Paper Reference(s) 5CH1H/01

Edexcel GCSE

Chemistry/Science

Unit C1: Chemistry in Our World

Higher Tier

Monday 21 May 2012 - Morning

Time: 1 hour plus your additional time allowance

INSTRUCTIONS TO CANDIDATES

Write your centre number, candidate number, surname, initials and your signature in the boxes below. Check that you have the correct question paper.

Centre No.								
Candidate No.								
Surname								
Initial(s)								
Signature								
Paper Reference	5	С	Н	1	Н	/	0	1

- Use BLACK ink or ball-point pen.
- Answer ALL questions.
- Answer the questions in the spaces provided
 - there may be more space than you need.

MATERIALS REQUIRED FOR EXAMINATION Calculator, ruler

ITEMS INCLUDED WITH QUESTION PAPERS Nil

INFORMATION FOR CANDIDATES

- The total mark for this paper is 60.
- 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.
- A Periodic Table is provided.

ADVICE TO CANDIDATES

- 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.

ANSWER ALL QUESTIONS.

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

THE REACTIVITY SERIES

1 The list shows some metals in reactivity series order with the most reactive at the top.

MOST REACTIVE calcium

magnesium

aluminium

zinc

iron

copper

LEAST REACTIVE gold

((a)	Which of these metals can be found as the uncombined metal in the Earth's crust?		
		Put a cross (⊠) in the box next to your answer. (1 mark)		
		A calcium		
		☐ B gold		
		C magnesium		
		D zinc		
((b)	Metals are extracted by the reduction of their ores.		
		State the meaning of the term REDUCTION. (1 mark)		
Que	sti	on continues on next page)		

(c)	Aluminium is extracted by the electrolysis of a molten mixture of its ore (bauxite) and cryolite. Iron is extracted by heating a mixture of its ore and carbon.
		Explain why electrolysis is used to extract aluminium but is not used to extract iron. (2 marks)

(d)	An alloy of aluminium with magnesium is used for parts of aeroplanes.
	Explain why the aluminium alloy is stronger than pure aluminium. (2 marks)
(e)	When aluminium corrodes, it reacts with oxygen to form aluminium oxide, Al_2O_3 .
	Complete the balancing of this equation by putting numbers in the spaces provided. (2 marks)
	$\underline{\hspace{1cm}} AI + \underline{\hspace{1cm}} O_2 \longrightarrow 2AI_2O_3$
	Q1 (Total 8 marks)
(O 4)	(Total 8 marks)

(Questions continue on next page)

CARBON DIOXIDE LEVELS IN THE ATMOSPHERE

Scientists believe that, about 4500 million years ago, the Earth was very much hotter than it is now. The atmosphere then was very different from that on Earth today.			
	(a)	Explain why it is difficult to be precise about the composition of the Earth's early atmosphere. (2 marks)	
8 - 8			
(Qı	ıesti	on continues on next page)	

(b)	As the Earth cooled, oceans formed.				
	How did this affect the composition of the atmosphere? (1 mark)				
(c)	The first plants appeared about 400 million years ago.				
	Explain how the growth of these plants affected the composition of the atmosphere. (2 marks)				
2 2 2 2 2 2					
(Questi	on continues on next page)				

(d)	What is the current approximation carbon dioxide in the Earth's		
	Put a cross (⊠) in the box (1 mark)	next to your answer	:
	☐ A 0·04		
	□ B 1.0		
	☐ C 4·0		
	□ D 10		
(e)	The amount of carbon dioxicatmosphere has been rising years, mainly caused by an quantity of fossil fuels that l	over the past fifty increase in the	
	State another cause of increase carbon dioxide in the atmos	•	
			Q2
		(Total 7 marks)	
(Questi	ons continue on next page)	(Turn o	ver)

HYDROCARBONS

3 (a) During fractional distillation, crude oil is separated into a number of fractions.

The table shows the relative amount of these fractions that can be obtained from crude oil.

The table also shows the relative demand for each of these fractions.

FRACTION	RELATIVE AMOUNT OBTAINED	RELATIVE DEMAND	
LPG	2	6	
LI O		0	
petrol	12	29	
kerosene	16	11	
diesel	24	29	
fuel oil and bitumen	46	25	

(i)	For which fractions does the demand exceed
	the supply?

