

Write your name here

Surname

Other names

Centre Number

Candidate Number

**Edexcel GCSE**

# Chemistry/Science

## Unit C1: Chemistry in our World

**Higher Tier**

**Sample Assessment Material**

**Time: 1 hour**

Paper Reference

**5CH1H/01**

**You do not need any other materials.**

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 ►

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**Answer ALL questions**

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

**The oceans and atmosphere**

**1** The Earth's oceans and atmosphere are sources of useful substances.

(a) Chlorine can be obtained from seawater.

(i) Describe a test to show that a gas is chlorine.

(2)

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(ii) State, with a reason, a safety precaution you should take when testing for chlorine gas.

(2)

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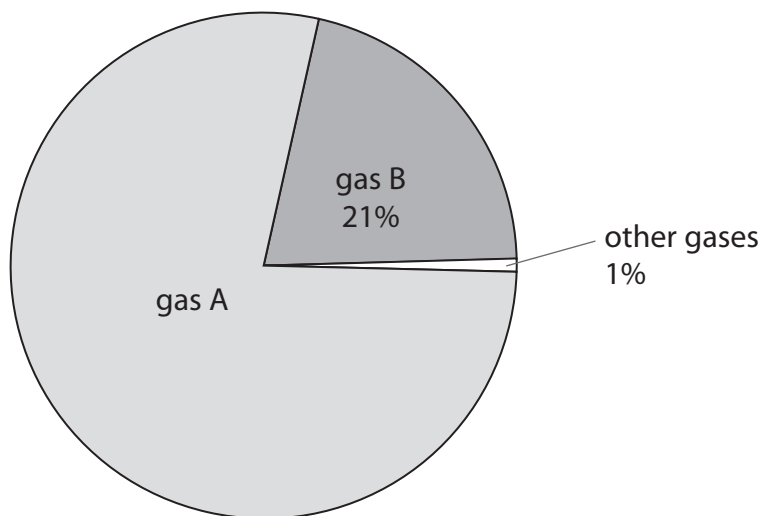
(iii) Complete the sentence by putting a cross () in the box next to your answer.

Chlorine gas is used in the manufacture of

(1)

- A** petrol
- B** soap
- C** poly(ethene)
- D** PVC

(b) The pie chart shows the composition of today's atmosphere.



(i) Name gas A and calculate the percentage of this gas in today's atmosphere. (2)

name of gas .....

percentage of gas .....%

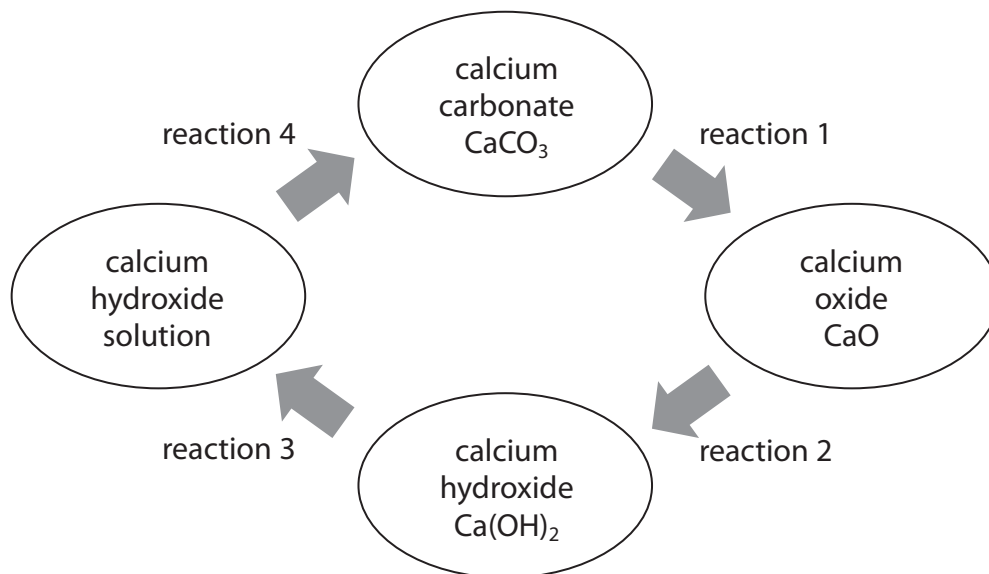
(ii) The amount of carbon dioxide in the atmosphere has increased in the last 100 years.  
Give **one** reason why this has happened. (1)

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**(Total for Question 1 = 8 marks)**

## Metal carbonates

2 (a) The diagram shows some reactions involving calcium compounds.



