

Write your name here	
Surname	Other names
Centre Number	Candidate Number
<div style="display: inline-block; width: 25px; height: 25px; border: 1px solid black; margin: 2px;"></div> <div style="display: inline-block; width: 25px; height: 25px; border: 1px solid black; margin: 2px;"></div> <div style="display: inline-block; width: 25px; height: 25px; border: 1px solid black; margin: 2px;"></div> <div style="display: inline-block; width: 25px; height: 25px; border: 1px solid black; margin: 2px;"></div> <div style="display: inline-block; width: 25px; height: 25px; border: 1px solid black; margin: 2px;"></div>	<div style="display: inline-block; width: 25px; height: 25px; border: 1px solid black; margin: 2px;"></div> <div style="display: inline-block; width: 25px; height: 25px; border: 1px solid black; margin: 2px;"></div> <div style="display: inline-block; width: 25px; height: 25px; border: 1px solid black; margin: 2px;"></div> <div style="display: inline-block; width: 25px; height: 25px; border: 1px solid black; margin: 2px;"></div>
<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <h1 style="margin: 0;">Edexcel GCSE</h1> <h2 style="margin: 0;">Chemistry/Additional Science</h2> <h3 style="margin: 0;">Unit C2: Discovering Chemistry</h3> </div> <div style="width: 35%; text-align: right;"> <h2 style="margin: 0;">Higher Tier</h2> </div> </div>	
Additional Sample Assessment Material Time: 1 hour	Paper Reference <h2 style="margin: 0;">5CH2H/01</h2>
You must have: Calculator, ruler	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

S39595A

©2011 Edexcel Limited.

6/8/8/



edexcel
 advancing learning, changing lives

2

Period

1

Key

2

Answer ALL questions

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Metal atoms

1 The table shows some information about four metals.

metal	atomic number	electronic configuration
lithium	3	2.1
sodium	11	
magnesium	12	2.8.2
calcium	20	2.8.8.2

(a) State the electronic configuration of sodium.

(1)

(b) Magnesium and calcium are in the same group of the periodic table.

Explain why they are both in the same group.

(2)

(c) Complete the sentence by putting a cross (☒) in the box next to your answer.

The atomic number of an element is equal to the number of

(1)

- ☐ **A** neutrons in the nucleus of its atom
- ☐ **B** electrons in the nucleus of its atom
- ☐ **C** protons in the nucleus of its atom
- ☐ **D** protons and neutrons in the nucleus of its atom



(d) Which of these statements is correct about the particles in atoms?

Put a cross (X) in the box next to your answer.

(1)

- ☐ **A** a proton has the same mass as an electron
- ☐ **B** an electron is heavier than a proton
- ☐ **C** a neutron is lighter than an electron
- ☐ **D** a neutron has the same mass as a proton

(e) A lithium atom contains charged particles and yet the atom has no overall charge.

Explain why.

(2)

.....

.....

.....

.....

(Total for Question 1 = 7 marks)



Structures

2 The table shows some properties of diamond and graphite.

diamond	graphite
colourless crystals	black, shiny solid
very hard	flakes easily
does not conduct electricity	conducts electricity

- (a) (i) Suggest why diamond and graphite might be expected to have similar properties.

(1)

- (ii) By referring to its structure, explain why diamond is very hard.

(3)

- (iii) By referring to its structure, explain why graphite flakes easily.

(2)



(b) Complete the sentence by putting a cross (☒) in the box next to your answer.

Carbon dioxide is a gas at room temperature.

A carbon dioxide molecule is a

(1)

- ☐ **A** giant molecule that has covalent bonds
- ☐ **B** giant molecule that has ionic bonds
- ☐ **C** simple molecule that has covalent bonds
- ☐ **D** simple molecule that has ionic bonds

(c) The atomic number of carbon is 6 and of fluorine is 9.

Carbon and fluorine atoms are combined in a tetrafluoromethane molecule, CF_4 .

Draw a dot and cross diagram of a tetrafluoromethane molecule.

Show outer electrons only.

(2)

(Total for Question 2 = 9 marks)



Sodium

- 3 The picture shows sodium metal reacting with chlorine gas to produce solid sodium chloride.



- (a) (i) Draw one straight line from each element to the part of the periodic table in which it is found.

(2)

element		part of periodic table
		<div><div></div>group 1</div>
<div>sodium</div>	<div></div>	<div><div></div>group 7</div>
		<div><div></div>transition metals</div>
<div>chlorine</div>	<div></div>	<div><div></div>group 8</div>

- (ii) Write a balanced symbol equation for the reaction of sodium with chlorine, Cl_2 .

