pH meter and universal indicator paper. The results are recorded in the table below.

Test	Result
pH meter	pH = 3.03
Universal indicator	orange pH = 3

(i) Explain how the colour of universal indicator is used to give a pH value.

_____

_____ [1]

(ii) How do the results show that acid Y is a weak acid?

_____

_____ [1]

(iii) Give one example of a weak acid.

_____ [1]

(iv) Which property of the acid is measured in the units mol/dm^3? Circle the correct answer.

mass **volume** **concentration** **strength**

[1]

Examiner Only

Marks	Remark

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Marks	Remark

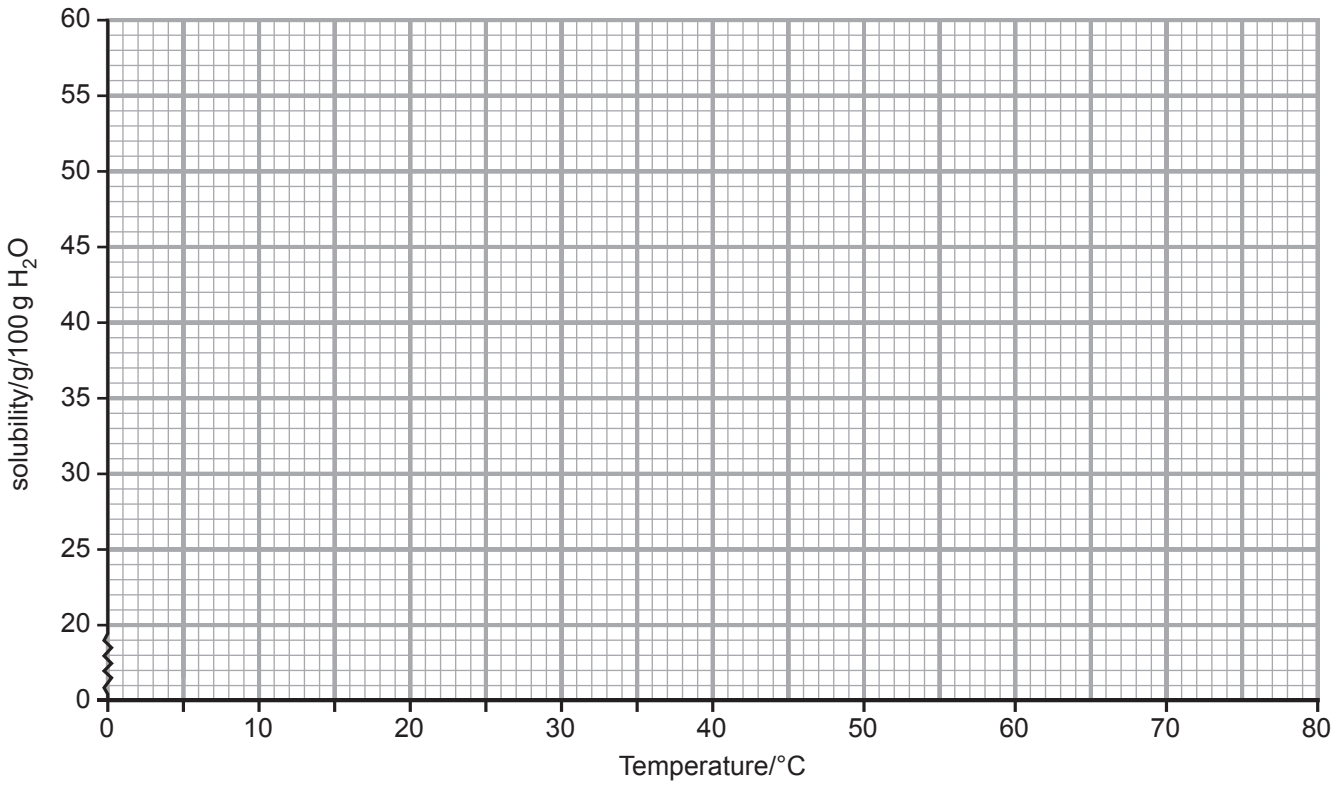
10 (a) An investigation was carried out to find the solubility (g/100 g H_2O) of potassium chloride at different temperatures. The results are given in the table below.

Temperature (°C)	0	10	20	30	40	50	60	80
Solubility (g/100 g H_2O)	27.8	30.9	34.0	37.1	40.0	42.9	45.8	51.2

(i) At 70 °C, 12.1 g of potassium chloride will saturate 25 g of water. Calculate the solubility of potassium chloride at 70 °C.
(You must show your working out.)

_____ g/100 g H_2O [1]

(ii) On the grid below draw the solubility curve for potassium chloride. [3]



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(b) The table below gives the solubility (g/100 g H_2O) at different temperatures for four **solid** compounds, A, B, C and D.

Solid	Solubility (g/100 g H_2O)						
	0 °C	10 °C	20 °C	30 °C	40 °C	60 °C	80 °C
A	60.0	66.7	73.9	81.8	88.7	106.0	132.0
B	12.3	16.4	18.6	25.0	31.6	40.4	49.0
C	0.22	0.24	0.25	0.26	0.26	0.24	0.23
D	79.2	85.4	94.2	105.0	119.0	158.0	187.0

(i) Use the data in the table to complete the following general rule.

For most solids the solubility _____ as the

temperature _____. [1]

(ii) One of the compounds in the table does not follow this solubility rule.
Describe fully what happens to the solubility of this solid as the temperature is increased from 0 °C to 80 °C.

_____

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

THURSDAY 15 MAY 2014, MORNING

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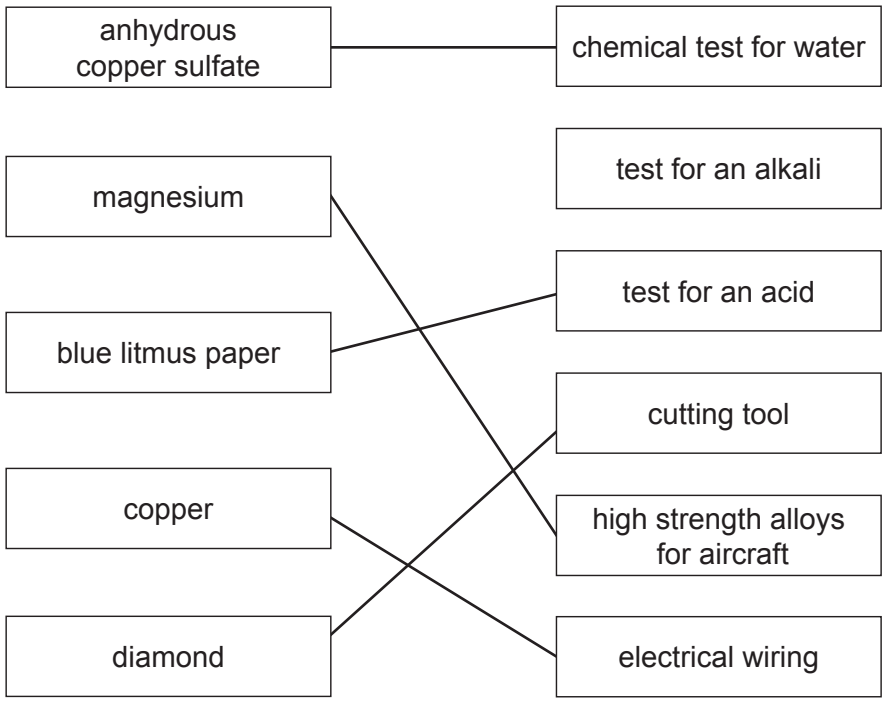
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			AVAILABLE MARKS
1	**Substance**	**Use**	



5 × [1] [5] 5

2 **(a)** sublimation [1]

(b)

Property	Iodine	
	solid	**gas**
has a fixed shape	✓	
takes the shape of the bottom of the container		
takes the volume and shape of the container		✓ [1]
can be compressed easily		✓
cannot be compressed easily	✓ [1]	

[1] mark for each column [2]

(c) Halogens or Group 7 [1] 4

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				AVAILABLE MARKS
3	**(a)**	blue	[1]	
	(b)	contains water of crystallisation	[1]	
	(c)	• filter paper • filter funnel • suitable container, e.g. conical flask/beaker – as part of filtration apparatus • liquid in flask/beaker • solid in filter paper 5 apparatus/diagram points = [3] 3 or 4 apparatus/diagram points = [2] 2 apparatus/diagram points = [1] 3 or more labels = [1]	[4]	6
4	**(a)**	electrolysis	[1]	
	(b)	$2H_2O \rightarrow \mathbf{2}H_2 + O_2$	[1]	
	(c)	apply a lighted splint [1] It burns with a pop [1]	[2]	
	(d)	**(i)** 	[1]	
		(ii) Any **two** from: • can warn of danger • eye-catching • can be understood if you cannot read • can be understood if you do not speak the language • internationally agreed 2 × [1]	[2]	7

AVAILABLE MARKS

5 **Indicative content**

- protons
- electrons
- neutrons
- **5** protons
- **5** electrons
- **6** neutrons
- protons in nucleus
- neutrons in nucleus
- electrons in shells
- electronic configuration 2,3

Response	Mark
Candidates make reference to **8–10** of the main points above to describe the structure of an atom of boron. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates make reference to **5–7** of the main points above to describe the structure of an atom of boron. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates make reference to **1–4** of the main points above using limited spelling, punctuation and grammar. The form and style are of a limited standard and they have made no use of specialist terms.	[1–2]
Candidates make no reference to the main points/and offer no other suitable response.	[0]

[6] 6

6 **(a)** A [1]

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

(ii) ions [1]

(c) A [1]

(d) C [1] 5

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			AVAILABLE MARKS
7	**(a)**	**2**K + Cl_2 → **2KCl** [1] mark for formula of product [1] mark for balancing [2]	
	(b)	cut surface is shiny or similar, e.g. Accept silver/silvery [1]	
	(c)	tarnishes (quickly)/goes dull Accept idea of reacting unless wrongly qualified [1]	
	(d)	Idea that it reacts with water vapour and/or oxygen/air **Not** just 'it reacts' [1]	
	(e)	any suitable safety precaution **particular to this reaction** except wearing safety goggles • use small piece of metal • use a safety screen • handle with tongs **Not** 'do not handle with fingers' **Not** wear gloves **Not** tying hair back **Not** tucking in tie **Not** wear lab coat • Allow idea of standing well back [2]	
	(f) **(i)**	(as Group 1 is descended) the reactivity increases [1]	
	(ii)	idea that at the beginning the universal indicator is green because it is in a neutral liquid [1] i.e. that liquid/water/solution is neutral the **reaction** produces an alkaline solution [1] clear and explicit that universal indicator is blue in alkaline solution [1] [3]	
	(iii)	idea that a gas is produced/bubbles/fizzing/heat being given out or other correct [1]	
	(iv)	sodium + water → sodium hydroxide [1] + hydrogen [1] Allow [1] if both products correct but no reactants given [2]	14

			AVAILABLE MARKS
8	**(a)**	an element contains only one type of atom/an element cannot be broken down into anything simpler (by chemical means) [1]	
	(b)	(relative) atomic mass **Not** atomic mass number, **Not** mass [1]	
	(c)	<table><tr><th>Name</th><th>Symbol</th><th>Metal/Non-metal</th></tr><tr><td>phosphorus</td><td>P</td><td>non-metal</td></tr><tr><td>bismuth</td><td>Bi</td><td>metal</td></tr></table> 4 correct = [2] 2 or 3 correct = [1] [2]	
	(d)	Period 2 [1]	
	(e)	it has 7 electrons in the outer shell [1] all group 5 elements have 5 electrons in the outer shell [1] **or** i.e. clear and explicit idea that group is determined by number of electrons in outer shell [1] link between 7 electrons and group 7 **or** 5 electrons and group 5 [1] second mark dependent on first [2]	7
9	**(a)**	hydrochloric acid [1]	
	(b)	it is not soluble in water (alkalis are soluble in water) [1]	
	(c)	produces a salt and water (only) **or** idea that hydrogen ions and hydroxide ions form water [1]	
	(d)	idea that MgO disappears [1] allow idea of heat given out [1] colourless solution remains [1] Max. [2] out of [3] [2] **Not** idea of bubbles/fizzing. If idea of gas produced is given Max. mark is [1]	
	(e) **(i)**	idea of comparison on a colour chart [1]	
	(ii)	pH of a weak acid is in the range 3–6/orange colour with universal indicator (indicates a weak acid) Allow simple answers such as pH is 3 (3.03) [1]	
	(iii)	ethanoic acid/vinegar or other correct named weak acid, e.g. citric acid [1]	9
	(iv)	concentration [1]	

				AVAILABLE MARKS
10	**(a)**	**(i)**	12.1 × 4 = 48.4g/100 g H_2O [1]	
		(ii)	7–8 tabulated points correctly drawn = [2] 4–6 points correctly drawn = [1] smooth curve/line [1] [3]	
	(b)	**(i)**	for most solids the solubility **increases** as the temperature **increases** Both needed [1]	
		(ii)	Up to 30 °C the solid becomes more soluble [1] between 30 °C and 40 °C the solubility is constant [1] idea that above 40 °C the solid becomes less soluble [1] Any [2] out of three i.e. Idea of solubility rising then decreasing [1] Reference to temperature(s) needed for both marks [2]	7
			Total	**70**

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

GSD21

TUESDAY 25 FEBRUARY 2014, 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 nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **9(b)**.
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	
8	
9	
Total Marks	

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Examiner Only	
Marks	Remark

1 Some containers of chemicals have labels, called hazard symbols, to warn of risks or dangers.

(a) For **each** of the hazard symbols below **draw a line** from the symbol to the correct risk or danger.

Hazard Symbol	Risk or Danger
	Could poison you
	Could cause skin burns
	Could cause an explosion
	Could cause a fire
	Could cause irritation

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[4]

(b) A student was given a chemical which was in a container labelled with the hazard symbol shown below. The student was asked to find the boiling point of the chemical.



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The instructions were:

Put 15 cm^3 of the chemical into a boiling tube and heat it until it boils. Record the boiling point of the chemical which will be less than 100 °C.

The diagrams below show two different methods of carrying out this experiment.



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Method 1



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Method 2

The student used **Method 2**. Explain why **Method 2** is safer than **Method 1**.

_____

_____

_____

_____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

2 The diagram below shows apparatus used in the laboratory to separate two liquids.



© Jerry Mason / Science Photo Library

Choose words from the list below to complete the sentences which follow.

miscible	**colourless**	**beaker**
immiscible	**filter funnel**	**cooking oil**
separating funnel	**orange juice**	

(a) The liquids shown are described as _____. [1]

(b) The liquid in the bottom layer is water. The liquid in the upper layer could be _____. [1]

(c) The liquid can be run out into a _____. [1]

(d) The apparatus shown is called a _____. [1]

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(Questions continue overleaf)

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3 The table below gives information about some gases in the air.

gas	formula	% by volume in air	boiling point/°C
argon	Ar	0.93	−185
oxygen	O_2	21.0	−183
carbon dioxide	CO_2	0.03	−78
nitrogen	N_2	78.0	−196
neon	Ne	0.005	−246

(a) Use this information to answer the questions that follow.

(i) Which gas in the table is a compound?

_____ [1]

(ii) Which noble gas, in the table, is the most abundant in the air?

_____ [1]

(iii) Which two gases, in the table, are diatomic?

_____ and _____ [1]

(iv) Which gas, in the table, has the highest boiling point?

_____ [1]

Examiner Only

Marks	Remark

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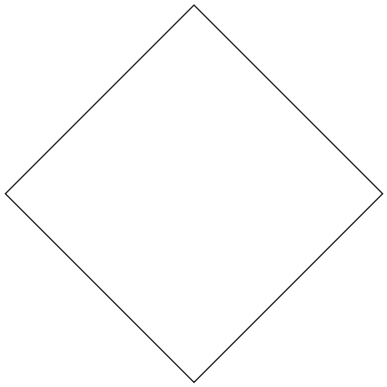
(b) Complete the table below which gives information about some of the Group 7 elements, called the halogens.

element	state at room temperature	colour	formula
chlorine			Cl_2
	liquid	red-brown	
iodine		grey	I_2

[5]

(c) All containers of halogens have a hazard symbol.

In the space below draw the hazard symbol used on containers of halogens.



[1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 **(a)** The list below gives the names of some common laboratory chemicals.

ethanoic acid **sodium hydroxide** **hydrochloric acid**

ammonia **sulfuric acid** **sodium chloride** **potassium sulfate**

Choose, from the list, a chemical which is a:

(i) strong acid _____ [1]

(ii) weak alkali _____ [1]

(iii) weak acid _____ [1]

(b) Complete the sentences below.

(i) All acids dissolve in water to produce _____ ions. [1]

(ii) All alkalis dissolve in water to produce _____ ions. [1]

(c) **(i)** Complete the general word equation for the reaction between an acid and a base.

acid + base → _____ + _____ [2]

(ii) The reaction between an acid and an alkali is described as:

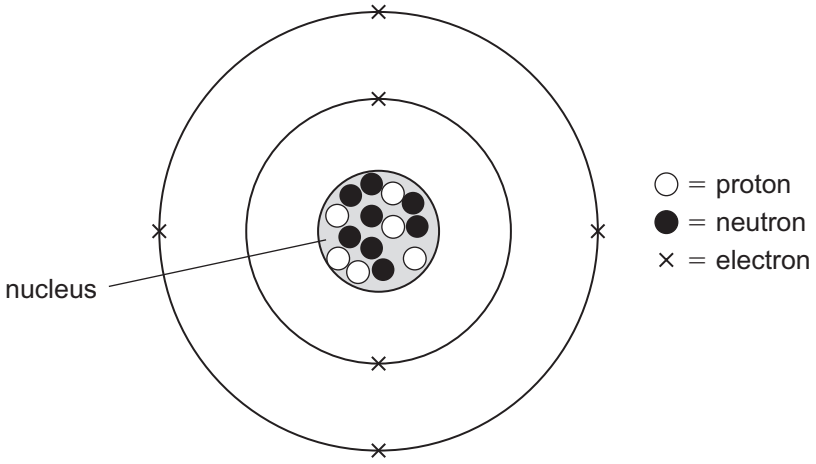
combustion **neutralisation** **electrolysis**

Circle the correct answer. [1]

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Examiner Only	
Marks	Remark

5 All elements are made up of atoms. The diagram below shows the structure of an atom of element **Y**. Use the diagram below to answer the questions that follow.



(a) What is the atomic number of element **Y**?

_____ [1]

(b) Element **Y** is in Period 2 of the Periodic Table. How does the diagram show this?

_____

_____ [1]

(c) How many neutrons are there in the atom of **Y** shown in the diagram?

_____ [1]

Element **Y** has two common isotopes.

(d) **(i)** What are isotopes?

Isotopes are _____

_____

_____ [2]

(ii) The diagram shows **one** of the two common isotopes. What is the relative atomic mass of the isotope shown?

_____ [1]

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6 Solid chemical compounds can be many different colours.

Examiner Only	
Marks	Remark

black **white** **yellow** **red** **green** **blue**

In answering this question each colour may be used once, more than once or not at all.

Choose, from the list, the correct colour of:

sodium chloride _____

hydrated copper(II) sulfate _____

aluminium sulfate _____

copper(II) carbonate _____ [4]

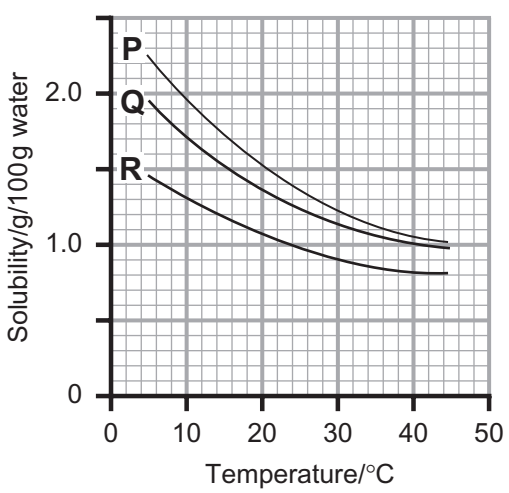
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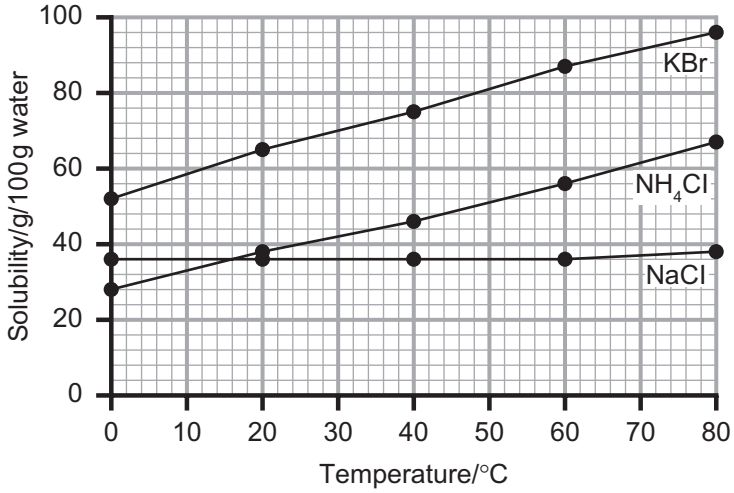
(Questions continue overleaf)

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7 **(a)** Look at the two graphs below showing solubilities.



graph X



graph Y

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Examiner Only	
Marks	Remark

(i) Describe the **trend** in solubility shown by the substances **P**, **Q** and **R** in graph **X**.