(i) How is the calcium carbonate turned into calcium oxide in reaction 1?

(1)

(ii) State **one** observation that can be made when water is added to calcium oxide in reaction 2.

(1)

(iii) 1 g of calcium oxide is added to 100 g water.  
The only product of the reaction is calcium hydroxide solution.

The mass of the calcium hydroxide solution is measured.

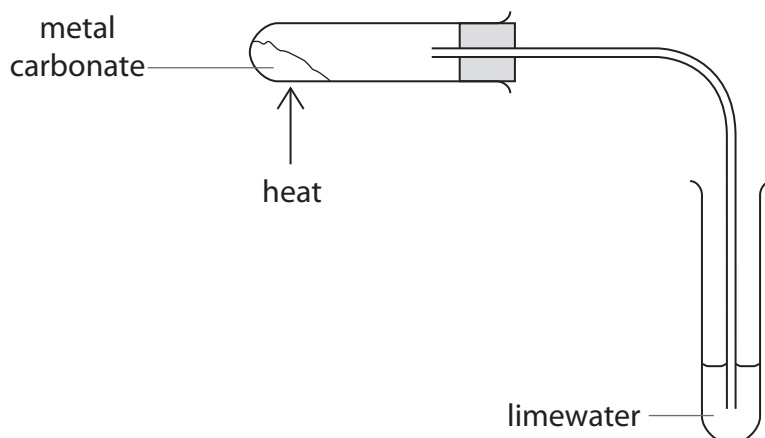
What is the maximum mass of calcium hydroxide solution formed?

(1)

Maximum mass of calcium hydroxide solution = .....g

Explain your answer.

- (b) Equal amounts of different metal carbonates were heated using the apparatus shown. The time taken for the limewater to go milky was measured.



Here are the results.

substance heated	time for limewater to go milky (s)
magnesium carbonate	20
calcium carbonate	41
strontium carbonate	57
barium carbonate	did not go milky after 300 s

- (i) Why did the limewater go milky in some of these experiments?

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

(1)

- A** oxygen already in the test tube passes into the limewater
- B** calcium hydroxide, which is milky, forms in the limewater
- C** carbon dioxide is formed from the metal carbonates
- D** when limewater becomes hot it goes milky

- (ii) Explain what the results of this experiment show about these metal carbonates.

(2)

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(iii) Explain why the scientist would repeat the experiment several times with each of the carbonates.

(2)

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**(Total for Question 2 = 8 marks)**

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## Iron and steel

3 Steel is made from iron. It has many uses.

(a) Iron is extracted from iron ore.

What is meant by the term ore?

(1)

(b) Stainless steel is an alloy of iron.

The photograph below shows some cutlery, made from stainless steel.



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

Iron is alloyed to make stainless steel for cutlery. Stainless steel is used to

(1)

- A reduce the cost
- B increase electrical conductivity
- C give a greater resistance to corrosion
- D increase the melting point

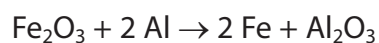
(c) Scrap steel can be recycled.

Explain why it is important to recycle scrap steel rather than making new steel.

(2)

- (d) Molten iron can be used to join railway tracks together.  
The molten iron is made by reacting iron oxide with aluminium.

The equation for the reaction is



The iron oxide has been reduced.

How does the equation show that the iron oxide is reduced?

(1)

- (e) The method used to extract metals from their ores depends on the reactivity of the metals.

Explain why iron and aluminium are extracted by two different methods.

(4)

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**(Total for Question 3 = 9 marks)**



## Acids and calcium carbonate

4 Calcium carbonate is found in rocks in the Earth's crust.

(a) Some calcium carbonate rocks are described as sedimentary.

Describe how a sedimentary rock is formed.

(2)

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(b) The photograph shows a statue made from a natural form of calcium carbonate. The statue has been damaged by rainwater.



Martin Bond/Science Photo Library

Explain how rainwater has damaged this statue.

(2)

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(c) Calcium carbonate,  $\text{CaCO}_3$ , is added to acidic soils.  
The calcium carbonate reacts with the acid in the soil and produces a salt.

(i) What type of reaction does the acid undergo when it reacts with the calcium carbonate?

(1)

(ii) Which of these is **not** a naturally occurring form of calcium carbonate?

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

(1)

**A** chalk

**B** limestone

**C** marble

**D** quicklime

(d) Explain why waste gases from coal-fired power stations are passed through calcium carbonate.

