

General Certificate of Secondary Education 2013

Science: Chemistry

Unit C2

Foundation Tier

[GCH21]

THURSDAY 20 JUNE, AFTERNOON



GCH21

TIME

1 hour 30 minutes.

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 box, around each page or on blank pages.

Complete in blue or black ink only. **Do not write with a gel pen**. Answer **all** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.

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 **3(c)**.

A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.



1	Fire	worl	s contain the	three ingredients shown in	the box below.	Examiner Only Marks Remark
				colouring agent		
				fuel		
				oxidiser		
	(a)	Ма	gnesium is oft	en used in fireworks as the	colouring agent.	
		(i)	What is the coburns?	colour of the flame observed	when magnesium	
					[1]	
		(ii)		nced symbol equation for ma	[0]	
		(iii)	What is the p	percentage of oxygen in air?		
					[1]	
	(b)	Car	bon in the for	m of charcoal is often used	as the fuel in fireworks.	
		(i)	What is obse	rved when a sample of carb	oon burns?	
					[2]	
		(ii)	Name the proof oxygen.	oduct formed when carbon b	ourns in a limited supply	
					[1]	

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(c)		disers provide the oxygen needed to allow fireworks to burn ectively. A common oxidiser is potassium nitrate.		Examin Marks	er Only Remark
	Wri	te the formula for potassium nitrate.			
			[1]		
(d)	and	arklers are hand held fireworks which contain a fuel, an oxidiser I iron powder. Often the iron powder is mixed with linseed oil to vent it rusting.			
	(i)	What conditions are required for iron to rust?			
			[2]		
	(ii)	Explain why rusting is an oxidation reaction.			
			[2]		
	(iii)	State one observation you would make which would indicate th rusting is a chemical reaction.	at		
			[1]		
				[lur	n ove

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(e) In industry, iron is manufactured in the Blast Furnace. Two of the reactions which occur in the Blast Furnace are shown in the table below. Choose a word or phrase from the box which is most suitable to describe each type of reaction.

thermal decomposition

neutralisation

redox	displacement
combu	stion

Reaction in the Blast Furnace	Type of Reaction
$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$	
$CaCO_3 \rightarrow CaO + CO_2$	