_____

_____ [2]

(ii) In what physical state would you expect the substances **P**, **Q** and **R** to be?

_____ [1]

(iii) Describe the **trends** in solubility for the substances in graph **Y**.

_____

_____

_____

_____ [2]

(iv) At what temperature do NaCl and NH_4Cl have the same solubility?

_____ [1]

Read the following passage and answer the questions that follow.

The river Bush is good for salmon fishing. In summer, after a spell of hot weather, heavy rain caused water from a nearby car park to run into the river. This water was warmed by the hot tarmac and it increased the river water temperature by several degrees.

(b) (i) What effect would increased water temperature have on the oxygen levels in the river water?

_____

_____ [1]

(ii) Explain how salmon could be affected if the temperature in the river rises.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

8 Aluminium is combined with small amounts of some other elements to produce a new material called **X**. This new material has improved properties making it tougher and stronger than pure aluminium. It has excellent corrosion resistance and very good resistance to seawater.

The table below gives some information about material **X**.

elements used to make X	% by weight	relative atomic mass
aluminium		27
magnesium	0.8	24
silicon	0.6	28
iron	0.7	56
zinc	0.2	65
copper	0.4	64

(a) Why can **X** be described as an alloy?

_____

_____ [2]

(b) **(i)** Calculate the **total** percentage by weight of all the other elements added to aluminium in this alloy.

_____ [1]

(ii) Calculate the percentage by weight of aluminium in this alloy. Show your working.

_____% [2]

(c) (i) From the information given in the passage opposite and your own knowledge, explain why **X** would be very suitable in the manufacture of aircraft.

_____

_____

_____

_____ [2]

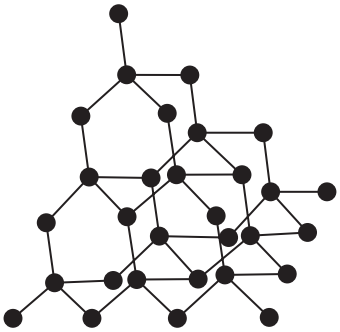
(ii) Suggest another use for **X** based on the information in the passage and the table.

_____ [1]

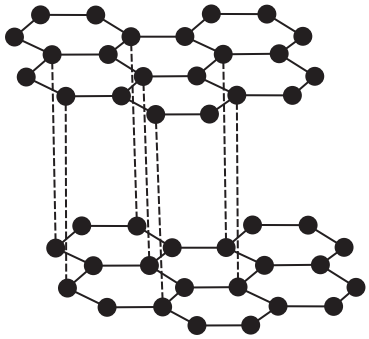
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

9 Two structural models are shown below.



A



B

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(a) (i) Name a substance which has:

Structure **A** _____

Structure **B** _____ [2]

(ii) What do the black dots in the structural models represent?

_____ [1]

In part (b) you will be assessed on your written communication skills including the use of specialist scientific terms.

Examiner Only	
Marks	Remark

(b) Compare and contrast the physical properties of the substances which have structures **A** and **B**.

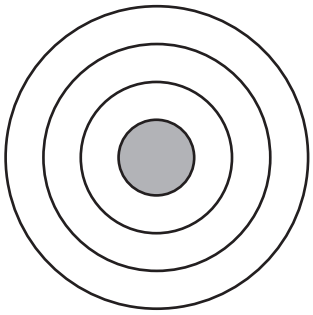
Your answer should include similar physical properties and physical properties which are different.

[6]

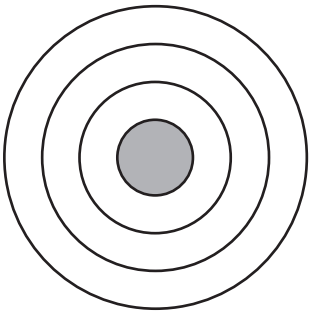
Examiner Only	
Marks	Remark

(c) (i) Sodium reacts with sulfur to form a compound called sodium sulfide.

Complete the diagrams below to show **all** the electrons in a sodium atom and in a sulfur atom.

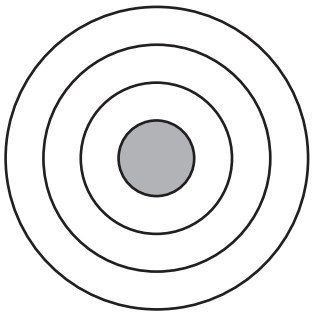


sodium atom

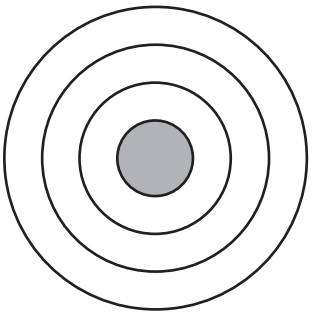


sulfur atom [2]

(ii) In the space below draw diagrams to show **all** the electrons in a sodium ion and in a sulfide ion.



sodium ion



sulfide ion [2]

(iii) How are the ions held together in sodium sulfide?

_____ [1]

(iv) What is the chemical formula for sodium sulfide?

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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114853

Rewarding Learning

General Certificate of Secondary Education
2013–2014

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

TUESDAY 25 FEBRUARY 2014, MORNING

MARK SCHEME

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General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

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		AVAILABLE MARKS
1	**(a)** In order of hazard symbols could cause skin burns [1] could poison you [1] could cause irritation [1] could cause an explosion [1] [4]	
	(b) Chemical C is flammable [1] idea that in method A it could catch fire [1] [2]	6
2	**(a)** immiscible (accept colourless) [1]	
	(b) cooking oil [1]	
	(c) beaker [1]	
	(d) separating funnel [1]	4
3	**(a)** **(i)** carbon dioxide [1]	
	(ii) argon [1]	
	(iii) oxygen and nitrogen [1]	
	(iv) carbon dioxide [1]	

(b)

element	state at room temperature	colour	formula
chlorine	**gas** [1]	**greenish-yellow*** [1]	Cl_2
bromine [1]	liquid	red-brown	**Br_2** [1]
iodine	**solid** [1]	grey	I_2

*accept green

[5]

	(c) toxic hazard symbol [1]	10
4	**(a)** **(i)** hydrochloric or sulfuric [1]	
	(ii) ammonia [1]	
	(iii) ethanoic acid [1]	
	(b) **(i)** hydrogen/H^+ [1]	
	(ii) hydroxide/OH^- [1]	
	(c) **(i)** salt [1] + water [1] [2]	
	(ii) neutralisation [1]	8

				AVAILABLE MARKS
5	**(a)**	6	[1]	
	(b)	it has two (electron) shells	[1]	
	(c)	8 (neutrons)	[1]	
	(d) **(i)**	atoms with same atomic number/same number of protons [1] and different atomic mass/different number of neutrons [1]	[2]	
	(ii)	14	[1]	6
6	sodium chloride – white [1] hydrated copper(II) sulfate – blue [1] aluminium sulfate – white [1] copper(II) carbonate – green [1]		[4]	4
7	**(a)** **(i)**	They (all) decrease in solubility [1] as the temperature rises [1] second mark dependent on first; idea of negative correlation, unqualified gains [1]	[2]	
	(ii)	gases	[1]	
	(iii)	They increase in solubility with temperature [1] NaCl stays the same or increases only slightly with temperature [1]	[2]	
	(iv)	16° C ± 0.5 units needed	[1]	
	(b) **(i)**	oxygen levels decrease	[1]	
	(ii)	salmon depend on oxygen for breathing/respiration [1] they will have less energy/could die [1]	[2]	9
8	**(a)**	Metal X is a mixture of more than two elements [1] it includes metal elements [1]	[2]	
	(b) **(i)**	addition of all other elements = 2.7%	[1]	
	(ii)	100 – 2.7 [1] e.c.f. 97.3% [1] (for correct method but wrong answer award [1])	[2]	
	(c) **(i)**	good corrosion resistance/stronger or any suitable [1] low atomic mass/lighter [1]	[2]	
	(ii)	ships, cars, any suitable linked to properties given in the passage and the table	[1]	8

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		AVAILABLE MARKS
9 **(a)** **(i)** A – diamond [1] B – graphite [1] [2]		
(ii) (carbon) atoms [1]		
(b) **Indicative content** Compare ● High melting point for diamond ● High melting point for graphite ● Insolubility in water ● Solids Contrast ● Graphite conducts electricity ● Diamond does not ● Diamonds hard ● Graphite soft Or other correct		

Band	Response	Mark
A	Candidates use 5 or more indicative points above to describe the properties of both diamond and graphite. They use appropriate specialist terms and the spelling, punctuation and grammar and form and style are of a good standard.	[5]–[6]
B	Candidates use 3–4 indicative points above to describe the properties of diamond and graphite. They use appropriate specialist terms and the spelling, punctuation and grammar and form and style are of a satisfactory standard.	[3]–[4]
C	Candidates make reference to 1–2 indicative points above using limited spelling, punctuation and grammar and the form and style are of limited standard and they have made no use of specialist terms.	[1]–[2]
D	Candidates make no reference to the points above and offer no other suitable response.	[0]

[6]

(c) **(i)** sodium 2,8,1 arrangement [1] sulfur 2,8,6 arrangement [1] [2]		
(ii) correct sodium ion 2,8 arrangement [1] correct sulfide ion 2,8,8 arrangement [1] [2]		
(iii) electrostatic attraction/forces of attraction between oppositely charged ions [1]		
(iv) Na_2S [1]		15
	Total	**70**

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2013–2014

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

GSD21

THURSDAY 14 NOVEMBER 2013, 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 nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **4(d)**.
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	
8	
9	
Total Marks	

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Examiner Only	
Marks	Remark

1 Sodium is a soft metal which is easily cut with a knife.

(a) How is sodium stored in the laboratory?

_____ [1]

(b) Describe the appearance of the surface of a piece of freshly cut sodium.

_____ [1]

(c) What happens to the freshly cut surface if the piece of sodium is left in the air?

_____ [2]

To demonstrate the reaction of sodium with water a **small** piece of sodium is placed into the water using **tongs**.

(d) Suggest why it is safer to:

(i) use a small piece of sodium rather than a large piece

_____

_____ [1]

(ii) lift the sodium with tongs rather than handle it using your fingers.

_____

_____ [1]

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2 The table below contains definitions of five different chemical terms.

Complete the table by choosing a chemical term from the list below which matches each definition.

hydrated	**immiscible**	**distillate**	**solute**
miscible	**insoluble**	**solvent**	**residue**

Definition	Chemical term
a liquid which will dissolve a solid	
a solid which will not dissolve in water	
liquids which do not mix but form a series of layers	
the solid left after a mixture of a solid and a liquid is filtered	
a liquid which has been condensed from a vapour during distillation	

[5]

Examiner Only	
Marks	Remark

3 A method to find out the boiling point of water is given below.

- Measure 150 cm^3 of water
- Pour the water into a 250 cm^3 beaker
- Heat the beaker using a Bunsen burner
- Record the temperature when the water boils.

(a) Draw a labelled diagram of the assembled apparatus used to boil the water and record the temperature.

[5]

(b) Name a piece of apparatus which can be used to measure 150 cm^3 of water.

_____ [1]

Water contains some dissolved oxygen.

(c) What happens to the dissolved oxygen as the water is heated?

_____

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

4 Rock salt is a mixture of sodium chloride (salt) and sand.

(a) What is the chemical formula of sodium chloride?

_____ [1]

(b) Describe the appearance of pure dry sodium chloride.

_____ [2]

(c) Why is sodium chloride described as a compound?

_____

_____ [2]

In part (d) you will be assessed on your written communication skills including the use of specialist scientific terms.

(d) Describe the practical steps you would take to

(i) separate a mixture of sodium chloride and sand

(ii) obtain a dry sample of sodium chloride

- You should mention the apparatus used in each step.

_____

_____

_____

_____

_____

_____

_____

_____

_____

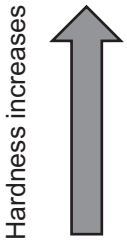
_____

_____ [6]

Examiner Only	
Marks	Remark

5 Jewellery is generally made from gold alloys rather than pure gold.

The table below gives some information about different gold alloys and pure gold.

Alloy	% gold	% other metals e.g. copper, silver, nickel	Price per gram /£	Hardness
9 carat	37.5	62.5	13	
14 carat	58.3	41.7	20	
18 carat	75.0	25.0	26	
22 carat	91.6	8.4	31	
24 carat pure gold	100.0	0.0	35	

(a) Use the information in the table to explain why 9 carat gold is an alloy.

_____

_____ [2]

(b) Use the information in the table to suggest two reasons why jewellery is **not** made from pure gold.

1. _____ [1]

2. _____ [1]

(c) **(i)** Write chemical **symbols** for the four metals copper, silver, nickel and gold.

copper _____

silver _____

nickel _____

gold _____ [2]

(ii) Name the area of the Periodic Table where these four metals are found.

_____ [1]

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Examiner Only	
Marks	Remark

6 Aluminium is produced on an industrial scale by the electrolysis of aluminium oxide.

(a) Balance the symbol equation below which shows how aluminium is formed from aluminium oxide.

$$Al_2O_3 \rightarrow Al + O_2$$ [2]

(b) Name the electrode at which aluminium is produced during the electrolysis of aluminium oxide.

_____ [1]

(c) Complete the definition of electrolysis by choosing one word from each box. Put a circle round the correct word in each box.

Electrolysis is the | decomposition / production / evaporation | of a | solid / liquid / gas | compound using | heat. / chemicals. / electricity. |

[3]

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Examiner Only	
Marks	Remark

7 The balanced symbol equation below includes state symbols.

$$K_2CO_{3\,(s)} + 2\,HCl_{(aq)} \rightarrow 2\,KCl_{(aq)} + H_2O_{(l)} + CO_{2\,(g)}$$

Look at the equation carefully and answer the questions which follow.

(a) **Name** the product which is dissolved in water.

_____ [1]

(b) **Name** the solid reactant.

_____ [1]

(c) Suggest two observations which can be made when the reactants are added together.

1. _____ [1]

2. _____ [1]

(d) Complete the table below to give information about the elements present in a substance which has the formula K_2CO_3.

Name of element	Number of atoms of the element in the formula

[3]

8 This question is about atomic structure.

Examiner Only

Marks	Remark

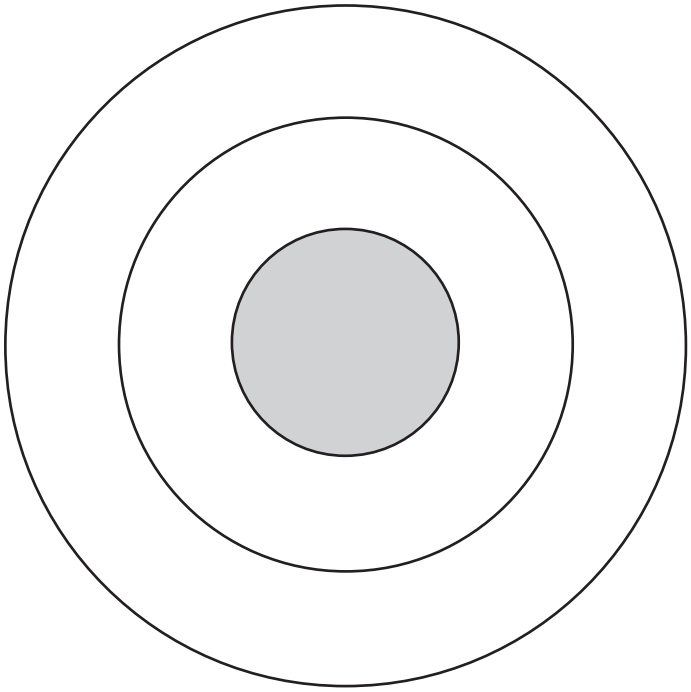
(a) Complete the table to show the relative charge and mass of the different particles found in an atom.

Particle	Relative charge	Relative mass
electron		
proton		
neutron		

[3]

Carbon-12 ($^{12}_{6}C$) atoms have 6 electrons, 6 protons and 6 neutrons.

(b) Draw **a labelled** diagram of an atom of carbon-12 ($^{12}_{6}C$) to show the **position** and **number** of the electrons, protons and neutrons in the atom.



[4]

(c) Carbon-14 ($^{14}_{6}C$) and carbon-12 ($^{12}_{6}C$) are isotopes of carbon.

Compare, in terms of the particles in the atoms, an atom of carbon-14 ($^{14}_{6}C$) with an atom of carbon-12 ($^{12}_{6}C$).

[3]

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Examiner Only	
Marks	Remark

9 By the 1860s chemists had discovered about 60 elements and were attempting to organise them by looking for patterns. Today, over 100 elements are known and they are arranged in a particular way in the modern Periodic Table.

(a) Explain what is meant by the term element.

_____

_____

_____ [1]

(b) One suggested pattern was called "The Law of Octaves".

(i) Name the chemist who developed "The Law of Octaves".

_____ [1]

(ii) Complete the sentence to explain what is meant by "The Law of Octaves".

When elements are arranged in order of their _____

every eighth element has _____ [2]

(c) In what order are the elements arranged in the modern Periodic Table?

_____ [1]

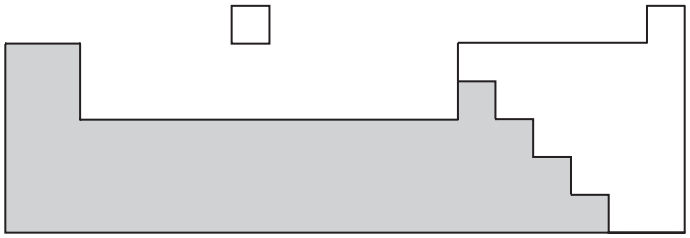
(d) What names are given to the rows and columns of elements in the modern Periodic Table?

(i) rows _____ [1]

(ii) columns _____ [1]

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(e) The diagram below shows an outline of part of the modern Periodic Table with a shaded area.



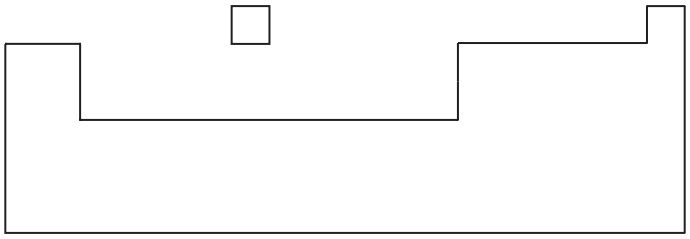
The elements in the shaded area in the diagram have similar physical properties. Give two physical properties of the elements in this area.

1. _____ [1]

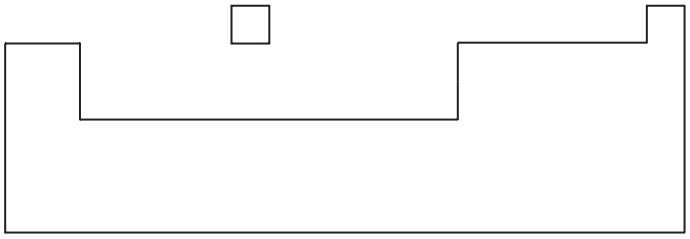
2. _____ [1]

(f) On the outlines of the Periodic Tables below shade in the area where the:

(i) halogens can be found.



(ii) alkaline earth metals can be found.