(2)



(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Sodium chloride does not conduct electricity when solid but it does conduct electricity when molten.

It has a very high melting point.

The structure of sodium chloride is

(1)

- ☐ **A** ionic
- ☐ **B** simple molecular, covalent
- ☐ **C** giant molecular, covalent
- ☐ **D** metallic

(b) Sodium metal is stored under oil.

Explain why it is stored in this way.

(2)

.....

.....

.....

.....



(c) The table shows the elements in group 1 and their atomic numbers.

element	atomic number
lithium	3
sodium	11
potassium	19
rubidium	37
caesium	55
francium	87

Elements in group 1 increase in reactivity as their atomic numbers increase.

Explain why.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 3 = 11 marks)



Copper and its compounds

4 (a) Copper is a transition metal.

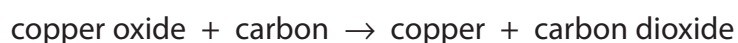
Which of these is a property of copper?

Put a cross (X) in the box next to your answer.

(1)

- ☐ A it is a poor conductor of electricity
- ☐ B it is brittle
- ☐ C it has a low melting point
- ☐ D it forms coloured compounds

(b) Jasmine reacted an oxide of copper with carbon.



She reacted 5.0 g of copper oxide.

In her reaction, 2.8 g of copper was formed.

The theoretical yield for this reaction is 4.0 g.

(i) State what is meant by the term **theoretical yield**.

(1)

(ii) The percentage yield of Jasmine's experiment was 70%.

Explain how this value was calculated.

(2)



(iii) State **two** reasons why the yield of Jasmine's experiment was not 100%.

(2)

.....

.....

.....

.....

(c) Calculate the relative formula mass of copper chloride, CuCl_2 .
(Relative atomic masses: Cu = 63.5, Cl = 35.5)

(1)

.....

.....

answer =

(d) 14.3 g of an oxide of copper contained 12.7 g of copper.

Calculate the empirical formula of this oxide.

Show your working.

(Relative atomic masses: Cu = 63.5, O = 16)

(3)

.....

.....

.....

.....

answer =

(Total for Question 4 = 10 marks)



S 3 9 5 9 5 A 0 1 1 1 5

Calcium carbonate

5 (a) Calcium carbonate reacts with dilute hydrochloric acid.

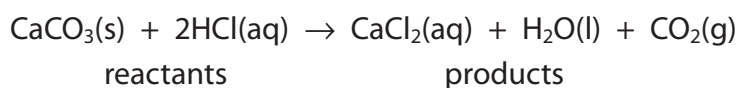
Complete the sentence by putting a cross (☒) in the box next to your answer.

In this reaction hydrochloric acid is

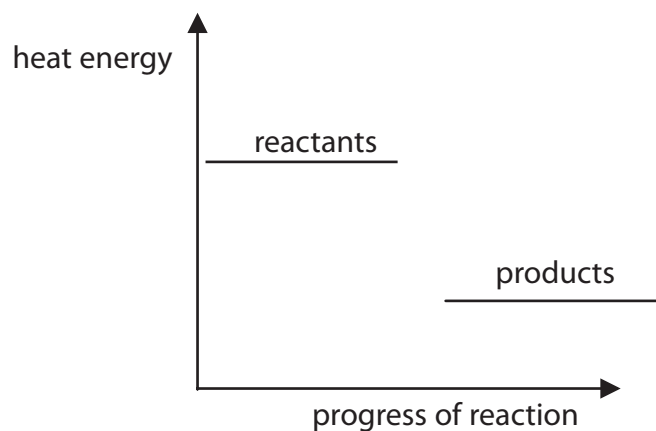
(1)

- ☐ **A** precipitated
- ☐ **B** displaced
- ☐ **C** neutralised
- ☐ **D** combusted

(b) The equation for the reaction is



The diagram shows the heat energy contained in the reactants and the heat energy contained in the products.



Use the diagram to explain why this reaction is as an exothermic reaction.

(2)



Explain, in terms of particles, why the rate of reaction increases.

*(d) An experiment was carried out to compare the rates of reaction between calcium carbonate and two different concentrations of hydrochloric acid.

Describe, in detail, how you would carry out this experiment.

(6)

(Total for Question 5 = 12 marks)



Salts

6 The table gives the names and formulae of three salts.

salt	formula
sodium carbonate	Na_2CO_3
copper sulfate	CuSO_4
calcium chloride	CaCl_2

- (a) The atomic number of calcium, Ca, is 20.
A calcium cation has the symbol Ca^{2+} .