(2)

(e) Hydrochloric acid reacts with calcium carbonate to make calcium chloride, water and carbon dioxide.

Complete the balanced equation for this reaction.

(3)

..... + .....  $\rightarrow$   $\text{CaCl}_2$  + ..... + .....

**(Total for Question 4 = 11 marks)**

### Biofuels

5 Biofuels are increasingly used as fuels for cars.  
One biofuel is ethanol,  $C_2H_5OH$ .

(a) Write the word equation for the complete combustion of ethanol.

(2)

ethanol + ..... → ..... + .....

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

Ethanol for use as a biofuel is produced by

(1)

- A cracking
- B fermentation
- C electrolysis
- D reacting sugar cane or sugar beet with acid

\*(c) Some biofuels are made from plants.  
The biofuel ethanol is often made from sugar cane or sugar beet.

Petrol is a fossil fuel that is made from crude oil.

A small number of filling stations sell biofuels as well as petrol.



Evaluate the advantages and disadvantages of using biofuels instead of petrol as a fuel in cars.

(6)

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(d) A hydrogen fuel cell is an alternative source of power for a car.

Explain why there is an environmental benefit to using hydrogen fuel cells compared to combustion of petrol.

(3)

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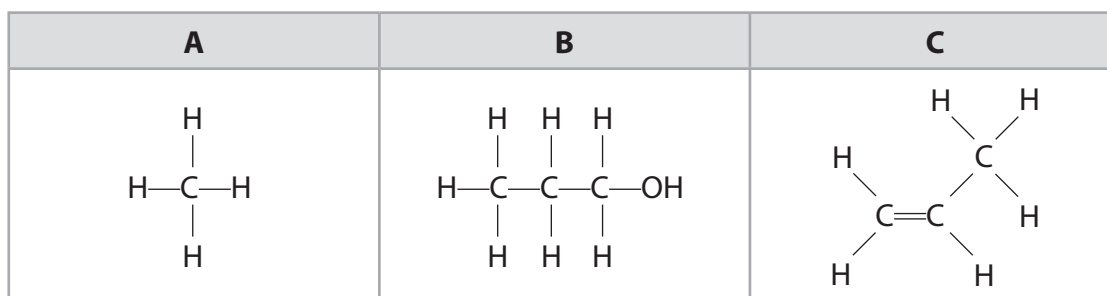
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**(Total for Question 5 = 12 marks)**

### Crude oil

6 Crude oil is a mixture of hydrocarbons.

(a) The diagram shows molecules of three compounds, **A**, **B** and **C**.



(i) Explain which of the compounds in the table are hydrocarbons.

(2)

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(ii) Give the molecular formula of **B**.

(1)

.....

(iii) What would you see if **C** was bubbled into some bromine water?

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

The mixture

(1)

- A** turns milky
- B** turns from orange to colourless
- C** turns clear
- D** turns yellow

(b) Draw the structure of a molecule of ethene, showing all the bonds.

(2)

\*(c) Alkenes can be used to make polymers (plastics).  
Polymers are useful materials.  
Waste polymers can be recycled, burned or buried in landfill sites.

Evaluate these three methods of dealing with waste polymers.

(6)

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**(Total for Question 6 = 12 marks)**

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**TOTAL FOR PAPER = 60 MARKS**





# Sample Mark Scheme

## Unit C1: Chemistry in our World (Higher Tier)

Question Number	Answer	Acceptable answers	Mark
1(a)(i)	a description including the following: add damp litmus paper to the gas (1) chlorine bleaches the litmus paper (1)	accept UI turns white	(2)

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	use a fume cupboard/gas mask/ventilated room (1) because it is toxic (1)	accept small volume of chlorine to avoid breathing it in	(2)

Question Number	Answer	Mark
1(a)(iii)	D	(1)

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	nitrogen/N <sub>2</sub> (1) 100 – (21 + 1) = 78(%) (1)	reject N	(2)

Question Number	Answer	Mark
1(b)(ii)	Any 1 from: combustion (burning) of fossil fuels/ respiration of humans and other animals/volcanoes erupting/due to deforestation/increased industrialisation/more cars	(1)

**TOTAL: 8 MARKS**

Question Number	Answer	Mark
2(a)(i)	heat	(1)

Question Number	Answer	Mark
2(a)(ii)	any one from <ul style="list-style-type: none"> <li>calcium oxide expands/flakes</li> <li>steam forms/hissing</li> <li>heat released</li> </ul>	(1)