[2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only

Marks	Remark

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Rewarding Learning

General Certificate of Secondary Education
2013–2014

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

THURSDAY 14 NOVEMBER 2013, MORNING

MARK SCHEME

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General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

	AVAILABLE MARKS

1 **(a)** Sodium is stored under oil. [1]

(b) The freshly cut surface is shiny. [1]

(c) Idea that it tarnishes [1] quickly [1] [2]

(d) **(i)** Idea that sodium is very reactive **not** idea of danger unqualified [1]

(ii) Idea that sodium will react with the moisture on your hands or idea of qualified harm/danger e.g. burning . . . or tongs prevents above [1] — 6

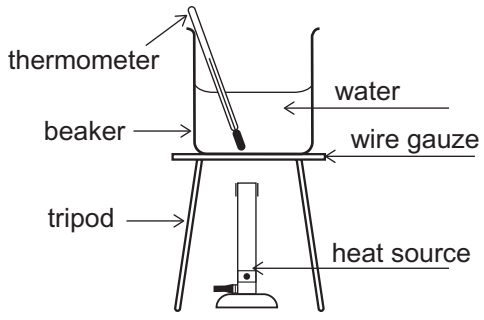
2

Chemical Term	
solvent	[1]
insoluble	[1]
immiscible	[1]
residue	[1]
distillate	[1]

5

3 **(a)** Beaker with water + thermometer [1]
Tripod with gauze [1]
Heat source [1]
4 or more labels [2]

(Award [1] for 2 or 3 labels
If heat source is arrowed with 'heat' this does not count as a label) [5]



(b) measuring cylinder [1]

(c) idea that oxygen leaves the water [1] — 7

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4 **(a)** NaCl [1]

(b) white [1] crystals/solid [1] *not* powder [2]

(c) idea that it contains two elements [1] which are (chemically) combined [1] [2]

(d) **Indicative content**

- place in a suitable container
- add water
- stir (with a stirring rod)
- filter (the sand from the water)
- using filter paper and a filter funnel
- evaporate (the filtrate)
- using an evaporating dish and a Bunsen burner

Response	Mark
Candidates must use appropriate specialist terms throughout to describe how a dry sample of sodium chloride can be obtained from the mixture in a logical sequence, using 6 or 7 of the indicative points. They use good spelling, punctuation and grammar and the form and style are of a high standard.	5–6
Candidates use 4 or 5 of the indicative points to describe how a sample of sodium chloride can be separated from the mixture in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	3–4
Candidates make reference to 1–3 of the indicative points using limited spelling, punctuation and grammar. The form and style is of limited standard and they have made no use of specialist terms.	1–2
Candidates make no reference to the main points above and offer no other suitable response.	0

[6]

AVAILABLE MARKS

11

			AVAILABLE MARKS
5	**(a)**	idea that 9 carat gold is a *mixture* [1] of (at least two) metals [1] [2]	
	(b)	idea that pure gold is the most expensive option [1] idea that pure gold is a very soft material (and would not be hardwearing enough for jewellery) [1] [2]	
	(c)	**(i)** two correct symbols [1], four correct [2] copper Cu silver Ag nickel Ni gold Au [2]	
		(ii) transition metals allow d block [1]	7
6	**(a)**	$2Al_2O_3 \rightarrow 4Al + 3O_2$ [1] [1] [2]	
	(b)	cathode [1]	
	(c)	electrolysis is the **decomposition** [1] of **a liquid** [1] compound using **electricity** [1] [3]	6
7	**(a)**	potassium chloride [1]	
	(b)	potassium carbonate apply cm [1]	
	(c)	idea that solid disappears/dissolves [1] bubbles/fizzing [1] heat given off [1] *colourless* solution formed [1] any two [2]	
	(d)		

Name of element	Number of atoms of the element in the formula
potassium	2
carbon	1
oxygen	3

[3] 7

6 correct = [3]; 4 or 5 correct = [2]; 2 or 3 correct = [1]
Number of atoms depends on correct element

8 **(a)**

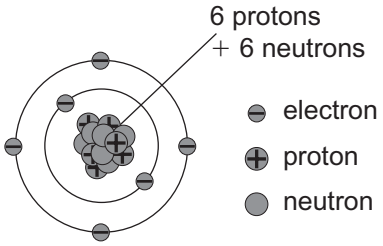
Particle	Relative charge	Relative mass
electron	–1	(almost) 0*
proton	+1	1
neutron	0	1

[3]

*allow $\frac{1}{1800} - \frac{1}{2000}$

6 correct = [3], 4 or 5 correct = [2], 2 or 3 correct = [1]

(b) electrons in shells 2,4 [1]
6 protons and 6 neutrons [1]
in the nucleus [1]
2 or 3 labels [1]



Carbon atom

[4]

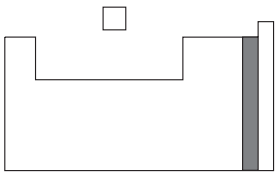
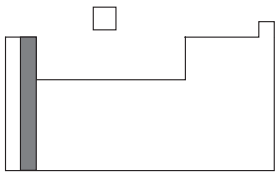
(c) idea that each atom has 6 electrons and 6 protons/same number of protons and electrons [1]
carbon–14 has more neutrons or carbon–12 has fewer neutrons [1]
carbon–14 has 2 (more neutrons) or carbon–12 has 2 (fewer neutrons) [1]

[3]

AVAILABLE MARKS

10

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		AVAILABLE MARKS
9	**(a)** an element is a substance which has only one type of atom/ cannot be broken down into anything simpler (by chemical means) [1]	
	(b) **(i)** (John) Newlands [1]	
	(ii) When elements are arranged in order of (relative) **atomic mass** [1] (**NOT** *mass number)*/every 8th element has **similar properties** [1]. [2]	
	(c) atomic number [1]	
	(d) **(i)** periods [1]	
	(ii) groups (apply cm) [1]	
	(e) any 2 suitable general physical properties of a metal e.g. conduct heat, conduct electricity, ductile, malleable, sonorous, high melting point, shiny *NOT* hard, NOT dense, *NOT* solid, *NOT* high B.P. [2]	
	(f) **(i)**  halogens [1] **(ii)**  alkaline earth metals [1] [2]	11
	Total	**70**

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

GSD21

MONDAY 20 MAY 2013, AFTERNOON

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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **10(b)**.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

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Examiner Only	
Marks	Remark

1 The four hazard symbols, A, B, C and D below are used on bottles of chemicals to warn of danger.



A B C D

(a) Give two other reasons why hazard symbols are useful.

1. _____

_____

2. _____

_____ [2]

(b) Which hazard symbol, A, B, C, or D would you find on a bottle containing a

(i) chemical which is corrosive? _____

(ii) chemical which is explosive? _____ [2]

(c) In the diamond below draw the general hazard symbol you would expect to see on a bottle containing a chemical which needs to be handled with caution.

[1]

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2 **(a)** Complete the table below to show the colour of universal indicator and the pH of three solutions.

Solution	Colour of universal indicator	pH
lemon juice	orange	
baking soda solution		9
cleaning fluid	purple	

[3]

(b) From the table choose a solution which is:

(i) a weak acid _____ [1]

(ii) a weak alkali _____ [1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

3 Iodine is an element in Group 7 of the Periodic Table.

(a) What is the name given to Group 7 elements? Circle the correct answer.

alkali metals	halogens	noble gases	transition metals

[1]

(b) Choose **two** words from the list below which best describe iodine at room temperature. Circle the correct answers.

dark grey	liquid	red-brown
green	gas	solid

[2]

Iodine exists as diatomic molecules.

(c) What is the formula of iodine? _____ [1]

Iodine reacts with sodium to form a white crystalline solid.

(d) Name the white crystalline solid and give its formula.

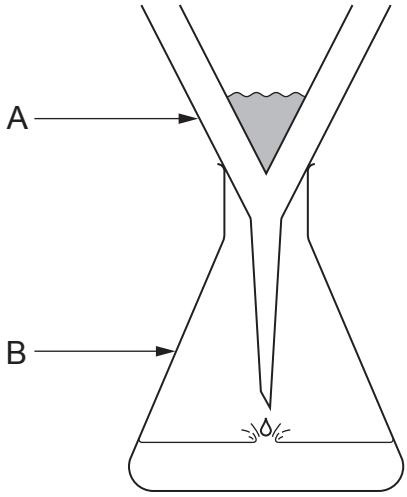
name _____

formula _____ [2]

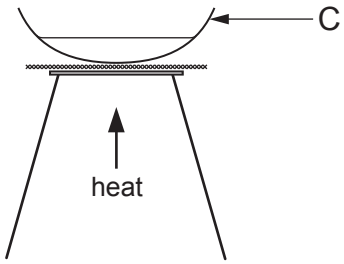
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Examiner Only	
Marks	Remark

4 Salt can be obtained from a mixture of sand, salt and water by filtration followed by evaporation as shown in the diagrams below.



filtration



evaporation

(a) Name the pieces of apparatus A, B and C.

A _____

B _____

C _____ [3]

(b) On the filtration diagram above label the **filtrate** and the **residue**. [2]

(c) Name a piece of apparatus which could be used to provide the heat.

_____ [1]

(d) Why can copper(II) sulfate **not** be separated from a mixture of copper(II) sulfate and water by filtration?

_____

_____ [1]

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Examiner Only	
Marks	Remark

5 The table below lists the melting points and boiling points of substances A, B, C and D.

Substance	Melting point /°C	Boiling point /°C
A	0	100
B	808	1465
C	114	444
D	–7	59

(a) What is meant by the term **melting point**?

_____

_____ [2]

(b) Which two substances, A, B, C or D, are solids at room temperature (20 °C)?

_____ and _____ [1]

(c) What state is substance D in at 70 °C?

_____ [1]

(d) What is the name given to the change of state from a solid to a gas?

_____ [1]

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Examiner Only	
Marks	Remark

6 **(a)** You may use your Data Leaflet to help you answer this question.

Circle the correct answer.

(i) The element with the symbol **Pd** is:

potassium phosphorus palladium plutonium [1]

(ii) The correct symbol for the aluminium **ion** is:

Al Al^{3+} Al^{+} Al^{3-} [1]

(iii) The compound with the formula $\mathbf{Al_2(SO_4)_3}$ is:

aluminium sulfur oxide aluminium sulfide aluminium sulfate aluminium sulfite [1]

(iv) The formula $\mathbf{Ca(OH)_2}$ means:

2 calcium and 2 hydroxide ions 1 calcium and 2 hydroxide ions 1 calcium, 2 oxygen and 2 hydrogen ions 1 calcium, 1 oxygen and 2 hydrogen ions [1]

(b) Balance the symbol equation below which describes the reaction between sodium oxide and hydrochloric acid.

Na_2O + HCl ⟶ NaCl + H_2O [2]

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Examiner Only	
Marks	Remark

7 **(a)** Select words from the list below to complete the paragraph about the atomic structure of phosphorus.

electrons protons neutrons shells nucleus

Phosphorus has an atomic number of 15. This means it has

15 _____ in each atom.

It has 15 _____ orbiting in _____

around the centre of the atom. [3]

(b) Name the particles with a positive charge found in an atom of phosphorus.

_____ [1]

The mass number of phosphorus is 31.

(c) What other information does this tell you about the atomic structure of phosphorus?

_____ [1]

(d) A molecule of phosphene is formed from one atom of phosphorus and three atoms of hydrogen.

(i) What is the formula of phosphene?

_____ [1]

(ii) Name the type of bonding you would expect phosphene to have.

_____ [1]

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

8 Graphene is an allotrope of carbon. It consists of a single layer of carbon atoms joined together by covalent bonds. It is 200 times stronger than steel. It conducts electricity as efficiently as copper and is a good conductor of heat. It is almost completely transparent with possibly the highest melting point known.

(a) What are **allotropes**? Tick (✓) the correct answer.

Atoms of the same element with a different mass number. ☐

Different forms of the same element in the same physical state. ☐

Two or more atoms held tightly by a covalent bond. ☐ [1]

(b) Explain why graphene is said to be an element.

_____

_____ [1]

(c) Give two pieces of information from the passage which suggest that graphene might be thought to be **metallic**.

1. _____

_____

2. _____

_____ [2]

(d) Give two pieces of information from the passage which suggest graphene might be thought to be **non-metallic**.

1. _____

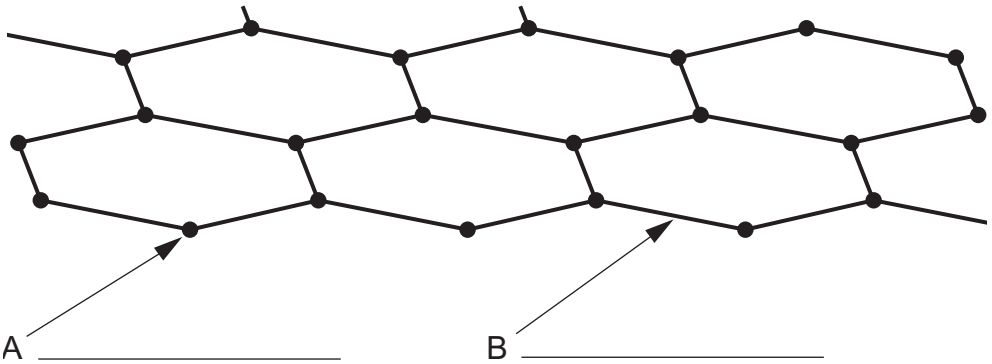
_____

2. _____

_____ [2]

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(e) Using the information in the passage, label A and B in the diagram of graphene below.



A _____ B _____ [2]

(f) Graphene was discovered in 2004. It has many outstanding properties.

Choose one property of graphene from the passage and **suggest** a use based on the property.

property	
use	

[1]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

9 A small piece of sodium metal was added, using tongs, to a trough of water.

(a) How is sodium stored in the laboratory?

_____ [1]

(b) Why was a **small** piece of sodium added to the water?

_____ [1]

(c) Why was the sodium handled with tongs instead of using fingers to lift it?

_____

_____

_____ [2]

(d) Choose **three** statements which describe what happens when sodium is placed into the water.

Put a tick (✓) in the three correct boxes.

bubbles of carbon dioxide gas form	☐	melts into a silvery ball	☐
burns with a lilac flame	☐	sinks to the bottom then floats to the top	☐
moves quickly across the surface of the water	☐	eventually disappears	☐

[3]

(e) In which group of the Periodic Table would you find sodium?

_____ [1]

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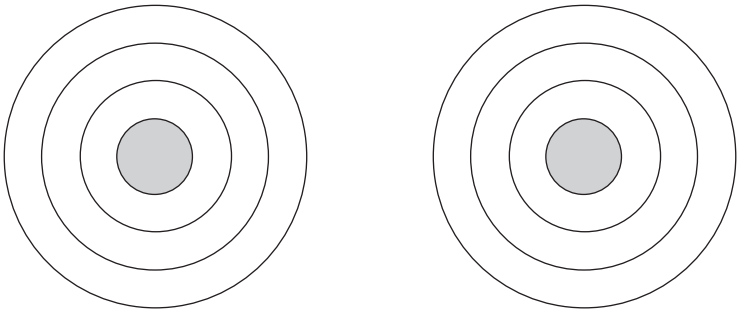
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Examiner Only	
Marks	Remark

10 Hot magnesium metal will burn in chlorine gas to form magnesium chloride.

(a) Complete the diagrams below to show **all** the electrons in a magnesium atom and a chlorine atom.



magnesium atom chlorine atom [2]

In part (b) you will be assessed on your written communication skills including the use of specialist scientific terms.

(b) Explain fully, **in terms of electrons**, how the atoms of magnesium and chlorine react together to form magnesium chloride.

Include in your answer the charges on the ions and an explanation of how the ions are held together in the compound.

[6]

(c) Using a **dot and cross** diagram, draw a molecule of hydrogen.

[2]

(d) Describe a test for hydrogen gas.

_____

_____

_____ [2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

MONDAY 20 MAY 2013, AFTERNOON

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

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			AVAILABLE MARKS
1	**(a)**	idea of eyecatching/can be understood by people who cannot read/can be understood by people who cannot speak language/ internationally agreed *any 2* (not to warn of danger) [2]	
	(b)	**(i)** C	
		(ii) D [2]	
	(c)	 [1]	5
2	**(a)**	any pH in range 3–6 [1] dark green [1] any pH in range 12–14 [1] (accept blue–green) [3]	
	(b)	**(i)** Lemon juice [1]	
		(ii) Baking soda [1]	5
3	**(a)**	halogens [1]	
	(b)	dark grey [1] solid [1] [2]	
	(c)	I_2 **not** I^2 **not** I2 [1]	
	(d)	Sodium iodide [1] Nal [1] [2]	6
4	**(a)**	A filter funnel [1] **not** filter **not** funnel B conical flask [1] **not** flask C evaporating dish [1] allow evaporating basin [3]	
	(b)	Candidates draw an arrow to the liquid in the conical flask and label it the filtrate [1] Candidates draw an arrow to the solid in the filter paper in the filter funnel and label it the residue [1] [2]	
	(c)	Bunsen burner or other suitable named apparatus e.g. hot plate [1]	
	(d)	Copper(II) sulfate is soluble in water [1]	7

			AVAILABLE MARKS
5	**(a)** The temperature [1] at which a solid changes to a liquid [1]	[2]	
	(b) B and C (both needed)	[1]	
	(c) gas	[1]	
	(d) sublimation	[1]	5
6	**(a)** **(i)** Palladium	[1]	
	(ii) Al^{3+}	[1]	
	(iii) Aluminium sulfate	[1]	
	(iv) 1 calcium, 2 hydroxide ions	[1]	
	(b) $Na_2O + 2HCl \longrightarrow 2NaCl + H_2O$ [1] [1]	[2]	6
7	**(a)** protons [1] electrons [1] shells [1] in this order	[3]	
	(b) protons	[1]	
	(c) it has 16 neutrons or idea that it has 31 protons and/plus neutrons	[1]	
	(d) **(i)** PH_3 **not** PH^3, **not** PH3, **not** pH_3	[1]	
	(ii) covalent	[1]	7

AVAILABLE MARKS

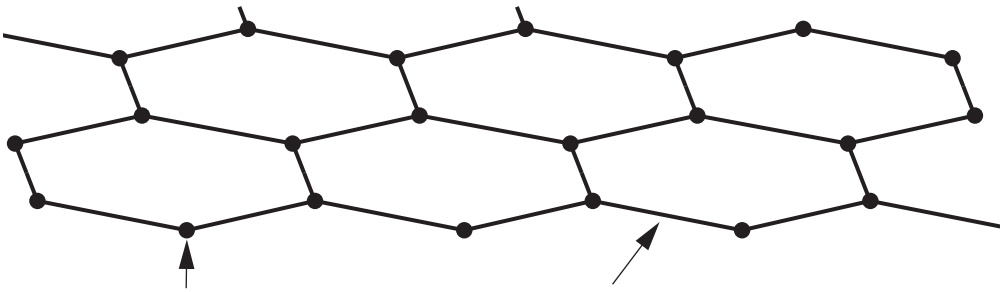
8 **(a)** Different forms of the same element in the same physical state [1]

(b) It contains **only** carbon atoms/It contains one type of atom
Idea that it is a form of (the element) carbon [1]

(c) It is a (good) conductor of electricity [1] it is a (good) conductor of heat [1]
Allow [1] for (good) conductor on its own [2]

(d) Carbon is a non-metallic element/It is transparent/it has covalent bonds/idea of extremely high melting point. *Any* (2 × [1])
not It is an allotrope of carbon [2]

(e)



[2]

(f) Candidates choose a property of graphene from the passage and gain a mark for an associated use. Candidates may suggest common uses for the property e.g. used in construction, linked to strength as steel or a futuristic use. [1]

9

9 **(a)** Under oil [1]

(b) Idea that a large piece could pose a danger or idea that sodium is *very* reactive [1]

(c) Idea of causing burning/being corrosive (to skin) [1]; idea of reacting with moisture on skin [1]
Idea that using tongs prevents this [1] any (2 × [1]) [2]

(d) Moves quickly across the surface of the water [1] melts into a silvery ball [1] eventually disappears [1] [3]

(e) Group 1 allow alkali metals. [1]

8

AVAILABLE MARKS

10 (a) Candidates draw a magnesium atom with an electronic configuration 2,8,2 [1] and a chlorine atom with the electronic configuration 2,8,7 [1] [2]

(b) Indicative content

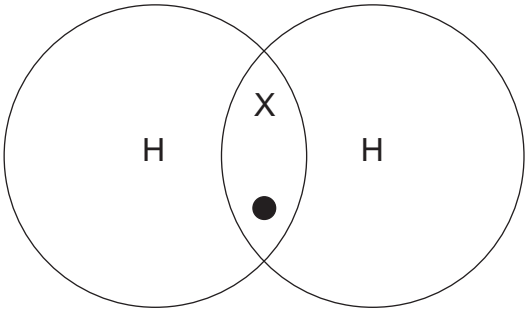
- Idea of electron transfer from magnesium to chlorine
- Magnesium loses 2 electrons
- To 2 chlorine atoms/forms $MgCl_2$
- To become a magnesium ion with a charge of 2+/to form Mg^{2+}
- Each chlorine atom gains one electron
- To become a chloride ion with a charge of 1−/to become Cl^-
- The ions are held together by electrostatic forces/oppositely charged ions are attracted

Response	Mark
Candidates make correct reference to 6–7 of the indicative points shown. They use good spelling, punctuation and grammar and the form and style are of a high standard.	5–6
Candidates make correct reference to 4–5 of the indicative points shown. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	3–4
Candidates make correct reference to 1–3 of the indicative points shown using limited spelling, punctuation and grammar. The form and style is of limited standard and they have made no use of specialist terms.	1–2
Candidates make no reference to the main points above and offer no other suitable response.	0

[6]

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(c) Molecule must be H_2 for any credit [2]
Correct sharing, dot and cross, correct total electrons [2]
Correct sharing, dot and cross, incorrect total electrons [1]
Correct sharing, not dot and cross, correct total electrons [1]
Correct total electrons is dependent on correct sharing.