Put a cross (\boxtimes) in the box next to your answer. (1 mark)

answer. (1 mark)			
A	kerosene, diesel, fuel oil and bitumen		
В	LPG, petrol and diesel		
С	LPG, petrol and kerosene		
_			

D petrol, diesel, fuel oil and bitumen

(Question continues on next page)

	(11)	molecules in some fractions are converted into smaller molecules.
		Explain why cracking is needed. (2 marks)
(Questio	n c	ontinues on next page)

(b) The table shows the number of carbon atoms per molecule in the substances present in each of the fractions.

FRACTION	NUMBER OF CARBON ATOMS PER MOLECULE
LPG	1 – 4
petrol	4 – 12
kerosene	9 – 16
diesel	15 – 25
fuel oil and bitumen	over 25

Complete the sentence by putting a cross (\boxtimes) in the box next to your answer. (1 mark)

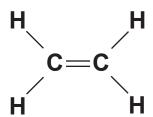
As the number of carbon atoms in the molecules of a hydrocarbon increases

□ A	the number of hydrogen atoms in the molecule remains the same
В	the boiling point of the hydrocarbon increases
□ c	the hydrocarbon becomes easier to burn
D	the viscosity of the hydrocarbon

(Question continues on next page)

decreases

(c) The structure of a molecule of ethene is



(i) What is the formula of a molecule of ethene?

Put a cross (\boxtimes) in the box next to your answer. (1 mark)

- A CH₂
- \square B C₂H₄
- \square C C_nH_{2n}
- \square D (CH₂)_n

(ii) Ethene can be converted into poly(ethene).

Write a balanced equation for this reaction. (2 marks)

(d)	bur This	ny power stations generate electricity by ning fossil fuels, such as fuel oil. s process adds carbon dioxide to the osphere.
	(i)	Explain why some people are concerned about the increase in the amount of carbon dioxide in the atmosphere. (2 marks)

(ii)	Some hydrocarbon fuels can contain su impurities.	ılfuı	•
	Explain how the product of combustion of these sulfur impurities affects the environment. (2 marks)		
		Q	3
	(Total 11 marks)		

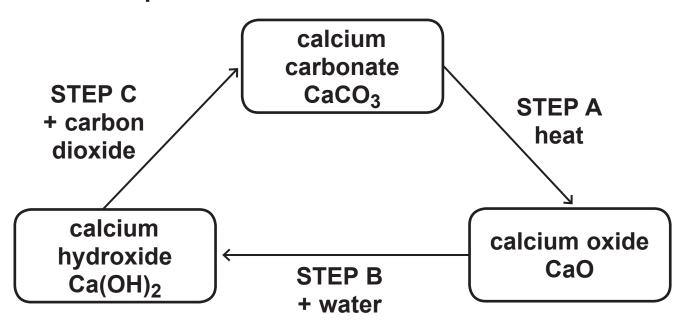
CALCIUM COMPOUNDS

- Calcium carbonate is an important raw material in the 4 chemical industry.
 - It exists naturally as chalk, marble and limestone.
 - (a) Which row of the table correctly identifies chalk, marble and limestone as sedimentary or metamorphic rocks?

Put a cross (\boxtimes) in the box next to your answer. (1 mark)

		CHALK	MARBLE	LIMESTONE	
	A	sedimentary	sedimentary	metamorphic	
	В	metamorphic	metamorphic	sedimentary	
	С	sedimentary	metamorphic	sedimentary	
	D	metamorphic	sedimentary	metamorphic	

(b) The diagram shows reactions of some calcium compounds.



(i) Both calcium carbonate and calcium oxide are white solids.