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	an explanation linking:  101 g (0)  (because) no atoms escape/destroyed/created/conservation of mass (1)	allow (because) atoms in reactants and products are the same	(1)

Question Number	Answer	Mark
2(b)(i)	C	(1)

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	an explanation linking:  order of decomposition of carbonates/'stability' is Mg, Ca, Sr, Ba (1)  (because) carbon dioxide is produced faster from least stable carbonates/slower from more stable carbonates (1)	magnesium carbonate decomposes most quickly/magnesium carbonate 'least stable' and barium carbonate does not decompose/decomposes slowly/ 'most stable' (1)  (because) limewater will go milky quicker for an unstable carbonate/slower for a more stable carbonate (1)	(2)

Question Number	Answer	Mark
2(b)(iii)	an explanation linking the following:  can identify any anomalous results (1)  therefore calculate a more accurate average value (1)	(2)

**TOTAL: 8 MARKS**

Question Number	Answer	Mark
3(a)	mineral/rock/material from which a metal can be extracted	(1)

Question Number	Answer	Mark
3(b)	C	(1)

Question Number	Answer	Acceptable answers	Mark
3(c)	<p>an explanation linking any pair of statements:</p> <p>making steel uses raw materials(1) (so) recycling preserves supplies (1)</p> <p>making steel requires (lots of) energy (1) (so) recycling saves energy (1)</p> <p>scrap metal would be being disposed of (1) (so) recycling stops landfill(1)</p>	<p>raw materials must be mined (so) recycling reduces mining</p>	(2)

Question Number	Answer	Mark
3(d)	oxygen removed	(1)

Question Number	Answer	Acceptable answers	Mark
3(e)	<p>an explanation linking the following:</p> <p>aluminium must be extracted by electrolysis (1)</p> <p>(because) aluminium oxide cannot be reduced by carbon/aluminium is more reactive than carbon (1)</p> <p>(and)</p> <p>iron is extracted by heating with carbon (1)</p> <p>(because) iron is less reactive than carbon (1)</p>	<p>iron can be extracted by heating with carbon or by electrolysis (1)</p> <p>(but) electrolysis is too expensive for iron production (1)</p>	(4)

**TOTAL: 9 MARKS**

Question Number	Answer	Mark
4(a)	a description including the following in a logical order:  layers of sediment/shells laid down (1) compressed/compacted (over time)(1)	(2)

Question Number	Answer	Acceptable answers	Mark
4(b)	an explanation that links the following:  rain contains acid/is acidic (1) (which) reacts with the calcium carbonate in the statue (1)	accept named acid	(2)

Question Number	Answer	Mark
4(c)(i)	neutralisation	(1)

Question Number	Answer	Mark
4(c)(ii)	D	(1)

Question Number	Answer	Acceptable answers	Mark
4(d)	an explanation linking the following:  waste gases are acidic/contain sulfur dioxide(1) (so) calcium carbonate neutralises the acid(1)	waste gases cause acid rain (1) acid will react with calcium carbonate(1)	(2)

Question Number	Answer	Acceptable answers	Mark
4(e)	$\text{CaCO}_3 + 2 \text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$	LHS formulae (1) RHS formulae (1) balancing correct formulae (1)	(3)

**TOTAL: 11 MARKS**

Question Number	Answer	Acceptable answers	Mark
5(a)	ethanol + oxygen → carbon dioxide + water	3 correct = 2 marks 2 correct = 1 mark  NB products in either order	(2)

Question Number	Answer	Mark
5(b)	B	(1)