(d) Apply a lighted splint [1] a popping sound is heard if hydrogen is present [1] [2]

Total

AVAILABLE MARKS
12
70

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

GSD21

TUESDAY 26 FEBRUARY 2013, 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 eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in question **8(b)**.
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	
8	
Total Marks	

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1 Elements can be classified as metals and non-metals.

The descriptions below apply to some metals and non-metals.
Draw a line from each description to the correct formula or symbol.

Description	Symbol/formula
Is used for making flares	Ar
Is used in making pencil lead	Mg
	Fe
Is used for overhead electrical wiring	
	O_2
Is an unreactive gas found in air	
	C
Is used to make bridges	Al

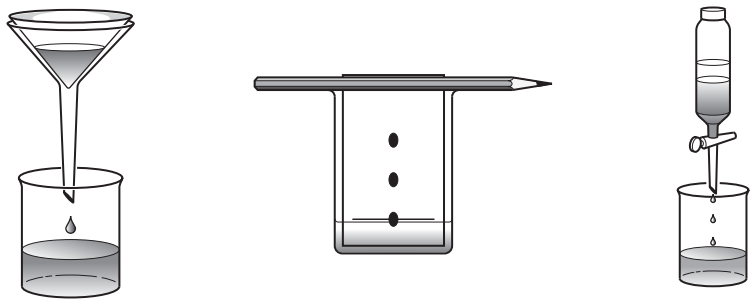
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Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

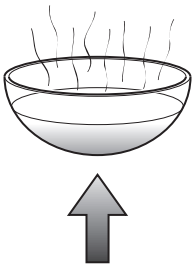
2 The diagrams below show different ways of separating mixtures.



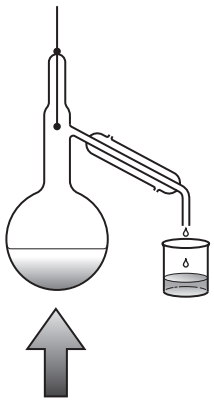
A

B

C



D



E

(a) Which diagram, **A**, **B**, **C**, **D** or **E**, shows the formation of a distillate?

_____ [1]

(b) **(i)** In which diagram, **A**, **B**, **C**, **D** or **E**, are immiscible liquids being separated?

_____ [1]

(ii) Name a liquid which is immiscible with water.

_____ [1]

(c) Which diagram, **A**, **B**, **C**, **D** or **E**, shows a filtrate?

_____ [1]

(d) In which two diagrams, **A**, **B**, **C**, **D** or **E**, are changes of state taking place?

_____ and _____ [2]

Examiner Only	
Marks	Remark

3 **(a)** The picture shows a £5 coin designed for the Olympic Games.

This £5 coin is made of 75% copper and 25% nickel.



© Coin Gallery

(i) What name is given to a substance that is a mixture of two or more different metals?

_____ [1]

(ii) Give **two** reasons why metals are suitable for making coins.

1. _____

2. _____ [2]

(b) The table below gives information about different coins.
Use this data to answer the following questions.

Coin	Mass (g)	Thickness (mm)	Composition	% metal
£1	9.5	3.15	copper	70
			zinc	24.5
			nickel	5.5
£2	12.0	2.50	copper	76
			zinc	
			nickel	4
50p	8.9	1.78	copper	75
			nickel	25
20p	5.0	1.70	copper	84
			nickel	16
2p	7.12	1.85	copper	97
			zinc	2.5
			tin	0.5

Source: Royal Mint

(i) What is the percentage composition of zinc in a £2 coin?

_____ % [1]

(ii) Which coin contains the highest percentage of copper?

_____ [1]

(iii) Calculate the difference in thickness between the heaviest and the lightest coin.

You must show your working out.

_____ mm [3]

Examiner Only

Marks	Remark

4 The table below shows the atomic numbers and mass numbers for six elements.

element	carbon	nitrogen	oxygen	fluorine	neon	sodium
atomic number	6	7	8	9	10	11
mass number	12	14	16	19	20	23

(a) The electrons in atoms are arranged in shells.

What is the largest number of electrons that can fit into the **first** shell of each of the atoms in the table?

_____ [1]

(b) Which element in the table has 8 protons in the nucleus of its atoms?

_____ [1]

(c) What is the electronic configuration of a sodium atom?

_____ [1]

(d) Explain why the sodium atom has no electrical charge.

_____

_____ [1]

(e) The mass number of fluorine is 19.

What is meant by the term **mass number**?

_____

_____ [1]

(f) Carbon can exist in two different forms with different mass numbers.

What name is given to atoms of the same element with different mass numbers?

_____ [1]

Examiner Only

Marks	Remark

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5 The table below lists some elements arranged in four columns.

A	B	C	D
carbon	lithium	helium	chlorine
silicon	sodium	neon	bromine
lead	potassium	argon	iodine

(a) (i) Which column, **A**, **B**, **C** or **D**, contains halogens?

_____ [1]

(ii) Which element in the table is a liquid at room temperature?

_____ [1]

(b) Which column, **A**, **B**, **C** or **D**, has three elements which all react with water to form solutions with a pH greater than 7?

_____ [1]

(c) Describe fully what you would **observe** when a piece of lithium is added to water.

_____

_____

_____

_____

_____

_____

_____ [4]

(d) Complete the word equation for the reaction of lithium with water.

lithium + water → + [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 **(a)** Indicators can change colour in acid and alkaline solutions. Indicators can be made from plant material such as red cabbage.

The table below gives information about three different indicators. Use this information to answer the questions that follow.

Substance	Colour of universal indicator paper	Colour of red litmus paper	Colour of red cabbage solution	pH range
hydrochloric acid	red	red	red	1–2
sodium hydroxide	dark blue	blue	yellow	12–14
water	green	red	purple	7
ethanoic acid	orange	red	red	3–6

(i) Why is red litmus paper **not** a suitable indicator for testing pH?

_____

_____ [1]

(ii) Explain why red cabbage solution can be described as an indicator.

_____

_____

_____

_____ [2]

(iii) Why is universal indicator a better indicator than red cabbage solution for testing acids?

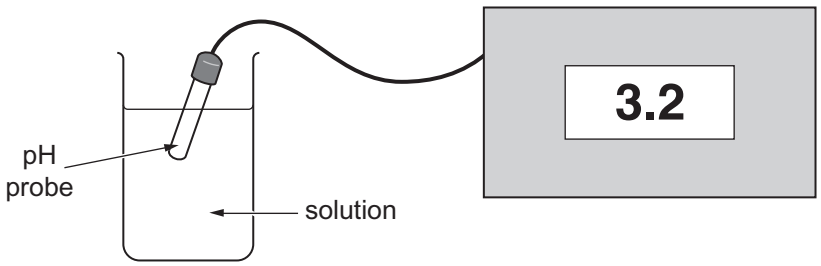
_____

_____

_____ [1]

Examiner Only	
Marks	Remark

(b) The diagram below shows a way of measuring pH.



Give an advantage of using a pH probe instead of an indicator solution to measure pH.

_____ [1]

(c) When copper(II) carbonate reacts with an acid it forms copper(II) sulfate. Complete the word equation for this reaction.

copper(II) carbonate + → copper(II) sulfate + +

[3]

(d) The colour of copper(II) sulfate crystals changes as they are heated.

The colour and formulae of three types of copper(II) sulfate are given in the table below.

Colour	Formula
blue	$CuSO_4.5H_2O$
green	$CuSO_4.H_2O$
white	$CuSO_4$

(i) Give the formula of the type of copper(II) sulfate that would be best to test for the presence of water.
Explain your answer.

Formula: _____ [1]

Explanation: _____

_____ [2]

(ii) What word is used to describe white copper(II) sulfate?

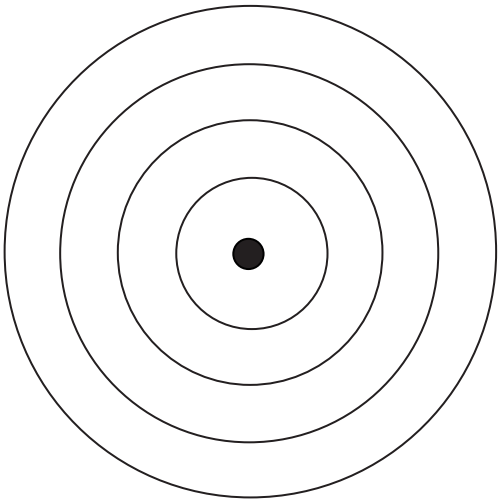
_____ [1]

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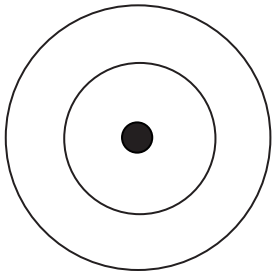
Examiner Only	
Marks	Remark

7 Potassium and fluorine react violently together to form the compound potassium fluoride.

(a) Complete the diagrams below to show the arrangements of **all** the electrons in a potassium atom and a fluorine atom.



potassium atom



fluorine atom

[2]

(b) Describe how a potassium atom becomes an ion and how a fluorine atom becomes an ion. You should state the formula of each ion.

[4]

(c) How are the ions held together in potassium fluoride?

[1]

(d) What is the formula for potassium fluoride?

[1]

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(Questions continue overleaf)

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Examiner Only	
Marks	Remark

8 **(a)** Give an accurate definition of the term solubility.

_____

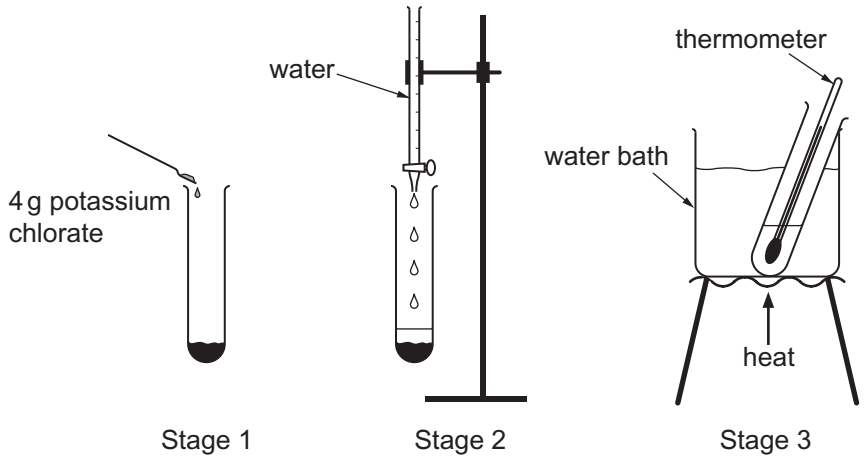
_____

_____

_____ [4]

In part (b) you will be assessed on your written communication skills including the use of specialist scientific terms.

(b) A student wanted to obtain results to plot a solubility graph for potassium chlorate. The first three stages of the method used are shown below.



Stage 1: 4 g of potassium chlorate are placed in a boiling tube.

Stage 2: 10 cm^3 of water are added.

Stage 3: The boiling tube is placed in a water bath and heated until all the potassium chlorate has dissolved. The boiling tube is then removed from the water bath.

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Describe, in detail, how you would **continue** this experiment in order to obtain a set of results from which you could draw a solubility graph.

[6]

(c) In a similar experiment a student obtained the following results. She used 2 g of potassium chlorate each time.

Mass of water (g)	Temperature at which crystals formed (°C)	Solubility in water (g/100 g)
4	92	50.0
8	63	25.0
12	48	
16	35	12.5

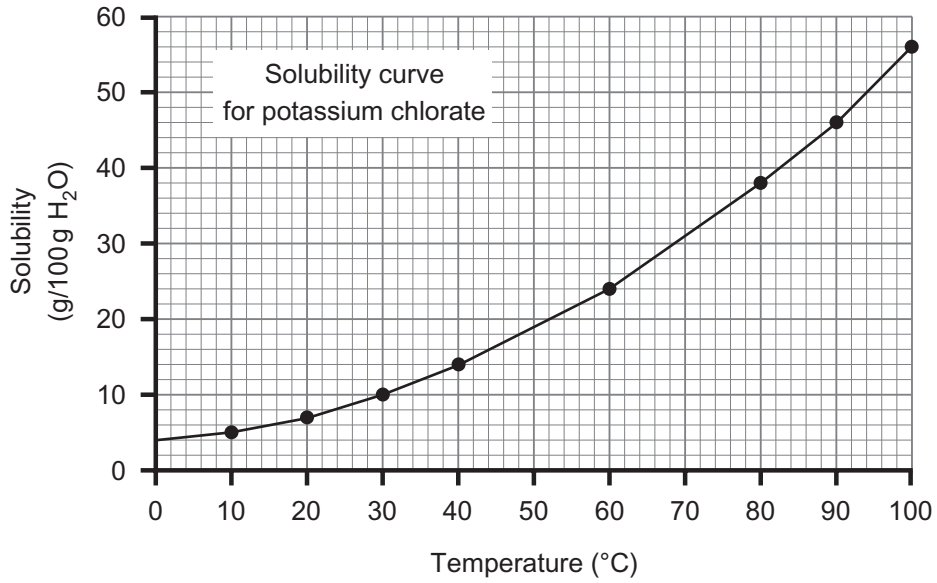
Calculate the solubility which is missing in the table. **You must show your working out.**

_____ g/100 g water [3]

Examiner Only

Marks	Remark

(d) A solubility curve for potassium chlorate is shown below.



(i) Describe the trend in solubility shown by the graph above.

_____

_____

_____ [2]

(ii) What is the solubility of potassium chlorate at 69 °C?

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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Marks	Remark

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Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

TUESDAY 26 FEBRUARY 2013
9.30 am–10.30 am

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			AVAILABLE MARKS
1	Making flares – Mg [1] pencil lead – C [1] electrical cables – Al [1] unreactive gas – Ar [1] bridges – Fe [1]	[5]	5
2	**(a)** E	[1]	
	(b) **(i)** C	[1]	
	(ii) oil any suitable	[1]	
	(c) A	[1]	
	(d) D [1] E [1]	[2]	6
3	**(a)** **(i)** alloys	[1]	
	(ii) hard wearing/durable/long lasting malleable unreactive/inert hard **(any 2 × [1])**	[2]	
	(b) **(i)** 20%	[1]	
	(ii) 2p coin	[1]	
	(iii) 2.50 [1] – 1.70 [1] 0.8 [1] apply c.m. for 3rd mark	[3]	8
4	**(a)** 2	[1]	
	(b) oxygen	[1]	
	(c) 2,8,1	[1]	
	(d) Idea that it has equal numbers of protons and electrons	[1]	
	(e) total number of protons and neutrons (in an atom)	[1]	
	(f) isotopes	[1]	6

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					AVAILABLE MARKS
5	**(a)**	**(i)**	D	[1]	
		(ii)	bromine	[1]	
	(b)		B	[1]	
	(c)		floats on surface [1] gives off gas/fizzes [1] moves [1] idea of vigorous reaction [1] disappears completely [1] colourless solution remains [1] do **not** accept goes on fire or forms a ball any 4	[4]	
	(d)		lithium hydroxide [1] + hydrogen [1]	[2]	9
6	**(a)**	**(i)**	Idea that it only has two colours/it can <u>only</u> indicate an alkali	[1]	
		(ii)	It has different colours [1] for acid, alkali (and neutral) [1]	[2]	
		(iii)	It can indicate the strength of the acid/it can indicate the pH	[1]	
	(b)		Gives a (more) accurate reading	[1]	
	(c)		sulfuric acid [1] water [1] carbon dioxide [1]	[3]	
	(d)	**(i)**	$CuSO_4$ It is white [1] and will change to blue [1] when water is added	[1] [2]	
		(ii)	anhydrous	[1]	12
7	**(a)**		2,8,8,1 [1] 2,7 [1]	[2]	
	(b)		potassium loses one electron [1] fluorine gains one electron [1] K^+ [1] F^- [1]	[4]	
	(c)		electrostatic attraction/attraction between oppositely charged ions	[1]	
	(d)		KF	[1]	8

AVAILABLE MARKS

8 **(a)** mass of solid [1] required to saturate [1]
100 g of water [1] at a particular temperature [1] [4]

(b) **Indicative content**

- Allow to cool
- Note appearance of crystals
- Record temperature at which they form
- Add another small given volume of water
- Idea of repeating stage 3
- Idea of repeat until a set of results are obtained
- Idea of carrying out appropriate calculations

Response	Mark
Candidates must use appropriate scientific terms throughout to describe the experimental procedure, using 5 to 7 of the points in the indicative content, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5–6]
Candidates use 3 or 4 points from the indicative content to describe the experimental procedure in a logical sequence using some scientific terms. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3–4]
Candidates use 1 or 2 of the points from the indicative content to describe the experimental procedure. However these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and make little use of scientific terms. The form and style are of a limited standard.	[1–2]
Response not worthy of credit.	[0]

[6]

(c) 100/12 [1] 100/12 × 2 [1] = 16.7 [1] [3]

(d) **(i)** The solubility of potassium chlorate rises [1] as the temperature increases [1] [2]

(ii) 30 (g/100 g water) [allow 30–30.5] [1] 16

Total **70**

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

GSD21

TUESDAY 13 NOVEMBER 2012, 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 nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **5**.
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	
8	
9	
Total Marks	

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Examiner Only	
Marks	Remark

1 A new type of **hazard symbol** will soon be used on containers of all dangerous substances. These symbols have been internationally agreed.

(a) Why do hazard symbols need to be internationally agreed?

_____

_____ [1]

(b) Give two **other** reasons why containers of certain substances are labelled using hazard symbols.

1. _____

_____

2. _____

_____ [2]

Examiner Only	
Marks	Remark

2 Some golf clubs are made from steel, which is an alloy of iron and carbon, and from the metallic elements titanium and tungsten.

(a) Complete the sentence below to explain the meaning of the term alloy.

Circle the correct words.

An alloy is a

compound **mixture** **molecule**

of two or more

atoms **substances** **elements**

one of which is a

metal **non-metal** **solid**.

[3]

(b) Explain why titanium, tungsten, iron and carbon can be described as elements.

_____

_____ [1]

(c) Give **two** properties you would expect titanium, tungsten and iron to have.

1. _____

2. _____ [2]

(d) Complete the table below which gives information about an atom of iron.

Name of element	Mass number	Atomic number	Number of protons	Number of neutrons	Number of electrons
iron	56		26		

[3]

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Examiner Only	
Marks	Remark

3 Carbon dioxide (CO_2) is a gas at room temperature and is made from two different elements covalently bonded together.

(a) How many carbon atoms are there in a molecule of carbon dioxide?

_____ [1]

(b) Place a tick (✓) in the box beside the phrase which best describes a single covalent bond.

one electron shared between 2 atoms ☐

attraction between 2 atoms ☐

a shared pair of electrons ☐

the transfer of a pair of electrons ☐ [1]

(c) Carbon dioxide dissolves in water to produce an acidic solution.