Suggest how you could show that, when calcium carbonate is heated, a reaction takes place. (2 marks)

(Question c	ontinues on next page)	(Turn over)
(iv)	State the common name solution. (1 mark)	for calcium hydroxide
(iii)	Write the balanced equat of calcium hydroxide with (STEP C). (2 marks)	
(ii)	Describe what you would is added, one drop at a ti oxide (STEP B). (2 marks	me, to cold calcium

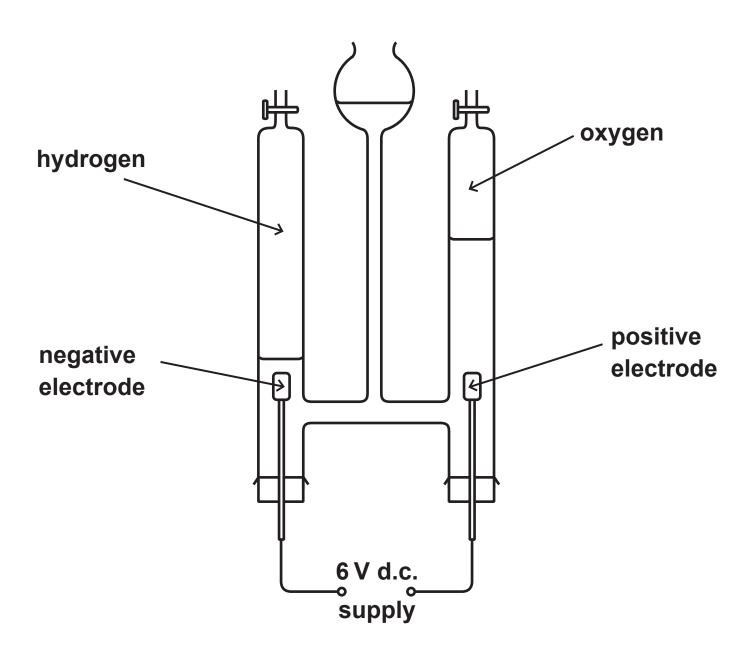
(c)	Explain why calcium carbonate removes ac gases from emissions in power station chir (2 marks)	
		Q4
	(Total 10 marks)	

ELECTROLYSIS

5	Electrolysis occurs when solutions of some compounds are decomposed by passing direct electric current through them.					
	(a)	The The	Sodium chloride solution was electrolysed. The reaction produced chlorine and hydrogen. The remaining solution contained sodium hydroxide, NaOH.			
		(i)	State a hazard associated with (1 mark)	chlorine gas.		
		(ii)	Describe a test that can be use sample of gas as chlorine. (2 r	•		
				 		
(Q	uesti	on c	continues on next page)	(Turn over)		

(iii) State a use of chlorine. (1 mark)
(iv) Complete and balance the equation for the overall reaction taking place when sodium chloride solution is electrolysed. (2 marks)
NaCl + $+$ + +
(Question continues on next page)

*(b) Water was decomposed by electrolysis in the apparatus shown.



The water decomposed into hydrogen and oxygen. After five minutes, the volumes of hydrogen and oxygen in the tubes were measured.

Two further experiments were carried out changing only one factor in each experiment. All other factors were kept the same.

(Question continues on next page)

The table shows the conditions and results of all three experiments.

experiment	time / minutes	current / amps	volume of hydrogen / cm ³	volume of oxygen / cm ³
1	5	0.50	20.0	10.0
2	10	0.50	40.0	20.0
3	5	0.75	30.0	15.0

Use these results of electrolysis to compare the volumes of hydrogen and oxygen formed and to show the effect of changing the time and the current on the volumes of these gases. (6 marks)

(Turn over)

(Continue your answer on next page)

	Q5
(Total 12 marks)	

ALTERNATIVE FUELS

(Cc	ontin	ue your answer on next page)	(Turn over)
	······································		
		using bioethanol, instead of petrol, as cars. (6 marks)	s a fuel for
	*(b)	Evaluate the advantages and disadva	•
		Explain the difference between NON-and RENEWABLE fuels. (2 marks)	RENEWABLE
	(a)	Fuels such as those obtained from connon-renewable. Efforts are being mathese types of fuels with renewable fe	de to replace
6	In t	own crude oil deposits are being used he past, most of our fuels, such as peen obtained from crude oil.	-

(Question continues on next page)

(c) The photograph shows one of the new buses for London.



The bus uses hydrogen as a fuel.

There are six hydrogen fuel tanks, which can be seen on the roof of the bus.

The hydrogen from the tanks reacts with oxygen from the air in a fuel cell to release energy to power the bus.