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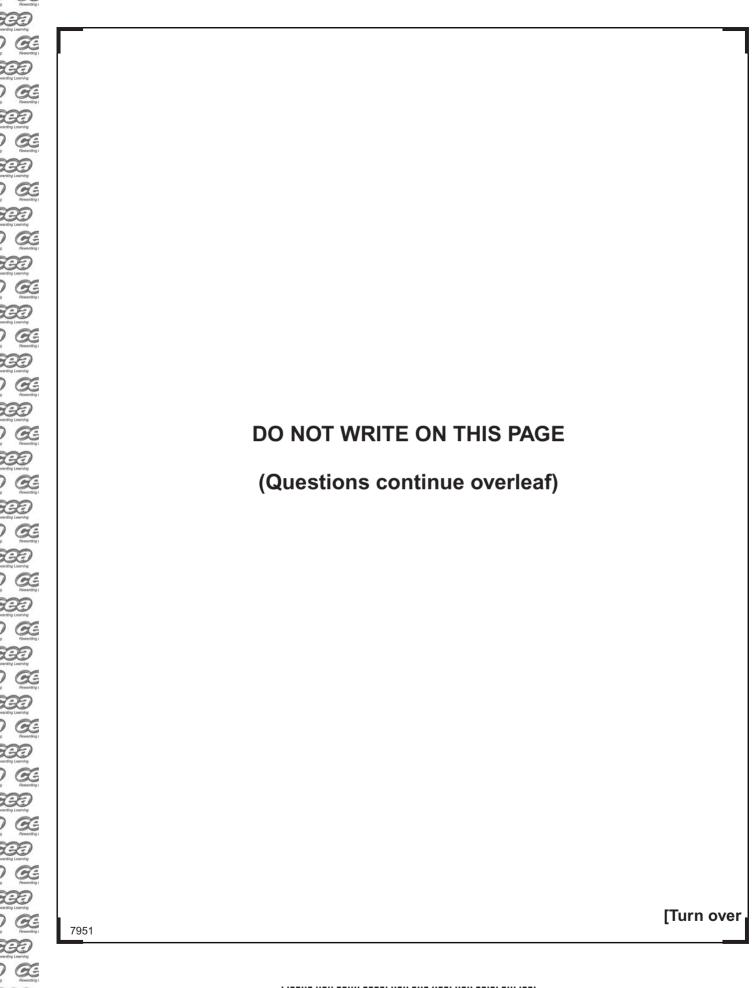
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2	(a)	The rate of decomposition of hydrogen peroxide using a catalyst of be measured using the apparatus shown below.	an	Examine Marks	r Only Remark
		hydrogen peroxide solution and manganese(IV) oxide			
		© CCEA			
		(i) Name the pieces of apparatus labelled A and B.			
		A B	[2]		
		(ii) Name the catalyst used in the decomposition of hydrogen peroxide.	_ [∸]		
			_ [1]		
		(iii) What is meant by the term catalyst?			
			[3]		
		(iv) Write a balanced symbol equation for the decomposition of hydrogen peroxide.	_		
			_ [3]		
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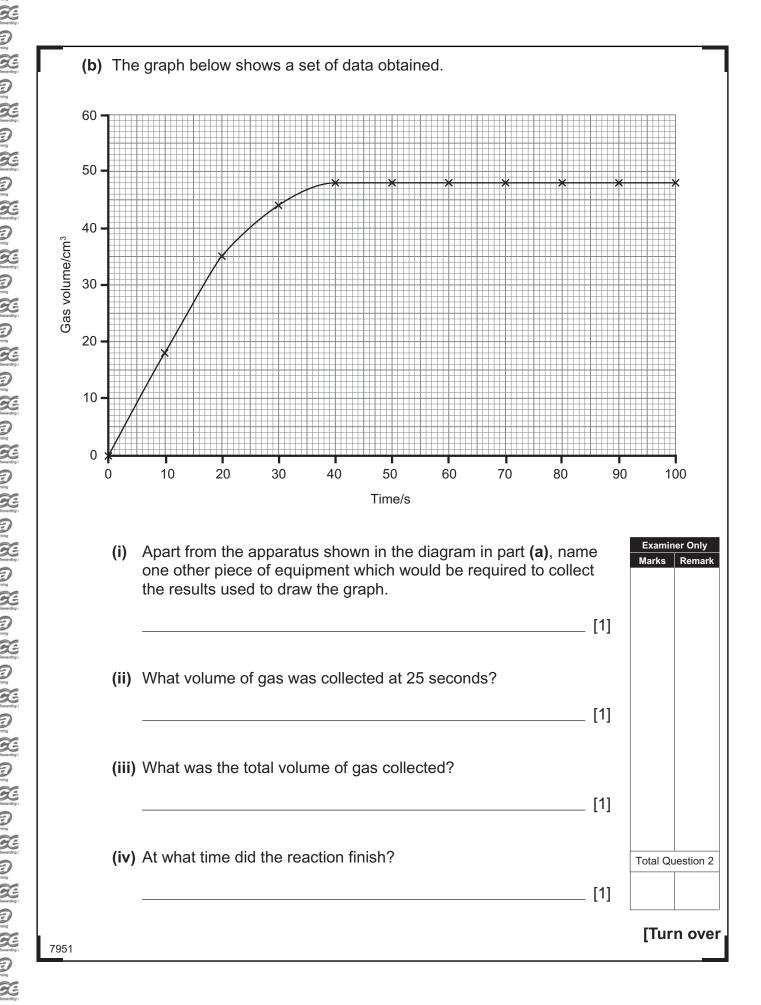
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3	Perfume is a mixture of essential oils dissolved in a solvent. One of the
	essential oils used in making perfume is called myrcene.

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(a) The structural formula of a molecule of myrcene is shown below.

(i) Explain why a molecule of myrcene can be classified as a hydrocarbon.

_____[1]

(ii) Identify the functional group present in myrcene.

______[1]



(iii)	Like all hydrocarbons, myrcene (C ₁₀ H ₁₆) undergoes combustion.
	Complete the balanced symbol equation for the complete
	combustion of myrcene.