How many electrons does a calcium cation contain?

(1)

- (b) The symbol for a sodium cation is Na^+ .

What is the symbol for a carbonate ion?

(1)

- (c) Calcium chloride is an ionic solid.
It has a high melting point of 782°C .

Explain why calcium chloride has a high melting point.

(3)



*(d) Choose **one** of the three salts from the table.

Describe, using suitable tests, how you would confirm the identity of each of the two ions in the salt you have chosen.

(6)

Name of salt

Description of your tests

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS



Additional Sample Mark Scheme

GCSE Science 2011

GCSE

GCSE Chemistry (5CH2H/01)

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- For questions worth more than one mark, the answer column shows how partial credit can be allocated. This has been done by the inclusion of part marks eg (1).
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- Write legibly, with accurate spelling, grammar and punctuation in order to make the meaning clear
- Select and use a form and style of writing appropriate to purpose and to complex subject matter
- Organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

General Information

The following symbols are used in the mark schemes for all questions:

Symbol	Meaning of symbol
eq	Indicates that credit should be given for other correct alternatives to a word or statement
/ oblique	Words or phrases separated by an oblique are alternatives to each other
{ } curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point

Question Number	Answer	Acceptable answers	Mark
1(a)	2.8.1	any separation allowed	(1)

Question Number	Answer	Acceptable answers	Mark
1(b)	<p>An explanation linking two of the following points</p> <ul style="list-style-type: none"> • both have two electrons (1) • in outer shell (1) • (therefore) in group 2 (1) 		(2)

Question Number	Answer	Acceptable answers	Mark
1(c)	C		(1)

Question Number	Answer	Acceptable answers	Mark
1(d)	D		(1)

Question Number	Answer	Acceptable answers	Mark
1(e)	<p>An explanation linking the following points</p> <ul style="list-style-type: none"> • {equal numbers of / three} protons and electrons (in atoms) (1) • proton (charge) +1 and electron (charge) -1 (1) 		(2)

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	both (pure forms of) carbon / both giant molecular		(1)

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	<p>An explanation linking three of the following points</p> <ul style="list-style-type: none"> • (every) carbon atom forms four bonds (1) • strong bonds / hard to separate atoms from lattice (1) • covalent bonds (1) • no weaknesses in molecule (1) 		(3)

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	<p>An explanation linking the following</p> <ul style="list-style-type: none"> • (in) layers (1) • weak forces between layers (1) 		(2)

Question Number	Answer	Acceptable answers	Mark
2(b)	C		(1)

Question Number	Answer	Acceptable answers	Mark
2(c)	<ul style="list-style-type: none"> • four bonding pairs shown (1) • six non bonded electrons on each fluorine atom (1) 		(2)

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	<ul style="list-style-type: none"> a single line from sodium to group 1 (1) a single line from chlorine to group 7 (1) 		(2)

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	$2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ correct formulae (1) balancing of correct formulae (1)		(2)

Question Number	Answer	Acceptable answers	Mark
3(a)(iii)	A		(1)

Question Number	Answer	Acceptable answers	Mark
3(b)	An explanation linking two from the following points <ul style="list-style-type: none"> sodium is very reactive (1) sodium reacts with water (1) sodium reacts with oxygen / air (1) oil prevents moisture / air from contacting metal (1) 		(2)

Question Number	Answer	Acceptable answers	Mark
3(c)	<p>An explanation linking four from the following points</p> <ul style="list-style-type: none"> atoms react by losing one electron (1) electron is lost from outer shell (1) atoms increase in size lithium to francium (1) (outer) electron lost most easily from biggest atom (1) (because) electron further from nucleus / more electrons between nucleus and outer shell / more shells (1) 		(4)

Question Number	Answer	Acceptable answers	Mark
4(a)	D		(1)

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	the mass (of product) is calculated (from the balanced equation) (1)		(1)

Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	$\frac{\text{actual yield}}{\text{theoretical yield}} \times 100$ <div style="display: flex; justify-content: space-around; align-items: center;"> <div> $\frac{2.8}{4.0} \times 100$ </div> <div>(1)</div> </div>	allow formula described in words	(2)

Question Number	Answer	Acceptable answers	Mark
4(b)(iii)	<p>Any two from the following points</p> <ul style="list-style-type: none"> loss of product during experiment (1) reaction does not complete (1) not enough carbon in mixture (1) other (unwanted) reactions occur (1) 		(2)