(i) Write the balanced equation for the overall reaction that takes place when the hydrogen reacts with oxygen in the fuel cell. (3 marks)

(ii)	Like all fuels, hydrogen, when mixed with air and ignited, explodes.					
	Apart from the possibility of an explosi state another disadvantage of using hy rather than diesel, as a fuel for buses. (1 mark)	•	јеп,			
		Q	6			
	(Total 12 marks)					

TOTAL FOR PAPER = 60 MARKS

END

The Periodic Table of the Elements

24							_	
Telative atomic mass atomic mass atomic mass atomic mass atomic symbol atomic search and atomic symbol atomic search and atomic search atomic search and atomic search and atomic search atomic search and atomic search atomic search and atomic search atomic search atomic search atomic search and atomic search atomic sear	0	4 He helium 2	20 Ne neon	40 Ar argon 18	84 Kr krypton 36	131 Xe xenon 54	[222] Rn radon 86	t fully
Telative atomic mass atomic mass atomic mass atomic mass atomic symbol atomic search and atomic symbol atomic search and atomic search atomic search and atomic search and atomic search atomic search and atomic search atomic search and atomic search atomic search atomic search atomic search and atomic search atomic sear	7		19 fluorine 9	35.5 CI chlorine 17	80 Br bromine 35	127 	[210] At astatine 85	orted but no
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Telative atomic mass atomic mass atomic mass atomic mass atomic symbol atomic search and atomic symbol atomic search and atomic search atomic search and atomic search and atomic search atomic search and atomic search atomic search and atomic search atomic search atomic search atomic search and atomic search atomic sear	4		12 carbon 6	28 Si silicon	73 Ge germanium 32	119 Sn tin	207 Pb lead 82	omic number
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1					65 Zn zinc 30	112 Cd cadmium 48	201 Hg mercury 80	Elem
1					63.5 Cu copper 29	108 Ag silver 47	197 Au gold 79	[272] Rg roentgenium
1					59 nickel 28	106 Pd palladium 46	195 Pt platinum 78	[271] Ds damstadtium 110
Secondarium					59 Co cobalt 27	103 Rh rhodium 45	192 Ir iridium 77	[268] Mt meitnerium 109
Standard		1 Hydrogen			56 iron 26	101 Ru ruthenium 44	190 Os osmium 76	[277] Hs hassium 108
Second				_	55 Mn manganese 25	[98] Tc technetium 43	186 Re rhenium 75	[264] Bh bohrium 107
9 Be beryllium 4 An 24 Mg magnesium 12 Ca Sc calcium scandium 20 Sr Y strontium 339 137 137 139 Ba La* barium lanthanum 556 56 7 Str Ay Ac* radium actinium actinium rut 88 88			mass bol ıumber		52 Cr chromium 24	96 Mo molybdenum 42	184 W tungsten 74	[266] Sg seaborgium 106
9 Be beryllium 4 An 24 Mg magnesium 12 Ca Sc calcium scandium 20 Sr Y strontium 339 137 137 139 Ba La* barium lanthanum 556 56 7 Str Ay Ac* radium actinium actinium rut 88 88		Key	ve atomic omic syml name (proton) r		51 V vanadium 23	93 Nb niobium 41	181 Ta tantalum 73	[262] Db dubnium 105
9 Be beryllium 4 12 12 Ca calcium 20 88 Sr strontium 38 137 Ba barium 56 [226] Ra radium 888			relativ atc atomic					[261] Rf rutherfordium 104
7 9 Li Be hium 3 24 Mg magnesium 11 12 28 88 88 88 88 88 88 88 88 88 88 88 88					45 Sc scandium 21	89 × yttrium 39	139 La* lanthanum 57	[227] Ac* actinium 89
7 Li. 11. 11. 11. 12.33 33. 33. 34. 35. 35. 35. 35. 37. 38. 38. 38. 38. 38. 38. 38. 38. 38. 38	2		9 Be beryllium	24 Mg magnesium 12			137 Ba barium 56	[226] Ra radium 88
	_		7 Li lithium 3	23 Na sodium 11	39 K potassium 19	85 Rb rubidium 37	133 Cs caesium 55	[223] Fr francium 87

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.