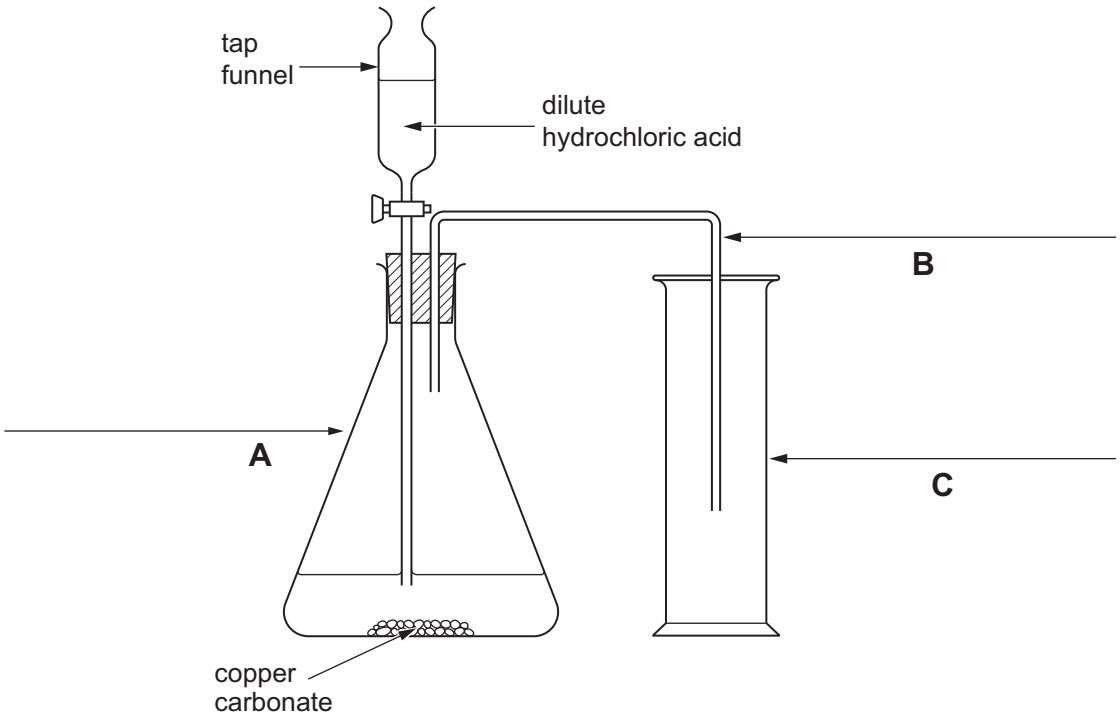
Describe how you would test a solution of carbon dioxide to find the strength of the acid.

_____

_____

_____ [2]

Carbon dioxide can be produced using the apparatus drawn below.



conical flask	**beaker**	**gas jar**
filter funnel	**delivery tube**	**test tube**

(d) Choose from the terms in the box above to complete the labels **A**, **B** and **C** on the diagram.

[3]

(e) Describe how you would carry out a test for carbon dioxide.

_____

_____

_____ [3]

(f) Carbon dioxide sublimes. Suggest why solid carbon dioxide is also called '**dry ice**'.

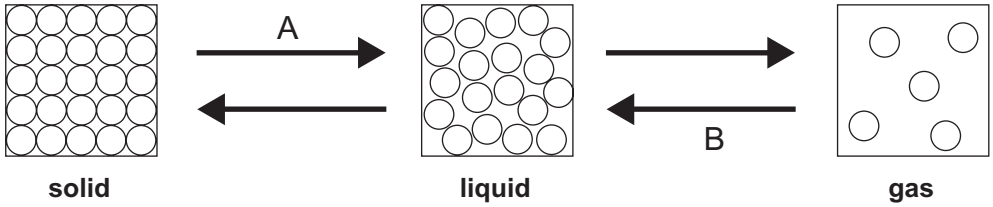
_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

4 Zinc is a grey solid at room temperature. It has a melting point of 420 °C and a boiling point of 907 °C. The diagrams below show the arrangement of particles in zinc when it is a solid, a liquid and a gas.



(a) Name the changes of state labelled A and B.

A _____

B _____ [2]

(b) How would you produce liquid zinc from solid zinc?

_____

_____ [2]

(c) Complete the sentence below to explain what is meant by the term boiling point.

Circle the correct words.

Boiling point is the **temperature** / **time** / **volume** at which a **solid** / **liquid** / **gas** changes to a **solid** / **liquid** / **gas**.

[3]

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In Question 5 you will be assessed on your written communication skills including the use of specialist science terms.

Examiner Only	
Marks	Remark

5 Describe **how** you would carry out the reaction between iron and sulfur in the school laboratory to form iron sulfide. You should also include:

- a description of the appearance and properties of the mixture;
- observations made during the reaction and at the end.

[6]

Examiner Only	
Marks	Remark

6 In the 1860s, John Newlands and Dmitri Mendeleev were two of the scientists who tried to bring order to the vast amount of information known at that time about the elements.

(a) Newlands stated that when the elements were arranged in order of atomic mass similar properties occurred every 8th element.

(i) What is the name of this law stated by Newlands?

_____ [1]

(ii) Give **one** reason why this pattern was not taken seriously by many scientists.

_____

_____ [1]

Mendeleev also arranged the elements in order of atomic mass but his pattern was taken more seriously than that of Newlands.

(b) Give **two** reasons why the table of elements prepared by Mendeleev was better than the one prepared by Newlands.

1. _____

_____

2. _____

_____ [2]

The modern Periodic Table contains more elements than the Periodic Table developed by Mendeleev.

(c) Give **two** other differences between the modern Periodic Table and Mendeleev's Periodic Table.

1. _____

_____

2. _____

_____ [2]

Part of the modern Periodic Table is shown below.

H							He
	Be				O		Ne
Na			Si		S	Cl	
K							

(d) Use **only** the elements shown above to answer the following questions.

(i) Give the **symbol** for a non-metal element which is a gas at room temperature and is green in colour.

_____ [1]

(ii) Which **two** elements are stored under oil?

_____ and _____ [1]

(iii) Name the element which has four electrons in its outer shell.

_____ [2]

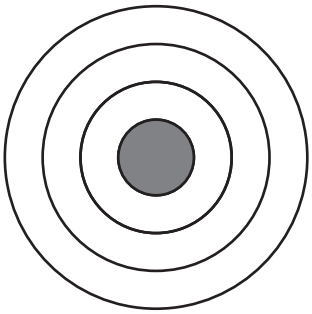
Examiner Only

Marks	Remark

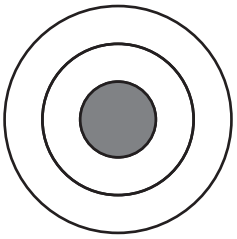
Examiner Only	
Marks	Remark

7 Sodium oxide is an ionic compound which can be formed by the reaction between sodium and oxygen.

(a) Complete the diagrams below to show **all** the electrons in a sodium atom and an oxygen atom.



sodium atom



oxygen atom [2]

(b) Explain how an oxide ion is formed from an oxygen atom.

_____

_____

_____ [2]

(c) What is the charge on a sodium ion?

_____ [1]

(d) How many sodium atoms react with one atom of oxygen?

_____ [1]

(e) Use your answer to part **(d)** to write the formula for the compound sodium oxide.

_____ [1]

(f) How are the ions held together in the compound?

_____

_____ [1]

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(g) Sodium oxide is a typical ionic solid.

Give **two** physical properties you expect sodium oxide to have.

1. _____

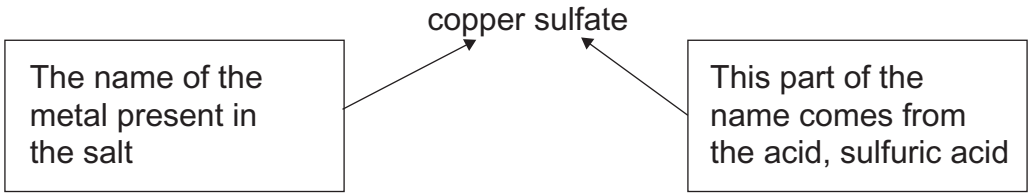
2. _____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

8 Read the following information carefully.

Copper oxide, a black solid, reacts with sulfuric acid and ethanoic acid to form two different salts. Salt is a general name given to one of the compounds formed when an acid is neutralised. The salt formed between copper oxide and sulfuric acid is called copper sulfate.



Name of acid	Name of salt produced when the acid reacts
hydrochloric acid	chloride
nitric acid	nitrate
sulfuric acid	sulfate
phosphoric acid	phosphate
ethanoic acid	ethanoate

(a) Name the salt formed when copper oxide reacts with ethanoic acid.

_____ [1]

(b) What is the name given to the type of reaction between an acid and a base to form a salt and water only?

_____ [1]

(c) Write a balanced symbol equation for the reaction between copper oxide and sulfuric acid.

_____ [2]

(d) Describe what you would observe when copper oxide reacts with sulfuric acid.

_____

_____

_____ [2]

(e) Name the acid which will react with copper oxide to form copper nitrate.

_____ [1]

Copper oxide reacts faster with 1 mol/dm^3 of sulfuric acid than with 1 mol/dm^3 of ethanoic acid.

(f) What does this tell you about the strength of sulfuric acid and ethanoic acid of the same concentration?

_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

9 Lithium chloride conducts electricity when it is molten but sulfur does not.

(a) Draw a labelled diagram of apparatus that can be used in a school laboratory to test if a molten compound conducts electricity.

[4]

(b) Why can molten lithium chloride conduct electricity?

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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112983

New Specification

Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

TUESDAY 13 NOVEMBER 2012
9.15 am–10.15 am

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)**	Idea that the symbol is used to convey the same information no matter where in the world you are/the symbol is not used to mean one thing in one country and have an alternative meaning in another country/ one meaning is not conveyed by several different symbols in different countries. [1]	
	(b)	idea of eyecatching/ idea of being able to understand it even if you cannot read/ idea of warning of danger any two **NOT** idea of internationally used [2]	3
2	**(a)**	mixture elements metal [3]	
	(b)	Idea that they each contain **one** type of atom/they cannot be broken down into anything simpler (by chemical means) [1]	
	(c)	Any suitable property of a metal for example good conductor of electricity/good conductor of heat/malleable/ductile also accept in this case hard/high melting point/shiny/sonorous any two allow strong [2]	
	(d)		

Name of element	Mass number	Atomic number	Number of protons	Number of neutrons	Number of electrons
		26 [1]		30 [1]	26 [1]

[3] 9

3	**(a)**	1 carbon atom [1]	
	(b)	A shared pair of electrons [1]	
	(c)	Use universal indicator [1] compare to a colour chart [1] or use a pH meter [1] idea of reading/recording/observing pH [1] [2]	
	(d)	A = conical flask B = delivery tube C = gas jar [3]	
	(e)	(Bubble through) lime water [1] lime water changes from colourless [1] to milky [1] [3]	
	(f)	Idea that it does not turn into a liquid [1]	11
4	**(a)**	A = melting B = condensing [2]	
	(b)	Heat the solid zinc [1] to a temperature of 420 °C [1] **NOT** melt **NOT** burn zinc [2]	
	(c)	temperature liquid gas [3]	7

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5

Response	Mark
Candidates must use 6–10 of the terms in the indicative content to describe fully the chemical reaction between sulfur and iron filings in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use 3–5 of the terms in the indicative content to describe the chemical reaction between sulfur and iron in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates make reference to 1–2 of the terms in the indicative content using limited spelling, punctuation and grammar. The form and style is of limited standard and they have made no use of specialist terms.	[1]–[2]

AVAILABLE MARKS

Indicative content

- Idea that mixture is solid
- Sulfur is yellow
- Iron is grey or similar
- Mixture can be separated using a magnet
- Idea that iron is magnetic
- Place a mixture of iron filings and sulfur into a boiling tube **OR** correct safety feature (goggles or fume cupboard)
- Heat gently in a Bunsen flame
- Mixture will glow bright red/glow will pass through the mixture
- The mixture will continue to glow after heating is stopped
- Compound is grey(-black) in colour [6]

6

6 **(a)** **(i)** The law of Octaves [1]

(ii) Newlands did not use all of the elements that were known at that time/he placed two elements into one space in his list
Accept idea that he grouped elements which were not alike, or other correct, e.g. idea that pattern did not work for all the elements [1]

(b) Mendeleev used all of the elements/he left gaps for undiscovered elements/he predicted the properties of undiscovered elements/he swapped elements from atomic mass order if the chemistry did not fit, e.g. I and Te or other correct, e.g. placing elements with similar properties in vertical columns (groups) any two × [1] [2]

(c) Idea must be clear which version of The Periodic Table the candidate is referring to. The modern Periodic Table is set out in atomic number order [1]/the transition metals occupy a separate area [1]/the noble gases [1]/lanthanides **OR** actinides [1] or other correct
NOT just "there are transition metals" [2]

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				AVAILABLE MARKS
	(d)	**(i)** Cl	[1]	
		(ii) Na and K both needed	[1]	
		(iii) Silicon identification of element [1] correct name [1] (Si = [1])	[2]	10
7	**(a)**	Candidates draw the electronic configuration Na 2,8,1 and O 2,6 on the diagrams provided	[2]	
	(b)	oxygen gains electrons [1] 2 electrons [1]	[2]	
	(c)	$+1/1+/Na^{+1}/Na^{+}$ **NOT** positive	[1]	
	(d)	2	[1]	
	(e)	Na_2O	[1]	
	(f)	electrostatic forces/attraction between opposite charges	[1]	
	(g)	Any two of: hard/brittle/non-conductor of electricity/soluble (in water)/crystalline/ high melting point/conducts electricity when liquid or in solution or other correct ($2 \times$ [1])	[2]	10
8	**(a)**	copper ethanoate	[1]	
	(b)	neutralisation	[1]	
	(c)	$CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$	[2]	
	(d)	(black) solid disappears dissolves [1] blue solution forms [1]	[2]	
	(e)	nitric acid	[1]	
	(f)	valid comparison sulfuric acid is a stronger acid than ethanoic acid idea that **one** acid is stronger than the other [1] or idea that sulfuric acid is strong/ethanoic acid is weak [1]	[2]	9
9	**(a)**	Candidates draw a **labelled** diagram [1] clear circuit with a battery [1] suitable vessel with liquid in it [1] electrodes [1] Bunsen burner heat source [1] Labelled circuit which works [4] 4 points [3] 3 points [2] 1 or 2 points [1]	[4]	
	(b)	Idea of ions which move	[1]	5
				70

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

GSD21

MONDAY 21 MAY 2012, 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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in question **8(c)**.
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	
8	
9	
10	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** Ethanoic acid is a **corrosive** liquid.

(i) Draw the hazard symbol, in the box below, which should be placed on a bottle of ethanoic acid.

[1]

(ii) Give **two** reasons why a hazard symbol is used rather than printed words.

1. _____

_____

2. _____

_____ [2]

(b) Vinegar is a mixture of ethanoic acid and water.

Circle the term which describes the water in the mixture.

solute **solvent** **solution** [1]

(c) When blue litmus paper is dipped into vinegar the colour of the litmus paper changes to red.

What does this tell you about vinegar?

_____ [1]

(d) When universal indicator is dropped into vinegar the colour of the indicator changes to yellow.

What does this tell you about vinegar?

_____ [1]

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Examiner Only	
Marks	Remark

2 Copper, aluminium and magnesium are very useful metals.

(a) Complete the table below which shows some of the uses of these metals. The first one is done for you.

Metal	Use		
	electrical wiring	**coins**	**aircraft alloys**
copper	✓	✓	
aluminium			
magnesium			

[3]

(b) Give **two** properties of copper which make it suitable for use in electrical wiring.

1. _____

2. _____ [2]

(c) Copper, aluminium and magnesium are elements.

Explain the meaning of the term **element**.

_____

_____ [1]

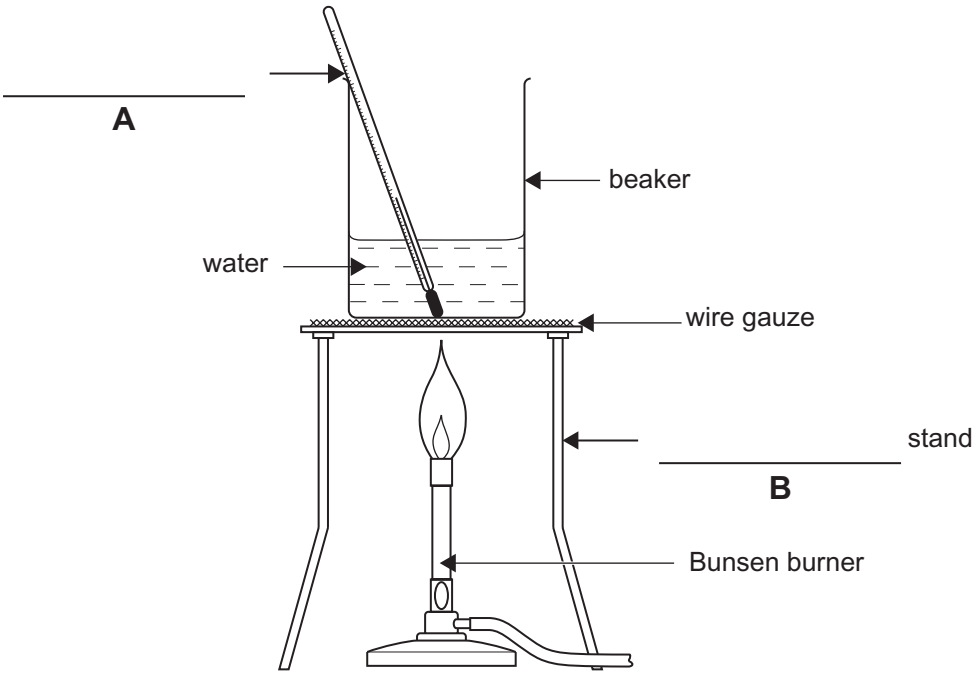
(d) Circle a word from the list below which best describes an aircraft alloy.

element **mixture** **compound** **salt** [1]

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Examiner Only	
Marks	Remark

3 The apparatus below can be used to find the boiling point of water.



(a) Complete the labels **A** and **B** in the diagram above. [2]

(b) Give **one** safety precaution, apart from wearing safety glasses, you would take when carrying out this experiment.

_____ [1]

(c) What is the boiling point of water?

_____ °C [1]

(d) Which of the following chemicals can be used to test for water?

Place a tick (✓) in the correct box.

sulfuric acid ☐

anhydrous copper(II) sulfate ☐

universal indicator ☐

hydrated iron(III) oxide ☐ [1]

(e) Potassium chloride is a typical ionic compound. Is potassium chloride soluble or insoluble in water?

_____ [1]

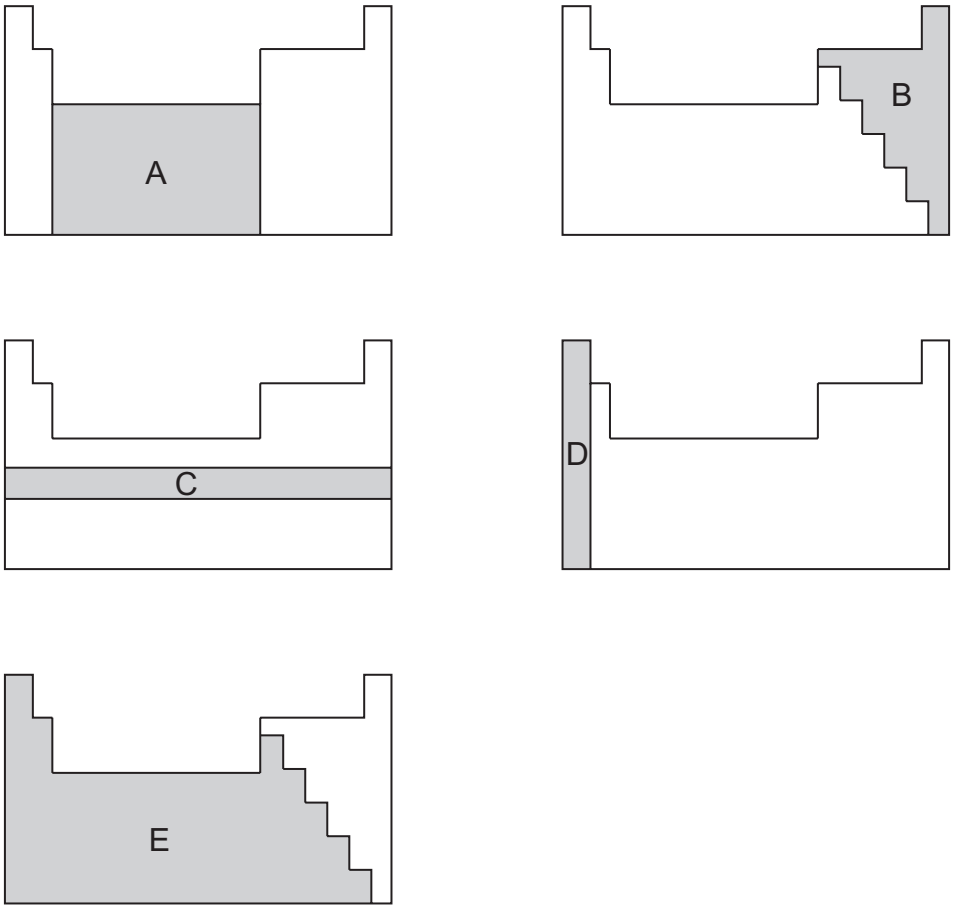
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(Questions continue overleaf)

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4 The diagrams below show the outline of the modern Periodic Table. A different area A, B, C, D and E, is shaded in each diagram.