$C_{10}H_{16} +$	$O_2 \longrightarrow$	[2]

(iv) Calculate the relative molecular mass (RMM) of myrcene ($C_{10}H_{16}$).

_____[1]

(v) Calculate the percentage of carbon present in myrcene $(C_{10}H_{16})$.

_____% [2]

(b) Ethene can be used to manufacture the solvent used in perfumes. Complete the table below to give information about ethene.

Ethene	Name	Molecular formula	Structural formula	State at room temperature and pressure
	Ethene			

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(c)	Ethene can also be used to make polymers. Polymers may be disposed of by landfill and incineration.	Examine Marks	er Only Remark
	Explain what you understand by the term polymer and state the advantages and disadvantages associated with each method of disposal.		
	In this question, you will be assessed on using your written communication skills including the use of specialist scientific terms.		
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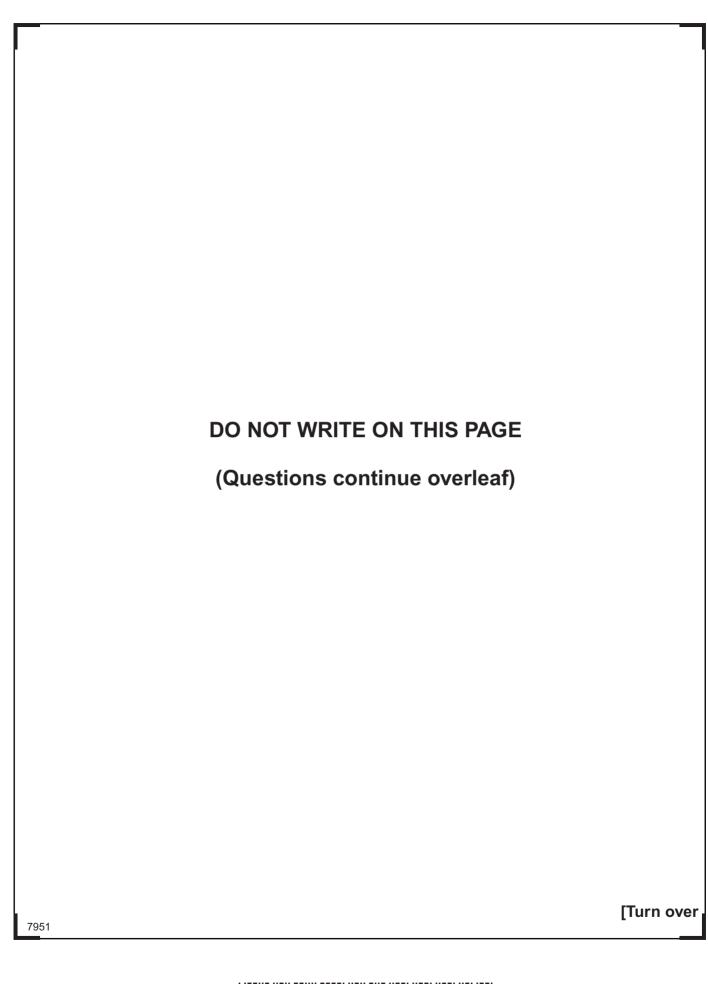
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(a) Aluminium is obtained from purified bauxite by electrolysis.			ained from purified here	rito by alastralysis	
(a)	Alui	minium is obta	amed from purmed baux	tite by electrolysis.	
	(i)	What is mean	nt by the term electrolys	sis?	
					_ [2]
	(ii)	Bauxite conta oxide.	ains aluminium oxide. V	Vrite the formula for alumin	nium
		_			_ [1]
	(iii)		ectrolysis of purified bar ne electrodes. Completo	uxite the ions present are e the table below.	
	Nan	ne of ion	Formula of ion (including charge)	Name of electrode to which ion is attracted	
	alu	ıminium			
	alu	ıminium	O ²⁻		
	alu	ıminium	O ²⁻		[4]
			the carbon anodes need	d to be replaced periodica	
		Explain why	the carbon anodes need	d to be replaced periodica	
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(b)	Aluminium cans are the world's most recycled packaging container. Over 50% of aluminium cans are recycled worldwide.	Examin Marks	er Only Remark
	© iStockphoto / Thinkstock		
	State two reasons why it is important to recycle aluminium.		
	1		
	2		
	[2]		
		Total Qu	estion 4