Question Number	Indicative content	Mark
*5(c) QWC	<p>an evaluation including references to the following:</p> <p>e.g. the advantages of biofuel making specific references to:</p> <ul style="list-style-type: none"> <li>• biofuel is renewable, petrol is finite</li> <li>• production uses CO<sub>2</sub> so 'carbon-neutral', reduction of greenhouse emissions</li> <li>• petrol gives 'greenhouse effect'</li> </ul> <p>may also refer to impact in the everyday world such as:</p> <ul style="list-style-type: none"> <li>• environmentally friendly</li> <li>• save drivers money</li> <li>• needs increased labour so helps to tackle world poverty</li> </ul> <p>e.g. the disadvantages of biofuel making specific references to:</p> <ul style="list-style-type: none"> <li>• need land to grow crops</li> <li>• losing land to grow food</li> <li>• low availability so low impact</li> </ul> <p>more sophisticated responses may include comment on:</p> <ul style="list-style-type: none"> <li>• biodiversity - loss of habitats</li> <li>• first generation biofuel not sustainable</li> <li>• burning of some crops can produce as much in carbon emissions</li> </ul>	(6)
Level	0	no rewardable material
1	1-2	<ul style="list-style-type: none"> <li>• a few advantages given regarding the use of biofuels compared to petrol</li> <li>• a few disadvantages given regarding the use of biofuels compared to petrol</li> <li>• little comparison of the comparative advantages and disadvantages in terms of putting forward a balanced consideration</li> <li>• communicates ideas using simple language and some scientific terminology. Spelling, punctuation and grammar are used with limited accuracy</li> </ul>
2	3-4	<ul style="list-style-type: none"> <li>• a number of advantages given regarding the use of biofuels compared to petrol</li> <li>• a number of disadvantages given regarding the use of biofuels compared to petrol</li> <li>• some attempt to present a balanced consideration of the advantages and disadvantages of using biofuels and the subsequent possible environmental impacts</li> <li>• communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately. Spelling, punctuation and grammar are used with some accuracy</li> </ul>
3	5-6	<ul style="list-style-type: none"> <li>• most of the identifiable advantages of using biofuels instead of petrol are given</li> <li>• most of the identifiable disadvantages of using biofuels instead of petrol are given</li> <li>• there is a balanced consideration of the advantages and disadvantages of using biofuels and the subsequent possible environmental impacts</li> <li>• the answer communicates ideas clearly and uses a range of scientific terminology appropriately. Spelling, punctuation and grammar are used with few errors</li> </ul>



Question Number	Answer	Acceptable answers	Mark
5(d)	<p>an explanation linking the following points:</p> <p>fuel cell produces only water (1)</p> <p>petrol produces carbon dioxide (as well as water) (1)</p> <p>(and) carbon dioxide is a worse greenhouse gas than water (vapour)/fuel cell produces liquid water not water vapour (1)</p>	<p>the water can be used as a source of more hydrogen/recycled</p> <p>therefore there are no emissions from the fuel cell/less emissions than with petrol</p>	(3)

**TOTAL: 12 MARKS**

Question Number	Answer	Mark
6(a)(i)	an explanation linking the following points:  A and C (1)  (because) they contain hydrogen and carbon <b>only</b> /B contains oxygen (1)	(2)

Question Number	Answer	Mark
6(a)(ii)	C <sub>3</sub> H <sub>7</sub> OH	(1)

Question Number	Answer	Mark
6(a)(iii)	B	(1)

Question Number	Answer	Mark
6(b)	C=C shown  rest of molecule	(2)

Question Number	Indicative content	Mark
*6(c) QWC	<p>an evaluation including references to the following:</p> <p>e.g. <b>recycling polymers</b> referring to:</p> <ul style="list-style-type: none"> <li>• using materials/not wasting them/environmentally friendly</li> <li>• hard to recycle some types of plastic</li> <li>• requires public cooperation and sorting</li> </ul> <p>e.g. <b>burning polymers</b> referring to:</p> <ul style="list-style-type: none"> <li>• dangers of burning polymers - toxic fumes</li> <li>• dangers including fire hazard</li> <li>• dangers including references to poisons such as hydrogen cyanide</li> </ul> <p>e.g. <b>burying polymers</b> referring to:</p> <ul style="list-style-type: none"> <li>• non-biodegradable polymers will continue to exist in the landfill sites</li> </ul>	(6)
Level	0	no rewardable material
1	1-2	<ul style="list-style-type: none"> <li>• a relevant comment made on each of the three given polymer disposal methods</li> <li>• little evidence of comparing and evaluating the three methods in terms of their usefulness and environmental impact</li> <li>• communicates ideas using simple language and uses some scientific terminology. Spelling, punctuation and grammar are used with limited accuracy</li> </ul>
2	3-4	<ul style="list-style-type: none"> <li>• each of the three given polymer disposal methods are briefly described and commented on</li> <li>• some evidence of a comparison of the three methods in terms of their comparative usefulness and environmental impact</li> <li>• 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</li> </ul>
3	5-6	<ul style="list-style-type: none"> <li>• each of the three given polymer disposal methods are described and commented on</li> <li>• clear evidence of a comparison of their comparative usefulness and environmental impact.</li> <li>• communicates ideas clearly and uses a range of scientific terminology appropriately. Spelling, punctuation and grammar are used with few errors</li> </ul>

**TOTAL: 12 MARKS**