(a) Choose the shaded area, A, B, C, D or E which shows

(i) a Group. _____ [1]

(ii) a Period. _____ [1]

(iii) the area where the non-metal elements are.

_____ [1]

Examiner Only	
Marks	Remark

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(b) Why are the elements nitrogen and phosphorus placed in the same Group? Place a tick (✓) in the box beside the correct answer.

Nitrogen and phosphorus have the same physical appearance. ☐

Nitrogen and phosphorus have the same density. ☐

Nitrogen and phosphorus have similar chemical properties. ☐

Nitrogen and phosphorus are both non-metals. ☐ [1]

(c) The chemists John Newlands and Dmitri Mendeleev contributed ideas towards the development of the Periodic Table. John Newlands proposed the "Law of Octaves".

(i) Give **one** reason why some scientists did not accept the proposed Law of Octaves.

_____

_____ [1]

(ii) In what order did Newlands and Mendeleev arrange the elements?

_____ [1]

(iii) Give **two** other ideas used by Mendeleev in the development of the Periodic Table.

1. _____

_____

_____

2. _____

_____

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

5 **(a)** Use the information given for the substances X, Y and Z to state whether the substance is a solid, a liquid or a gas at room temperature (20 °C).

(i) X takes the shape of the bottom of its container. It has a definite volume.

Substance X is a _____. [1]

(ii) Y has a definite shape and volume.

Substance Y is a _____. [1]

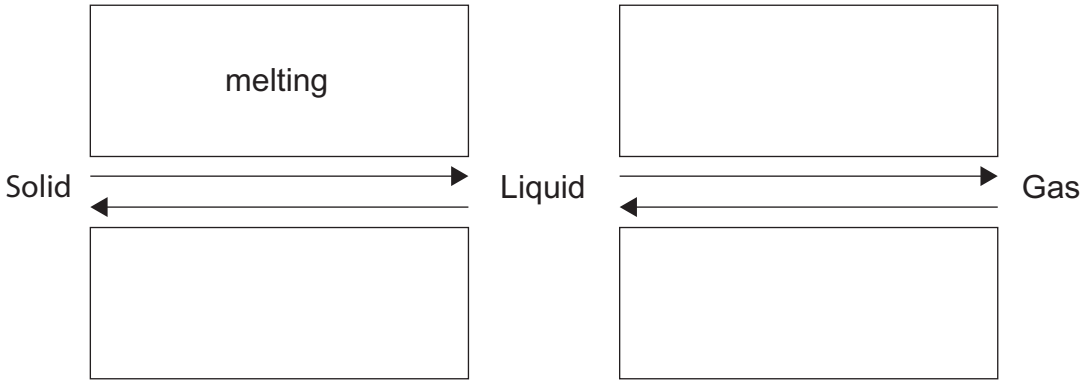
(iii) Z takes the shape and volume of the container.

Substance Z is a _____. [1]

(b) Substance B has a melting point of 16 °C and a boiling point of 118 °C. Is substance B a solid, a liquid or a gas at room temperature (20 °C)?

B is a _____. [1]

(c) Complete the diagram below by labelling the changes of state.



[3]

Examiner Only	
Marks	Remark

6 Chemists use symbols and formulae in chemical equations to give information about chemical reactions.

You may find your Data Leaflet helpful when answering this question.

(a) For each of the questions below four answers are given. Only one is correct. Circle the correct answer. The first one has been done for you.

The element with the symbol **P** is:

potassium (phosphorus) plutonium polonium

(i) **Sr** is the chemical symbol for:

silver tin strontium sulfur [1]

(ii) The compound with the formula **$Ca(OH)_2$** is:

calcium oxide hydride | calcium hydroxide | calcium oxide | calcium water [1]

(iii) The correct chemical formula for **aluminium nitrate** is:

$AlNO_3$ Al_3NO $Al(NO_3)_3$ $Al(NO)_3$ [1]

(iv) The formula **NH_3** means:

3 N atoms and 3 H atoms | 3 NH atoms | 1 N atom and 3 H atoms | 1 N atom and 1 H atom [1]

(b) Balance the chemical equation below which describes the reaction between sulfuric acid and sodium hydroxide.

$H_2SO_4 + NaOH \longrightarrow Na_2SO_4 + H_2O$ [1]

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Examiner Only	
Marks	Remark

7 **(a)** Two common isotopes of chlorine are $^{35}_{17}Cl$ and $^{37}_{17}Cl$.

(i) Complete the table below to show the numbers of protons, neutrons and electrons in the $^{37}_{17}Cl$ isotope.

Isotope	Protons	Neutrons	Electrons
$^{37}_{17}Cl$			

[3]

(ii) What are isotopes?

_____

_____

_____ [2]

(b) **(i)** Complete the table below which gives information about electronic structures and their relation to the Group number of the Periodic Table.

Element	Atomic number	Electronic configuration	Group of Periodic Table
A	17		7
B	5	2,3	
C		2,8,5	5
D	6		4

[4]

(ii) What is the name of the element in Group 2 Period 3?

_____ [1]

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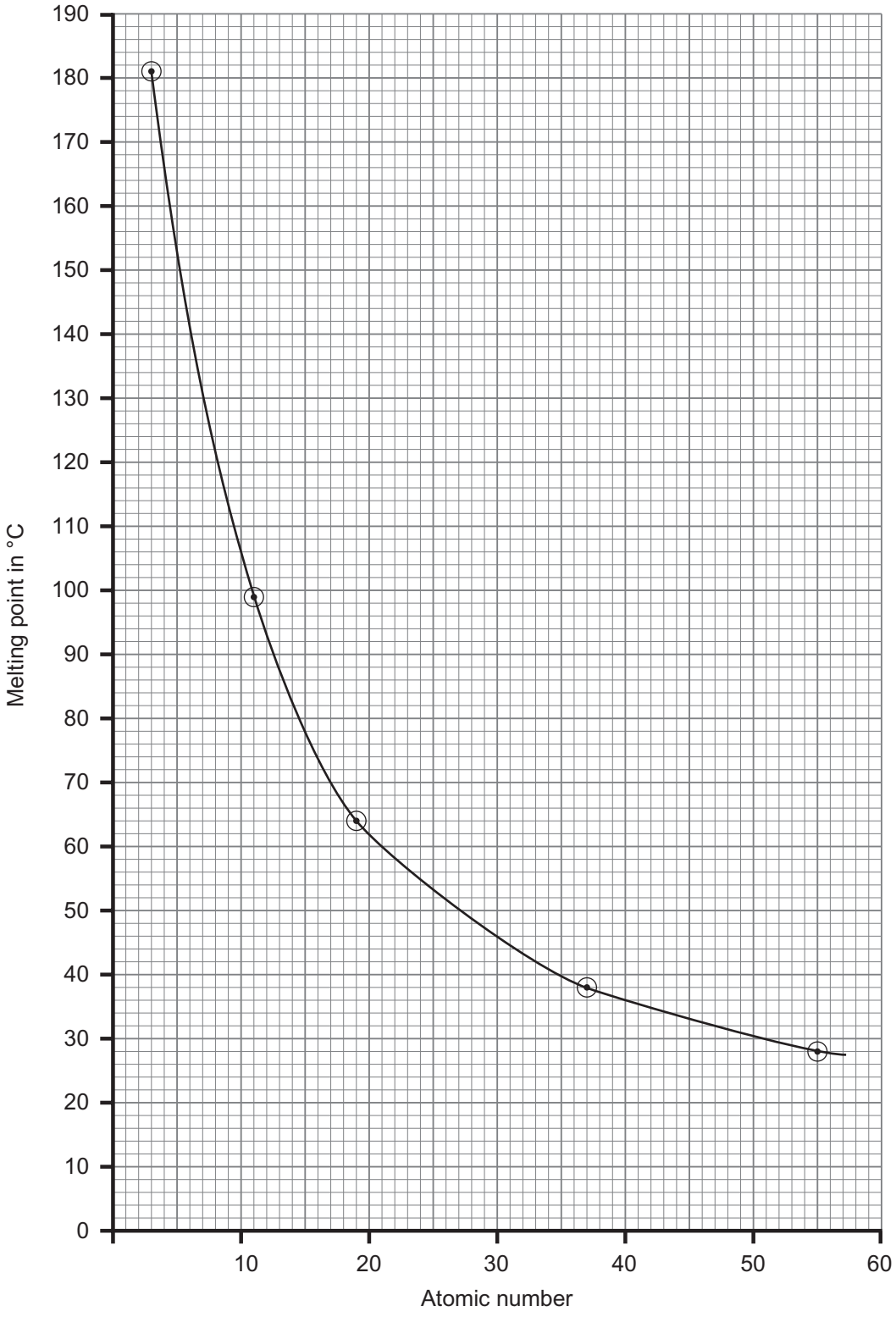
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(Questions continue overleaf)

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8 The graph below shows how the melting points of the alkali metals change with increasing atomic number.

Examiner Only	
Marks	Remark



(a) Name the alkali metal with the highest melting point.

_____ [1]

(b) What happens to the melting point of the alkali metals as the atoms increase in size?

_____

_____ [1]

In part (c) you will be assessed on your written communication skills including the use of specialist science terms.

(c) Describe how potassium is stored in the laboratory and the steps that need to be taken before adding it to water. Include in your answer its appearance at each stage and any safety precautions that need to be taken.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [6]

(d) **(i)** Suggest why rubidium (Rb) is **not** used in the school laboratory to show the reactions of the alkali metals.

_____ [1]

(ii) How many electrons would you expect rubidium to have in its outer shell?

_____ [1]

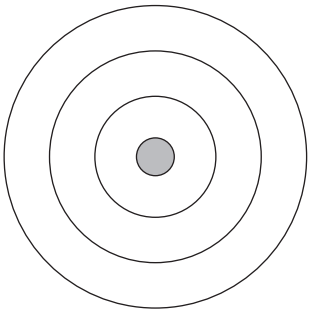
Examiner Only

Marks	Remark

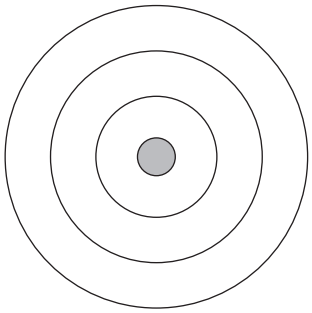
Examiner Only	
Marks	Remark

9 Magnesium reacts with chlorine to form an ionic compound, magnesium chloride.

(a) Complete the diagrams below to show **all** the electrons in a magnesium atom and a chlorine atom.



magnesium atom



chlorine atom [2]

(b) Explain how the atoms of magnesium and chlorine form **ions**.

_____

_____

_____ [2]

(c) How many chlorine atoms react with one atom of magnesium?

_____ [1]

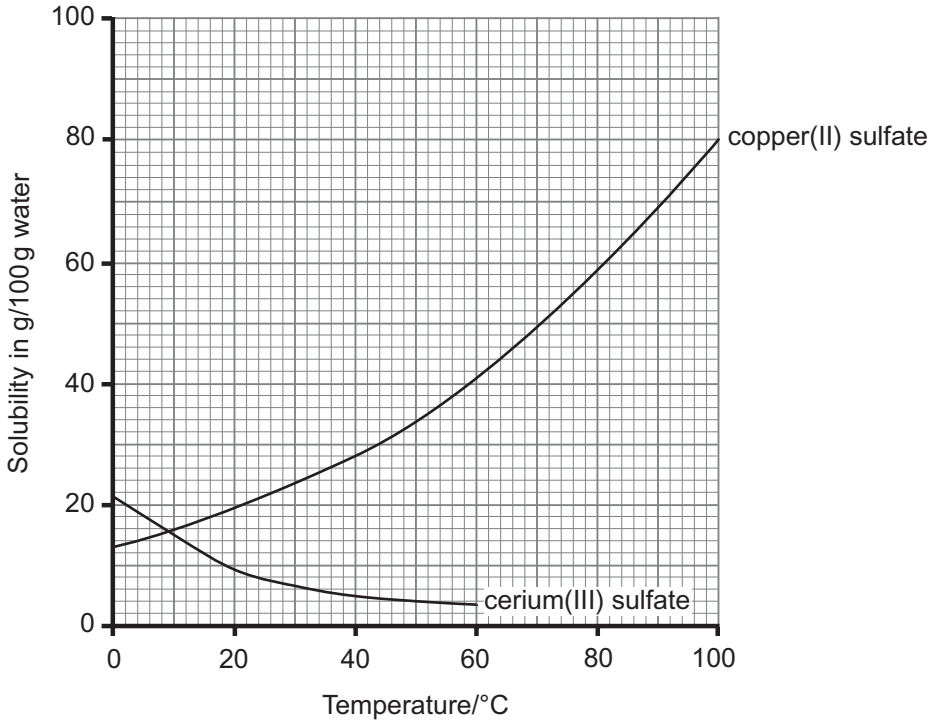
(d) How are the ions held together in the compound magnesium chloride?

_____

_____ [1]

Examiner Only	
Marks	Remark

10 The solubility curves for the solids copper(II) sulfate and cerium(III) sulfate are drawn below.



Use the solubility curves to answer the following questions.

(a) How does the solubility of the cerium(III) sulfate change as the temperature increases?

_____

_____ [1]

(b) What is the solubility of copper(II) sulfate at 26 °C?

_____ g/100 g water [1]

(c) At what temperature is the solubility of cerium(III) sulfate 8 g/100 g water?

_____ °C [1]

(d) At what temperature is the solubility of the cerium(III) sulfate equal to the solubility of copper(II) sulfate?

_____ °C [1]

(e) Name the solid which is more soluble at 0 °C.

_____ [1]

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112939

New Specification

Rewarding Learning

General Certificate of Secondary Education
2011–2012

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

MONDAY 21 MAY 2012, MORNING

MARK SCHEME

STEMUP.CO.UK

	AVAILABLE MARKS

1 (a) (i)  [1]

(ii) Idea of international recognition/idea of eyecatching/idea of being able to understand it even if you cannot read/idea of warning of danger *any two* [2]

(b) solvent [1]

(c) Vinegar is an acid [1]

(d) Vinegar is a **weak** acid [1] — 6

2 (a)

Metal	Use		
	electrical wiring	**coinage**	**aircraft alloys**
aluminium	✓ [1]		✓ [1]
magnesium			✓ [1]

[3]

(b) Good conductor **of electricity** [1]
ductile [1] [2]

(c) A substance which is made from only **one type** of atom/a substance which cannot be broken down **by chemical means** [1]

(d) mixture [1] — 7

3 (a) A = thermometer B = tripod [2]

(b) Safety precaution related to the danger associated with handling boiling water or working with a Bunsen flame [1]

(c) 100 (°C) [1]

(d) Anhydrous copper(II) sulfate [1]

(e) soluble [1] — 6

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					AVAILABLE MARKS
4	**(a)**	**(i)**	D	[1]	
		(ii)	C	[1]	
		(iii)	B	[1]	
	(b)		Nitrogen and phosphorus have similar chemical properties	[1]	
	(c)	**(i)**	It did not work for all the elements/two elements were placed in the same position (in the list)/he did not use all the elements known at that time/he grouped elements with different reactivity	[1]	
		(ii)	In order of atomic mass (Not mass number)	[1]	
		(iii)	He left gaps for undiscovered elements/he predicted properties of undiscovered elements/he arranged the elements into groups (with similar reactivity)/he swapped elements out of their atomic mass order to place elements of similar reactivity in the same group *any two*	[2]	8
5	**(a)**	**(i)**	Liquid	[1]	
		(ii)	Solid	[1]	
		(iii)	Gas	[1]	
	(b)		Liquid	[1]	
	(c)		Evaporating/boiling condensing freezing	[3]	7
6	**(a)**	**(i)**	Strontium	[1]	
		(ii)	Calcium hydroxide	[1]	
		(iii)	$Al(NO_3)_3$	[1]	
		(iv)	1 N atom and 3 H atoms	[1]	
	(b)		$H_2SO_4 + \mathbf{2}NaOH \longrightarrow Na_2SO_4 + \mathbf{2}H_2O$	[1]	5

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7 **(a)** **(i)** 17 20 17 [3]

AVAILABLE MARKS

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

(b) **(i)**

Element	Atomic number	Electronic configuration	Group of Periodic Table
A	17	**2,8,7**	7
B	5	2,3	**3**
C	**15**	2,8,5	5
D	6	**2,4**	4

[4]

(ii) magnesium [1] 10

8 **(a)** Lithium [1]

(b) Melting point decreases (as the size of the atoms increases) [1]

(c) Indicative content

- Potassium stored in oil } storage in the laboratory
- Idea that when freshly cut it is shiny
- Idea that as it is left in the air the freshly cut surface becomes dull } appearance
- Idea that before adding it to water dry the oil from the surface using a paper towel
- Idea of using small pieces/cut into small pieces } Preparative steps
- Handle with tongs
- Wear (safety) glasses/goggles
- Use (safety) screen } Safety

(award a max of 2 marks for safety)

Response	Mark
Candidates must use appropriate specialist terms throughout (at least 5 pts from indicative content) to describe a minimum of 3 of the following; how potassium is stored in the laboratory, appearance, safety precautions and the preparative steps that need to be taken before potassium is added to water. They use good quality spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates must use some appropriate specialist terms throughout (3–4 pts from indicative content) to describe a minimum of 2 of the following; how potassium is stored in the laboratory, appearance, safety precautions and the preparative steps that need to be taken before potassium is added to water. They use satisfactory spelling, punctuation and grammar and the form and style are of a high standard.	[3]–[4]
Candidates make reference to 1–2 of the main points shown above using limited spelling, punctuation and grammar. The form and style is of limited standard and they have made no use of specialist terms.	[1]–[2]
Candidates make no reference to the points above and offer no other suitable response.	[0]

[6]

(d) **(i)** Idea that rubidium is too reactive/too dangerous [1]

(ii) 1 (electron in the outer shell) [1]

AVAILABLE MARKS

10

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				AVAILABLE MARKS
9	**(a)**	Draw electronic configurations magnesium 2,8,2 [1] chlorine 2,8,7 [1]	[2]	
	(b)	Magnesium loses 2 electrons [1] chlorine gains 1 electron [1]	[2]	
	(c)	2	[1]	
	(d)	electrostatic forces/attraction between opposite charges	[1]	6
10	**(a)**	Solubility decreases (as the temperature increases)	[1]	
	(b)	22 g/100 g water	[1]	
	(c)	22 °C accept 22–24 °C	[1]	
	(d)	9 °C accept 9–9.8 °C	[1]	
	(e)	Cerium(III) sulfate	[1]	5
			Total	**70**

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

TUESDAY 28 FEBRUARY 2012
11.00 am–12.00 noon

GSD21

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 nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in Question **7(b)**.
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	
8	
9	
Total Marks	

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Examiner Only	
Marks	Remark

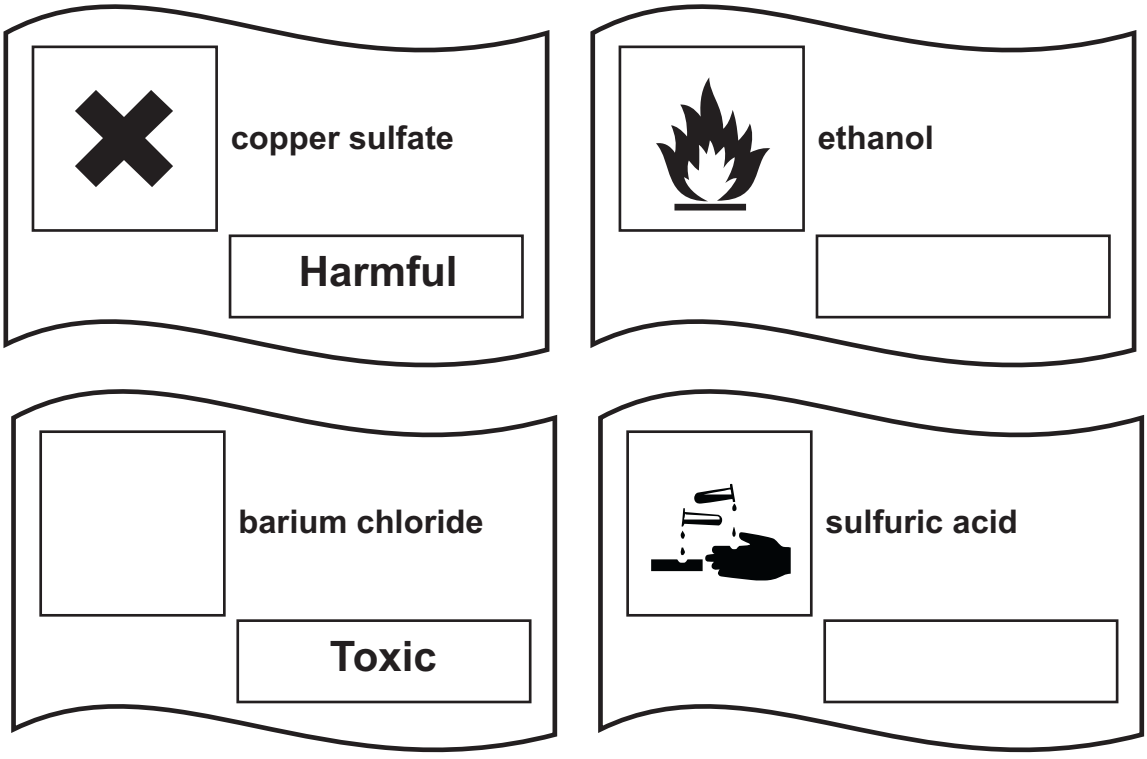
1 Hazard **symbols** are used instead of words to warn about the dangers of chemicals.