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		als may be placed in a reactivity series by observing their reactions air, water, steam and dilute acid.	Examine Marks	r Only Remark
		Describe what would be observed when a piece of calcium metal is heated in air.		
		[2]		
	(b)	The apparatus below may be used to react zinc metal with steam.		
dam miner		zinc gas produced		
woo		zinc gas produced		
HI	EAT	HEAT trough		
		water beehive shelf		
		© Barking Dog Art		
		(i) What labels should be placed at A and B on the diagram?		
		A		
		B [2]		
		(ii) Explain why the damp mineral wool is heated.		
		[1]		
		(iii) Name the gas produced in this experiment.		
		[1]		
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(iv)	Name a metal which	does not react when he	eated with steam [1]	Examiner Only Marks Remark
` '		he table below gives deals X, sodium and zinc		
Metal	Reaction when heated in oxygen	Reaction with cold water	Reaction with dilute hydrochloric acid	
Х	Black coating forms on metal without burning	No reaction	No reaction	
Sodium	Burns very vigorously with a yellow flame		Dangerous reaction not carried out in school laboratory	
Zinc	Burns forming a yellow solid which changes to white on cooling	No reaction	Reacts steadily	
(i)	Suggest the name of	metal X.	[1]	
(ii)	Describe what you we water.	ould observe when soc	lium reacts with cold	
			[3]	
(iii)	Write a balanced symwater.	nbol equation for the re	action of sodium with	Total Question 5
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6	(a)	Fill in the blanks in the following sentences about water.	
		Water is a colourless liquid at room temperature and	
		pressure and has a melting point of 0 °C and a boiling point	
		of°C.	
		One test for water is to use cobalt(II) chloride paper which changes	
		colour from to	
		if water is present.	[3]

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(b) An investigation was carried out to compare the hardness of water samples from three towns A, B and C.

25 cm³ of each water sample were placed into three separate conical flasks and labelled A, B and C. A sample of deionised water was also tested.

Soap solution was added 1 cm³ at a time to each conical flask with shaking until a lasting lather formed. The total volume of soap solution added to each flask was recorded.

The experiment was repeated with fresh samples of A, B and C which had been boiled and allowed to cool, before adding the soap solution.

The results are shown in the table below.

Water sample	Volume of soap solution required to form a lather		
·	before boiling (cm³)	after boiling (cm³)	
Deionised water	2	2	
A	6	6	
В	8	2	
С	11	7	



	(i)	Name a piece of apparatus which could be used to measure the 25 cm³ samples of water.	he	Examiner Marks F	Only Remark
			_ [1]		
	(ii)	Which of the three water samples (A, B or C) is the hardest water?	[1]		
	/ ****		_ [']		
	(iii)	Which of the three water samples (A, B or C) contains only temporary hardness?			
			_ [1]		
	(iv)	Which of the three water samples (A, B or C) contains both temporary and permanent hardness?			
			_ [1]		
(c)		te two disadvantages of hard water.			
	2				
			_ [2]		
				Total Que	stion 6
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	(i) Complete the table below on itrogen.	giving some physical properties of		
		Nitrogen		
	State at room temperature and pressure			
	Colour			
	Odour			
		I	[3]	
	(ii) State one other use of nitro	ogen.		
(b)		out a chemical test for the presence or vations you would make for a positive		
(b)	ammonia gas, stating the obse	out a chemical test for the presence o	of	
(b)	ammonia gas, stating the obse	out a chemical test for the presence or ervations you would make for a positive	of	
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	(c)		rogenous fertilisers contain ammonium compounds such as monium nitrate which is produced when ammonia reacts with nitric d.	Examine Marks	er Only Remark
		(i)	Write a balanced symbol equation for the reaction of ammonia with nitric acid.		
			[2]		
		(ii)	State one disadvantage of using nitrogenous fertilisers. [1]		
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