Question Number	Answer	Acceptable answers	Mark
4 (c)	$63.5 + (2 \times 35.5) / 134.5$ (1)		(1)

Question Number	Answer	Acceptable answers	Mark
4 (d)	<ul style="list-style-type: none"> mass of oxygen = $14.3 - 12.7$ (1) =1.6 <p>copper atoms: oxygen atoms = $12.7/63.5 : 1.6/16$ (1) 0.2 : 0.1</p> <ul style="list-style-type: none"> Cu_2O (1) 		(3)

Question Number	Answer	Acceptable answers	Mark
5(a)	C		(1)

Question Number	Answer	Acceptable answers	Mark
5(b)	<p>An explanation linking the following points</p> <ul style="list-style-type: none"> • products (of reaction) contain less heat energy than reactants (1) • difference in heat energies given out (1) 		(2)

Question Number	Answer	Acceptable answers	Mark
5(c)	<p>An explanation linking three of the following points</p> <ul style="list-style-type: none"> • particles have more energy (1) • (therefore) move faster (1) • (therefore) more frequent collisions (1) • (therefore) more energetic collisions (1) • (therefore) more collisions {result in reaction / are successful} (1) 		(3)

Question Number		Indicative Content	Mark
QWC	*5(d)	<p>A description including some of the following points</p> <ul style="list-style-type: none"> known mass of calcium carbonate known volume of hydrochloric acid mix determine how fast reaction is by suitable measurements <p>(repeat with)</p> <ul style="list-style-type: none"> same mass of same calcium carbonate same volume of acid of different concentration at same temperature <ul style="list-style-type: none"> determine how fast reaction is compare results of experiments 	(6)
Level	0	No rewardable content	
1	1 - 2	<ul style="list-style-type: none"> a limited description of how to carry out the basic experiment / some relevant facts to carry out the experiment the answer communicates ideas using simple language and uses limited scientific terminology spelling, punctuation and grammar are used with limited accuracy 	
2	3 - 4	<ul style="list-style-type: none"> a possibly incomplete description of a workable experiment indicating control of at least one variable / a limited attempt at the former with some comparison of the results the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately spelling, punctuation and grammar are used with some accuracy 	
3	5 - 6	<ul style="list-style-type: none"> a clear description of a workable experiment indicating the control of most variables and how the correct comparison will be obtained the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately spelling, punctuation and grammar are used with few errors 	

Question Number	Answer	Acceptable answers	Mark
6(a)	18		(1)

Question Number	Answer	Acceptable answers	Mark
6(b)	CO ₃ ²⁻		(1)

Question Number	Answer	Acceptable answers	Mark
6(c)	<p>An explanation linking three of the following points</p> <ul style="list-style-type: none"> • strong (electrostatic) forces (1) • between ions (1) • of opposite charge (1) • large amount of energy required to separate (ions) (1) • high temperature required (to provide energy for melting) (1) 		(3)

Question Number		Indicative content	Mark
QWC	*6(d)	<p>A description to include some of the following points</p> <ul style="list-style-type: none"> • use of flame test for metal ion • put wire in flame then (conc) hydrochloric acid • put back and repeat until no flame colouration • put wire in (conc) hydrochloric acid then (solid) salt • put wire in flame • note flame colour • correct colour for chosen salt: <ul style="list-style-type: none"> sodium = yellow copper = blue-green calcium = (orange-) red <p>OR other correct test for copper cations and / or calcium cations</p> <p>test for carbonate</p> <ul style="list-style-type: none"> • add dilute acid to solid • (pass) gas given off • (into) limewater • turns milky • carbon dioxide <p>test for sulfate</p> <ul style="list-style-type: none"> • dissolve salt in water • add dilute hydrochloric acid • add barium chloride solution • white precipitate formed <p>test for chloride</p> <ul style="list-style-type: none"> • dissolve salt in water • add dilute nitric acid • add silver nitrate solution • white precipitate formed 	(6)
Level	0	No rewardable material	
1	1-2	<ul style="list-style-type: none"> • a limited description of at least two relevant points either from one test or from both tests • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy 	
2	3-4	<ul style="list-style-type: none"> • a detailed description of one test (the result of the test must be correct) (one minor slip may be ignored) / a limited, workable description of both tests • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy 	
3	5 - 6	<ul style="list-style-type: none"> • a detailed description of both tests (the results of both tests must be correct) (one minor slip may be ignored) • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors 	