(a) Give one reason why hazard **symbols** are used instead of words.

_____

_____ [1]

Jars of chemicals in the laboratory may be labelled with the name of the chemical, the hazard and the hazard symbol. Four labels are shown below.



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(b) Complete the labels by drawing the missing hazard symbol and filling in the missing words.
The first label is done for you. [3]

(c) **(i)** From the labels above name a chemical which can catch fire easily.

_____ [1]

(ii) Name a chemical which may damage any living tissue it touches.

_____ [1]

Examiner Only	
Marks	Remark

2 This question is about the three states of matter, **solid**, **liquid and gas**.

(a) Complete the table below which gives 5 properties of solids, liquids and gases.
Place a tick (✓) in the correct column(s). The first one has been done for you.

Property	Solid	Liquid	Gas
Will melt when heated	✓		
Takes the shape of the container			
Takes the volume and shape of the container			
Has a definite shape			
Can be compressed			

[5]

(b) The table below lists the melting points and boiling points of four substances, A, B, C and D.

Substance	Melting point (°C)	Boiling point (°C)
A	114	444
B	–220	–118
C	–7	59
D	3500	4827

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

_____

_____ [2]

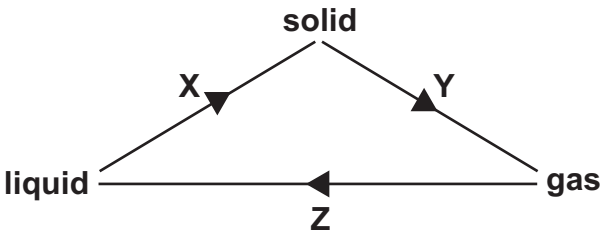
(ii) At room temperature, which of the substances A, B, C or D:

are solids? _____

is a liquid? _____ [3]

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The diagram below shows three **changes of state** labelled X, Y and Z.



(c) Name each change of state.

X _____

Y _____

Z _____ [3]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

3 **(a)** Food cans are made mainly from steel. Steel is an **alloy** of iron and carbon. The inside of a food can is coated with a thin layer of tin and a layer of white plastic.

(i) Name **two elements** used to make the food can.

_____ and _____ [1]

(ii) Explain why steel is an **alloy**.

_____

_____ [2]

The layer of white plastic is a special **compound** used to stop the tin reacting with acidic foods.

(b) Explain why the white plastic is described as a **compound**.

_____

_____ [2]

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4 The atom is the smallest part of an element which can exist on its own.

Four terms associated with atoms are given below. Place a tick (✓) beside the correct description of the term. The first one has been done for you.

Term	Description	
atomic structure	A central nucleus surrounded by electrons in shells	✓
	A central nucleus containing moving electrons	
	A mass number and an atomic number	
proton	Has a relative mass of 1 and a charge of +1	
	Has a mass of 0 and a charge of +1	
	Has a relative mass of 1 and a charge of –1	
mass number	The total number of elements in an atom	
	Total number of protons and neutrons in an atom	
	Total number of protons, neutrons and electrons in an atom	
atomic number	The number of protons in an atom	
	The number of electrons in an atom	
	The total number of protons and neutrons in an atom	

[3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

5 Daffodils, such as the ones in the picture below, like to grow in soil which is slightly acidic.

Image of a pot of daffodils removed due to copyright.

(a) The following test was used to find out if a sample of soil was suitable for planting daffodils.

Step 1 Add the soil sample to water. Shake to mix.

Step 2 Filter the soil from the soil and water mixture.

Step 3 Test the filtrate with substance X.

(i) Draw a labelled diagram, in the space below, of the apparatus used to carry out Step 2.

[3]

(ii) On your diagram label the **filtrate**. [1]

Substance **X** was used to find out the pH of the soil sample.

(b) Which of the following substances could be substance **X**?
Place a tick (✓) in the correct box.

☐ Red litmus paper

☐ Universal Indicator

☐ Blue litmus paper [1]

The table below shows the pH range of 4 soil samples, A, B, C and D.

Soil sample	pH range
A	0–2
B	3–6
C	7
D	8–11

(c) Which soil sample, A, B, C or D, is the most suitable for growing daffodils in?

Soil sample _____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 The box below shows the chemical symbols for some different types of ions.

K^+	S^{2-}	Mg^{2+}
Al^{3+}	Cl^-	NO_3^-
SO_4^{2-}	Na	N^{3-}

(a) From the box above choose

(i) a cation with a charge of 2 _____ [1]

(ii) a molecular ion _____ [1]

(iii) a symbol which is not an ion _____ [1]

(iv) the symbol for the nitrate ion _____ [1]

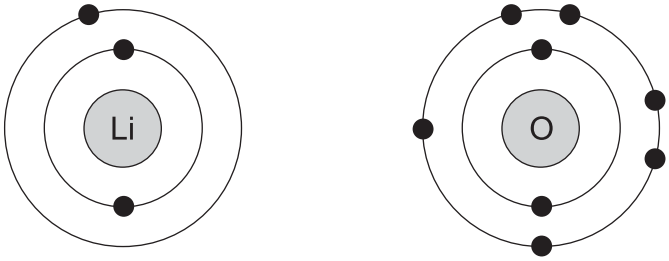
Lithium reacts with oxygen to form a solid white compound.

(b) Name the compound formed when lithium reacts with oxygen.

_____ [1]

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The structures of the lithium atom and the oxygen atom are shown below.



lithium atom oxygen atom

(c) Explain how lithium and oxygen react to form a compound.

_____

_____

_____

_____

_____ [3]

(d) Give **two** physical properties of the compound formed between lithium and oxygen.

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

7 A selection of colourless solvents used in the laboratory is shown in the photograph below. One of the liquids is water.

Image of a selection of colourless solvents removed due to copyright.

(a) What is meant by the term solvent? Place a tick (✓) in the box beside the correct answer.

A substance which is dissolved ☐

A substance which is able to dissolve another substance ☐

A mixture of one substance dissolved in another ☐

[1]

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In Part (b) you will be assessed on your written communication skills including the use of specialist science terms.

Examiner Only	
Marks	Remark

(b) Explain how you would identify which liquid is water. Give the full chemical name for any substance used to test the liquids.

[6]

Examiner Only	
Marks	Remark

8 Chemists have collected a vast amount of information about the atoms of elements and have displayed it on a table called the Periodic Table.

The table below gives information about the atomic number, group number and electronic configuration of the atoms of elements A, B, C and D.

Elements	Atomic Number	Electronic configuration	Group Number
A	12	2,8,2	
B	6		4
C		2,7	7
D	15		5

(a) Complete the table above. [4]

(b) How many electrons would you expect an atom of strontium to have in its outer shell?

_____ [1]

(c) Name the element in Group 6 and Period 3 of the Periodic Table.

_____ [1]

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Examiner Only	
Marks	Remark

(d) The elements in Group 1 of the Periodic Table, such as lithium, sodium and potassium, are found in the laboratory stored in oil.



© Martyn F. Chillmaid / Science Photo Library

(i) What name is given to the elements in Group 1 of the Periodic Table?

_____ [1]

(ii) Why are these metals stored in oil?

_____ [1]

Lithium, sodium and potassium are soft metals and can be cut easily into small pieces.

(e) Describe the surface of these metals when

(i) freshly cut

_____ [1]

(ii) 60 seconds after they are cut

_____ [1]

(f) Other than wearing safety glasses, state **two** safety precautions which you would take when using a Group 1 metal.

1. _____

2. _____ [2]

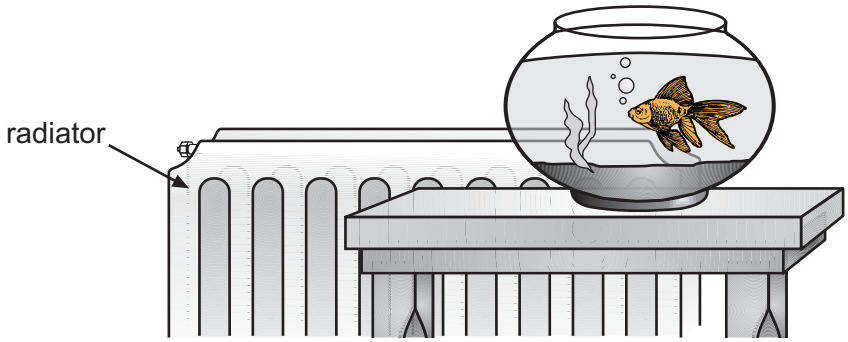
9 The table below shows the solubility of different substances in water at 15 °C and 20 °C.

Substance	Solubility (g/100g water)	
	at 15 °C	at 20 °C
salt	28.0	36.0
oxygen	0.005	0.004
carbon dioxide	0.18	0.14
sugar	176.0	204.0

(a) Which substances shown in the table decrease in solubility as the temperature increases?

_____ [1]

During spells of cold weather some goldfish owners place their goldfish near a warm radiator.



(b) Suggest, using the information in the table, why this may not be such a good idea.

_____

_____

_____ [3]

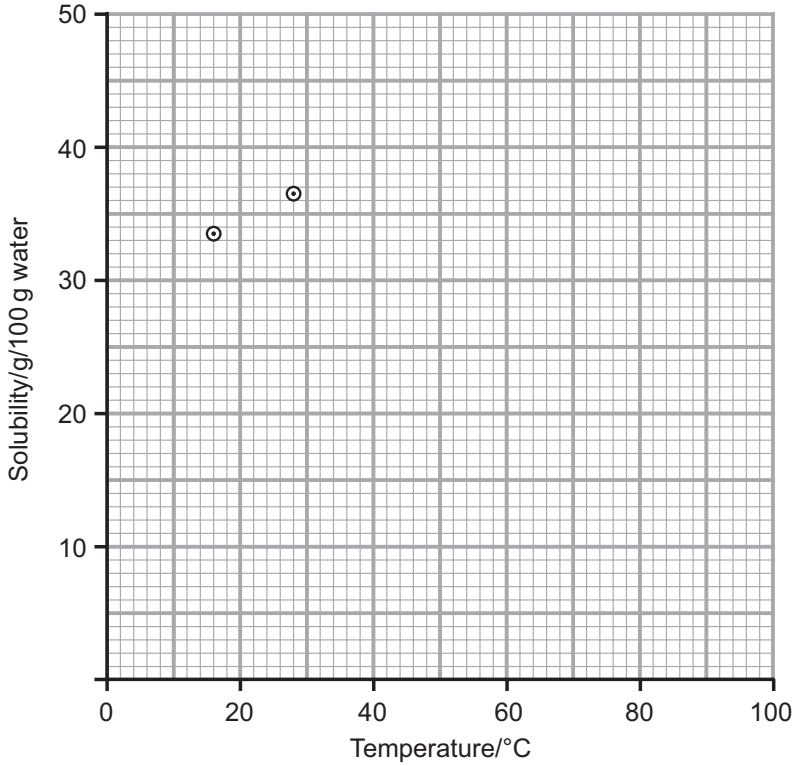
Examiner Only

Marks	Remark

(c) Use the values in the table below to plot the solubility curve for potassium chloride.
The first two points have been done for you.

Temperature (°C)	16	28	41	58	80
Solubility (g/100 g water)	33.3	36.4	40	44.4	50.0

[2]



(d) Use your graph to answer the following questions.

(i) What is the solubility of potassium chloride at 50 °C?

_____ [1]

(ii) A solution of potassium chloride at 20 °C contains 30 g of potassium chloride dissolved in 100 g of water. State whether the solution is saturated or unsaturated.

_____ [1]

Examiner Only

Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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New Specification

Rewarding Learning

General Certificate of Secondary Education
2011–2012

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

TUESDAY 28 FEBRUARY 2012
11.00 am–12.00 noon

MARK SCHEME

STEMUP.CO.UK

General Marking Instructions and Mark Grids

Introduction

Mark schemes are intended to ensure that the GCSE examination is marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria that they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these marking instructions.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners must be positive in their marking, giving appropriate credit for description, explanation and analysis, using knowledge and understanding and for the appropriate use of evidence and reasoned argument to express and evaluate personal responses, informed insights and differing viewpoints. Examiners should make use of the whole of the available mark range of any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Types of mark scheme

Mark schemes for questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

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			AVAILABLE MARKS
1	(a)	Any **one** from: idea of international recognition idea of eye catching idea of recognition without ability to read [1]	
	(b)	Flammable  Corrosive [3]	
	(c) (i)	Ethanol [1]	
	(ii)	Sulfuric acid [1]	6
2	(a)		

Property	Solid	Liquid	Gas
Will melt when heated	✓		
Takes the shape of the container		✓	✓
Takes the volume and shape of the container			✓
Has a defined shape	✓		
Can be compressed			✓

[1] per correct tick [5]

(b) (i) The temperature [1] at which a solid becomes a liquid [1] [2]

(ii) solid A and D [2]
liquid C [1] [3]

(c) X = freezing [1]
Y = sublimation [1]
Z = condensing [1] [3] 13

3 (a) (i) Any **two** of:
carbon/iron/tin [1]

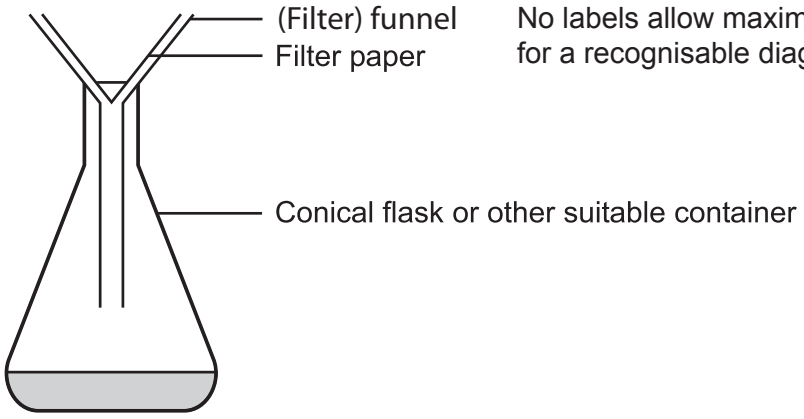
(ii) Mixture [1] idea that one component is a metal [1] [2]

(b) Idea that white plastic is composed of two or more elements [1]
chemically combined [1] [2] 5

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			AVAILABLE MARKS
4	proton	Has a relative mass of 1 and a charge of +1 [1]	
	mass number	Total number of protons and neutrons in an atom [1]	
	atomic number	The number of protons in an atom [1]	
		[3]	3

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



No labels allow maximum [2]/[3] for a recognisable diagram.

[3]

(ii) Correctly label the liquid in the container as filtrate [1]

(b) Candidates tick the box beside "Universal Indicator" [1]

(c) Soil B [1] — 6

6 **(a)** **(i)** Mg^{2+} [1]

(ii) SO_4^{2-}/NO_3^- [1]

(iii) Na [1]

(iv) NO_3^- [1]

(b) Lithium oxide [1]

(c) Correct direction of transfer of electrons [1]
Correct number transferred from lithium [1]
Correct number transferred to oxygen/idea of 2:1 ratio [1]
Idea of covalency = [0] [3]

(d) Any **two** from:
- solid/white/solid white/crystalline [1]
- high melting point (**not** high boiling point) [1]
- soluble/dissolves (in water) [1]
- does not conduct electricity (as a solid) [1]
- will conduct electricity in liquid form [1]
- brittle [1]

[2] — 10

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AVAILABLE MARKS

7 **(a)** Candidates tick the box beside “A substance which is able to dissolve another substance” [1]

(b)

Response	Mark
Candidates must use appropriate specialist terms throughout to describe fully the chemical identification of water in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	([5]–[6])
Candidates use some appropriate specialist terms to describe the chemical identification of water in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	([3]–[4]
Candidates make reference to 1–2 of the main points shown below using limited spelling, punctuation and grammar. The form and style is of limited standard and they have made no use of specialist terms.	([1]–[2])
Candidates make no reference to the main parts below and offer no other suitable response.	([0])

Use of anhydrous [1] copper sulfate [1]
White [1] to blue [1]
Practical idea of addition of the $CuSO_4$ to water/testing each sample individually [1]
Idea that this result indicates water [1]

Alternative to first 4 marking points:
Use of anhydrous [1] cobalt chloride [1]
Blue [1] to pink [1]

Accept for a maximum of [2]
Boiling point = 100 °C [1]
Freezing point = 0 °C [1] [6] 7

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					AVAILABLE MARKS
8	**(a)**				

Elements	Atomic Number	Electronic configuration	Group Number
A	12	2,8,2	**2** [1]
B	6	**2,4** [1]	4
C	**9** [1]	2,7	7
D	15	**2,8,5** [1]	5

[4]

(b) 2 (electrons) [1]

(c) Sulfur [1]

(d) **(i)** The alkali metals (**not** alkaline) [1]

(ii) They react with water (vapour) **in the air** [1]

(e) **(i)** Idea of shiny surface [1]

(ii) Idea that surface begins to tarnish [1]

(f) Any **two** from:
Use small pieces/use tongs to lift the alkali metal/use a safety screen [2] — 12

9 **(a)** Oxygen and carbon dioxide [1]

(b) Idea that fish require (dissolved) oxygen for survival [1]
As the temperature increases the dissolved oxygen (content of the water) decreases [1]
Link decreasing oxygen content to death of fish/distress/showing signs of struggling [1] [3]

(c) 3 points correctly drawn [1]
curve continued [1] [2]

(d) **(i)** 42 g/100 g water/read from candidate's graph [1]

(ii) Unsaturated [1] — 8

Total — **70**

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New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

GSD21

WEDNESDAY 9 NOVEMBER 2011
9.15 am–10.15 am

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 eleven** questions.

INFORMATION FOR CANDIDATES

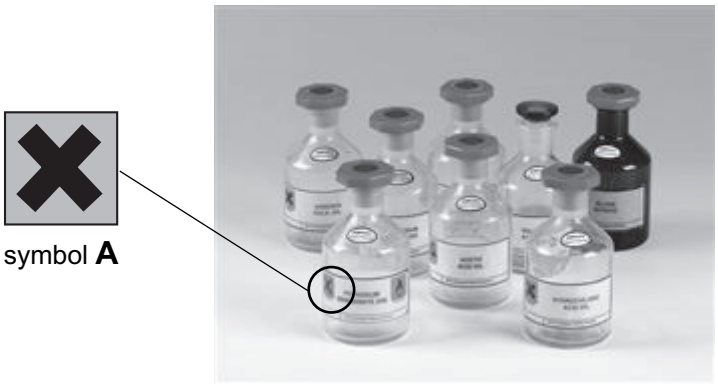
The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in **questions 6(b) and 11(b)**.
A Data Leaflet which includes a Periodic Table of the elements is provided.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total Marks	

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Examiner Only	
Marks	Remark

1 Bottles of chemicals in a chemistry laboratory are shown in the photograph below. Each bottle is labelled with a symbol. One of the symbols is enlarged on the left hand side of the photograph (symbol **A**).



symbol **A**

© *Timstar Laboratory Suppliers Ltd*

(a) What are these symbols called? Circle the correct answer.

chemical symbols **danger symbols** **hazard symbols** [1]

(b) Give **two** reasons why these symbols are used on bottles of chemicals.

1. _____

_____

2. _____

_____ [2]

(c) What does symbol **A**, shown above, tell you about the chemical in the bottle?

_____ [1]

One of the bottles contains a solution of barium chloride, which is a **poisonous** chemical.

(d) Draw the symbol found on the bottle of barium chloride solution in the box below.

[1]

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2 Use the information in the table below to decide if the substance is an element, a compound or a mixture. The first one has been done for you.

Description of Substance	Element	Compound	Mixture
A red–brown substance which conducts electricity and melts when heated.	✓		
A liquid which can be evaporated to give a white solid.			
A green solid forms a black powder and a colourless gas when it is heated.			
A colourless gas which burns to form water.			
A thick sticky black liquid which separates into many different gases, liquids and solids when heated.			

[4]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

3 Aeroplane wheels, similar to those in the picture below, may be made from an **alloy** of aluminium.



© ThinkQuest http://library.thinkquest.org/C004036F/parts.html

(a) Choose a word from the list to complete the sentence below.

a compound **a molecule** **an element** **a mixture**

An alloy is _____ containing at least one metal. [1]

(b) Give **two** properties, apart from strength, of the aluminium alloy which make it suitable for use as an aeroplane wheel.

1. _____

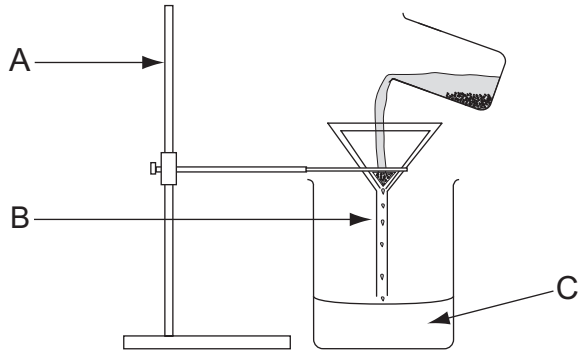
2. _____ [2]

Examiner Only	
Marks	Remark

4 A mixture of salt and sand may be easily separated using the following method:

1. Add water to the mixture and stir.

2. Filter the resulting mixture using the apparatus below.



(a) What happens to the salt and the sand when the water is added and the mixture stirred?

The salt _____

The sand _____ [2]

(b) Name the pieces of apparatus A and B.

A _____

B _____ [2]

(c) Which **two** of the terms in the list below best describe substance C? Circle the **two** correct answers.

residue	**distillate**	**solution**
filtrate	**insoluble**	**solvent** [2]

(d) Explain how you would obtain a dry sample of pure salt from substance C.

_____

_____

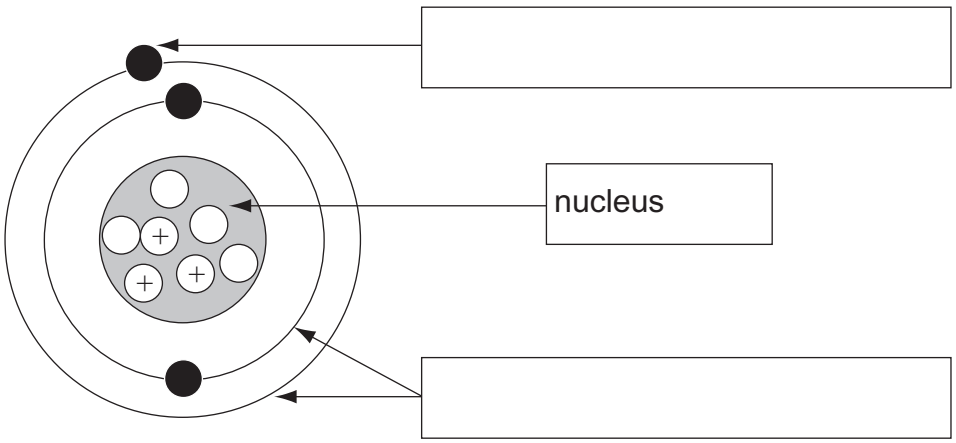
_____ [2]

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Examiner Only	
Marks	Remark

5 The diagram below represents an atom.

(a) Fill in the missing labels to complete the diagram.



[2]

(b) The nucleus contains two different types of particles.

(i) Name the type of particle in the nucleus which has a positive charge.

_____ [1]

(ii) What is the atomic number of this atom?

_____ [1]

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Examiner Only	
Marks	Remark

6 Solid iodine undergoes a change of state known as **sublimation**.

(a) Explain what is meant by the term **sublimation**.

_____

_____ [2]

In Part (b) you will be assessed on your written communication skills including the use of specialist science terms.

(b) The result of an experiment to demonstrate the sublimation of solid iodine in the laboratory is shown in the photograph below. Describe how you would safely carry out this experiment.



© Peter Arnold/Getty Images

_____

_____

_____

_____

_____

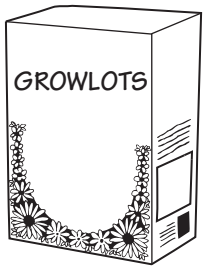
_____

_____

_____ [6]

Examiner Only	
Marks	Remark

7 Growlots plant fertiliser is sold as a blue powder. The instructions for preparing the fertiliser for use are given below.



- ➢ Place two tablespoons of the powder into a watering can.
- ➢ Add two litres of water.
- ➢ When fully dissolved the fertiliser is ready for use.

(a) (i) Give two ways in which the powder can be dissolved faster.

1. _____

2. _____ [2]

(ii) How would you know when the powder is fully dissolved?

_____ [1]

(b) The fertiliser is made up of two salts, copper(II) sulfate and iron(III) sulfate. Each salt can be made by reacting an acid with a base.

(i) Name the acid used to make the two salts in the fertiliser.

_____ [1]

(ii) What is the name given to this **type** of chemical reaction?

_____ [1]

(iii) When an acid reacts with a base, a salt and one other compound is formed. Write the **formula** for the other compound formed when an acid reacts with a base.

_____ [1]

(iv) Suggest why Growlots fertiliser is blue in colour.

_____

_____ [1]

(v) The formulae of copper(II) sulfate and iron(III) sulfate are given in the table below.

Complete the table by filling in the number of atoms of each element present in the formulae.

Formula	Number of atoms	
	sulfur	**oxygen**
$CuSO_4$	1	
$Fe_2(SO_4)_3$		

[3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

8 Copper(II) sulfate is a **hydrated** salt and has a high solubility in water.

(a) (i) What is meant by the term **hydrated**?
Tick (✓) the correct box.

can dissolve in water	☐
is wet to the touch	☐
contains water of crystallisation	☐
cannot absorb any more water	☐

[1]

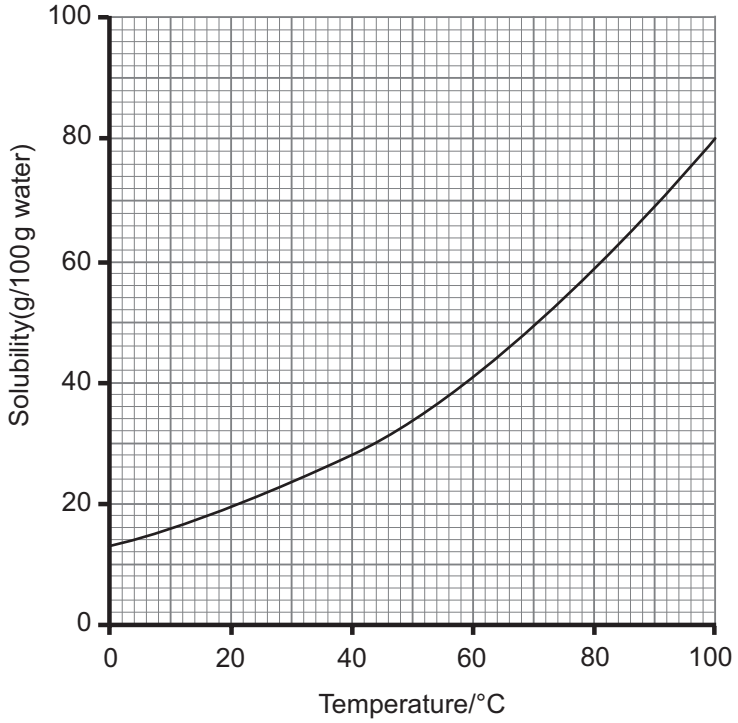
(ii) Explain what is meant by the term **solubility** by circling the correct words in the sentence below.

Solubility is the | minimum / average / maximum / total | mass of a solid which will dissolve in 100 g of water at a given | time / temperature / rate / volume | .

[2]

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(b) The solubility curve for copper(II) sulfate is drawn below.



Use the solubility curve to answer the following questions.

(i) How does the solubility of copper(II) sulfate change as the temperature of the water increases?

_____

_____ [1]

(ii) What is the solubility of copper(II) sulfate at 76 °C?

_____ [1]

(iii) State whether the following copper(II) sulfate solutions are saturated or unsaturated.

Solution			Saturated/unsaturated
Mass of $CuSO_4$ (g)	**Mass of water (g)**	**Temperature °C**	
45	100	60	
20	100	30	

[2]

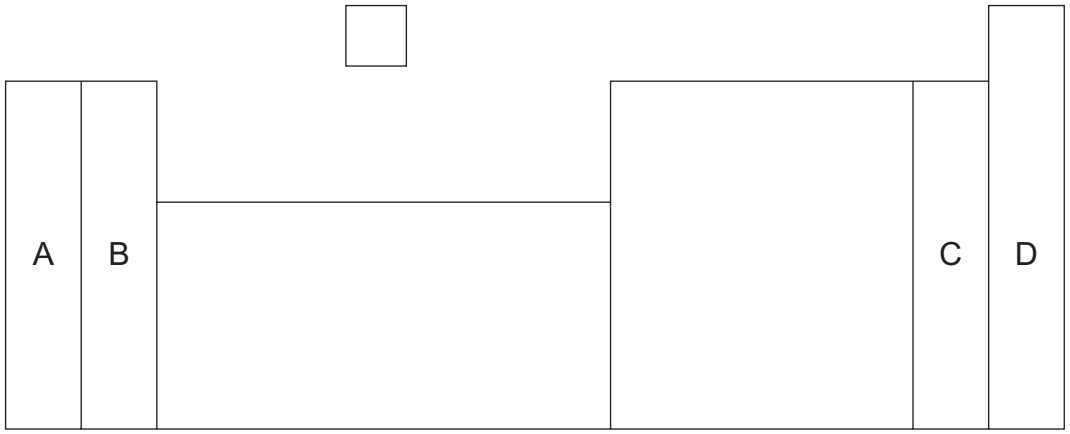
Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

9 The Periodic Table is a list of all known elements. Vertical columns called groups contain elements which react in a similar way.

The outline of the Periodic Table shown below shows four groups, labelled A, B, C and D.



(a) Which of the groups, A, B, C or D,

(i) is a group of unreactive gases? _____ [1]

(ii) contains the alkali metals? _____ [1]

The alkali metals are very reactive.

(b) How are the alkali metals stored?

_____ [1]

(c) Iron is a transition metal.

(i) Shade the area in the Periodic Table above where iron is placed. [1]

(ii) Give **one** use of iron.

_____ [1]

Many scientists have worked to develop the Periodic Table.

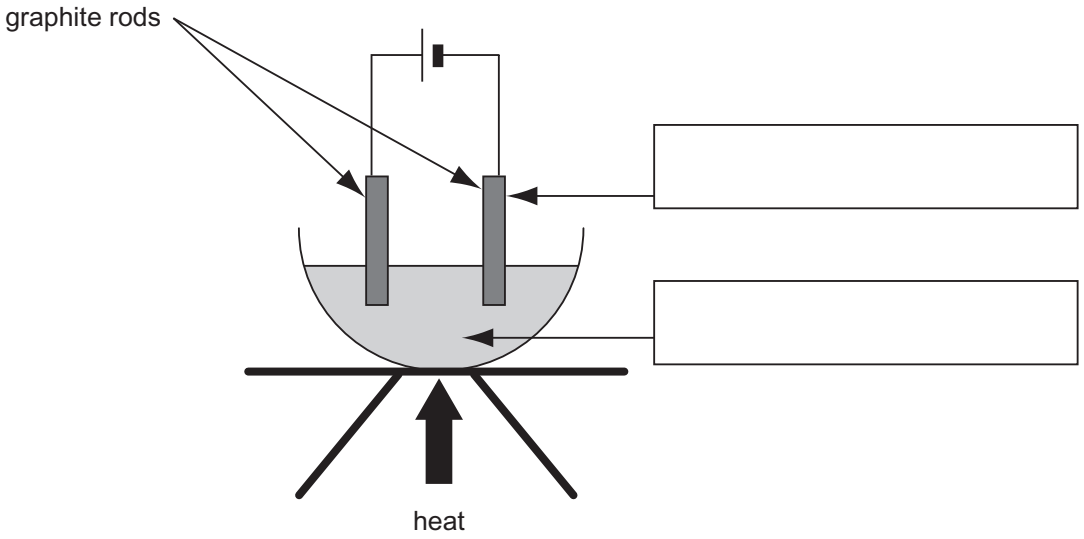
(d) Name **one** scientist who has contributed to the development of the Periodic Table.

_____ [1]

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10 Reactive metals are obtained from their compounds by electrolysis.

The diagram below represents an electrolysis cell. The metal compound is heated until it melts and electricity is passed through it.



(a) Complete the labels on the diagram by using **two** of the chemical terms given below.

anode **cathode** **electrolyte** **cation** [2]

(b) What happens to the molten compound when the electricity is passed through it?

_____ [1]

(c) Give **two** reasons why the rods are made of graphite.

Tick (✓) two boxes.

Graphite is a form of carbon. ☐

Graphite is a conductor of electricity. ☐

Graphite does not react with the molten compound. ☐

Graphite is a lubricant. ☐

Graphite is a non-metal. ☐

[2]

Examiner Only

Marks	Remark

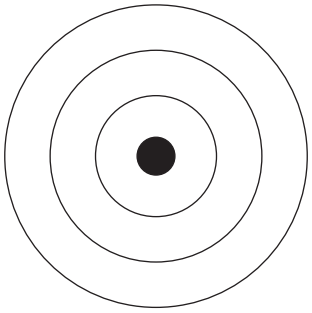
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Examiner Only	
Marks	Remark

11 Sodium reacts with chlorine to form the compound sodium chloride.

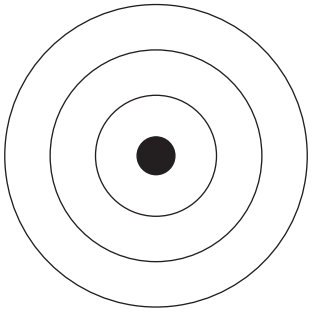
(a) Complete the diagrams below to show the arrangement of **all** of the electrons in a sodium atom and a chlorine atom.

(i) Sodium atom



[1]

(ii) Chlorine atom



[1]

In Part (b) you will be assessed on your written communication skills including the use of specialist science terms.

(b) Explain, using electronic structures, how sodium and chlorine bond to form the compound sodium chloride.

[6]

(c) Sodium chloride has a high melting point. Give **two** other physical properties you would expect sodium chloride to have.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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111997

New Specification

Rewarding Learning

General Certificate of Secondary Education
2011–2012

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

WEDNESDAY 9 NOVEMBER 2011
9.15 am–10.15 am

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)**	Candidates circle hazard symbols [1]	
	(b)	Any **two** from idea of warning of danger idea of international recognition idea of eye catching idea of recognition without ability to read [2]	
	(c)	Irritant/harmful [1]	
	(d)	 [1]	5
2			

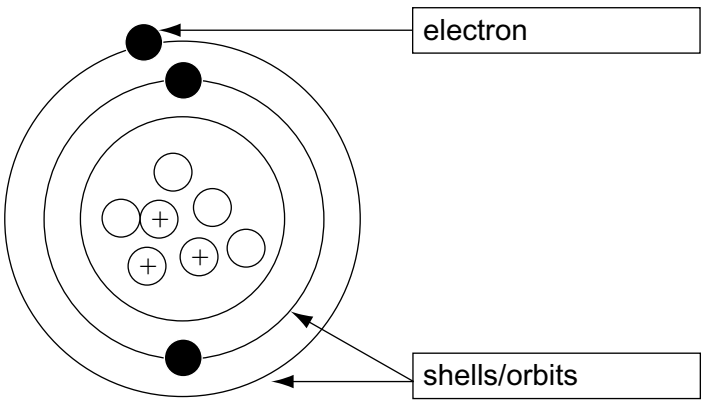
Element	Compound	Mixture
		✓
	✓	
✓		
		✓

[4] 4

3	**(a)**	Mixture [1]	
	(b)	Any **two** from Light/low density idea of resistance to corrosion idea that Al alloys are malleable idea that Al alloys are longlasting [2]	3
4	**(a)**	idea that the salt dissolves [1] the sand does not dissolve [1] [2]	
	(b)	retort/stand [1] filter funnel [1] [2]	
	(c)	filtrate [1] solution [1] [2]	
	(d)	evaporate (the water from the solution) [1] using a Bunsen burner/suitable container e.g. evaporating basin [1] accept idea of heat [2]	8

	AVAILABLE MARKS

5 (a)



[2]

(b) (i) Proton [1]

(ii) 3 [1] — 4

6 (a) Change (of state) from a solid to a gas [2]
vice versa [1] max. [2]

Indicative content
Candidates may use the apparatus in the picture or can choose other appropriate apparatus:

- Place the solid iodine in a beaker
- Place an evaporating dish on top of the beaker
- Place cold water in the evaporating dish
- Heat (gently) (with a Bunsen burner)
- 1–3 appropriate safety precautions including using a fume cupboard [6] — 8

Maximum 3 safety points must include use of fume cupboard

(b)

Response	Mark
Candidates must use appropriate specialist terms throughout to describe fully, using 5–6 of the terms shown in the indicative content, the demonstration of the sublimation of solid iodine in the laboratory in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	5–6
Candidates using 3–4 of the points shown in the indicative content partially describe the demonstration of the sublimation of solid iodine in the laboratory in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	3–4
Candidates make reference to 1–2 of the main points shown above using limited spelling, punctuation and grammar. The form and style is of limited standard and they have made little use of specialist terms.	1–2
Candidates make no reference to the main points below and offer no other suitable response.	0

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				AVAILABLE MARKS
7	(a)	(i)	Any **two** from Stirring/adding warm water/heating the mixture/adding more water [2]	
		(ii)	idea of no solid left at the bottom of the watering can/idea of completely disappearing [1]	
	(b)	(i)	sulfuric acid accept completely correct formula H_2SO_4 [1]	
		(ii)	Neutralisation [1]	
		(iii)	H_2O [1]	
		(iv)	the fertiliser contains copper sulfate (which is blue) [1]	
		(v)		

Formula	Number of atoms	
	sulfur	**oxygen**
$CuSO_4$	1	**4**
$Fe_2(SO_4)_3$	**3**	**12**

[3]

10

8	(a)	(i)	Candidates tick contains water of crystallisation [1]	
		(ii)	Candidates circle maximum [1] temperature [1] [2]	
	(b)	(i)	idea of as the temperature of the water increases the solubility increases [1]	
		(ii)	55 (g/100g water) ±1 [1]	
		(iii)		

Solution			Saturated/ unsaturated
Mass of $CuSO_4$ (g)	**Mass of water (g)**	**Temperature °C**	
45	100	60	**saturated**
20	100	30	**unsaturated**

[2]

7

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				AVAILABLE MARKS
9	**(a)**	**(i)** D	[1]	
		(ii) A	[1]	
	(b)	Under oil	[1]	
	(c)	**(i)** Candidates shade in all of the block to the right of block B	[1]	
		(ii) In bridges, in structures or other suitable	[1]	
	(d)	Mendeleev/Newlands	[1]	6
10	**(a)**	cathode electrolyte	[2]	
	(b)	Idea of decomposition	[1]	
	(c)	Candidates tick graphite is a conductor of electricity graphite does not react with the molten compound	[2]	5

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AVAILABLE MARKS

11 (a) Candidates draw diagrams to show the electronic structures
Na 2, 8, 1 [1]
Cl 2, 8, 7 [1]

Indicative content
- Transfer
- Correct direction of transfer
- Correct number of electrons transferred
- Correct electronic structure for sodium ion
- Correct charge on either ion
- Correct electronic structure for chloride ion
- Reference to how the ions are held together [6]

(b)

Response	Mark
Candidates must use appropriate specialist terms throughout to describe fully, using 5–7 of the points shown in the indicative content, how the atoms of sodium and chlorine bond to form sodium chloride in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	5–6
Candidates use using 3–4 of the points shown in the indicative content partially describe how the atoms of sodium and chlorine bond to form sodium chloride in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	3–4
Candidates make reference to 1–2 of the main points shown above using limited spelling, punctuation and grammar. The form and style is of limited standard and they have made little use of specialist terms.	1–2
Candidates make no reference to the main points below and offer no other suitable response. Response not worthy of credit	0

(c) Any **two** from
Hard/brittle/does not conduct electricity as a solid/soluble (in water) conducts electricity when molten or dissolved in water [2]

10

Total **70**

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