

General Certificate of Secondary Education 2013

Science: Chemistry

Unit C1

Foundation Tier

[GCH11]

MONDAY 10 JUNE, AFTERNOON



GCH11

TIME

1 hour 15 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 six** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is **80**.

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 2(b)(iv).

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



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	(vii)	Name one element which sublimes on heating.		Examiner Only Marks Remark	ζ.
			[1]		
(b)		element chlorine reacts with all Group 1 elements. Chlorine is nd in Group 7 of the Periodic Table.			
	(i)	What is the colour and physical state of chlorine at room temperature and pressure?			
		Colour:			
		State:	[2]		
	(ii)	Name the compound formed when lithium reacts with chlorine.			
			[1]		
	(iii)	Explain why chlorine should be used in a fume cupboard.			
			[1]		
	(iv)	Potassium reacts with chlorine according to the word equation:			
		potassium + chlorine			
		Write a balanced symbol equation for the reaction of potassium with chlorine.			
			[3]		
	(v)	What name is given to Group 7 of the Periodic Table?			
			[1]		
				Total Question 1	_
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2 Ski resorts use artificial snow to supplement natural snow. Artificial snow is made by forcing water and pressurised air through a snow cannon into cold air. The water droplets crystallise to form artificial snow.

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- (a) Water contains the elements hydrogen and oxygen.
 - (i) Complete the table below to give information about atoms of hydrogen and oxygen.

Atom	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons
1 ₁ H					
¹⁶ O					

[2]



	(ii) A dot and cross diagram showing the bonding in water is given below.	Examiner Only Marks Remark
	H * O : H	
	On the diagram above use an arrow to label the following features:	
	Label a covalent bond, A Label a lone pair of electrons, B. [2]	1
	(iii) Artificial snow production works most effectively if the water used contains calcium ions, Ca ²⁺ .	
	Draw a labelled diagram of a calcium ion stating the number of each subatomic particle present and showing the position of each particle. (Calcium atomic number $= 20$; mass number $= 40$)	
	[3]	1
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	(b)	Skis were originally made from wood. Modern skis are often made a layers of graphite with steel edges to help the skis turn easily.	of	Examin Marks	er Only Remark
		© Dorling Kindersley RF / Thinkstock			
		(i) Steel is an alloy. What is meant by the term alloy?			
			[2]		
		(ii) Instead of steel, aluminium can be used on the edges of skis to make a very lightweight ski. State one other use of aluminium.)		
			[1]		
		(iii) Graphite is one of the allotropes of carbon. Name another allotrope of carbon.			
			[1]		
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	High melting point	
	Soft	
	Good conductor of electricity	
comm	s question you will be assessed on your written nunication skills including the use of specialist tific terms.	

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3	Metal compounds are widely used in agriculture, in medicine and as
	catalysts.

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(Relative atomic masses:
$$H = 1$$
; $C = 12$; $N = 14$; $O = 16$; $S = 32$; $CI = 35.5$; $Cu = 64$)

(a) Complete the table below which gives information on some copper(II) compounds.

Copper compound	Formula	Colour	Relative Formula Mass
Hydrated copper(II) chloride	CuCl ₂ .2H ₂ O	blue-green	
Copper(II) oxide	CuO		
Copper(II) nitrate		blue	

[5]

(b) Copper(II) sulfate may be prepared by reacting copper(II) carbonate with sulfuric acid. The equation for the reaction is as follows:

$$CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + CO_2 + H_2O_3$$

 $4.65\,\mathrm{g}$ of copper(II) carbonate were added to a solution of sulfuric acid. The reaction produced $0.02\,\mathrm{moles}$ of copper(II) sulfate, $\mathrm{CuSO_4}$.

(i) Calculate the number of moles present in 4.65g of copper(II) carbonate.

Moles of copper(II) carbonate ______[2



_	(ii)	How would you know when the reaction was complete?	Examine Marks	er Only Remark
		[1]		
	(iii)	Calculate the mass of copper(II) sulfate, CuSO ₄ , present in 0.02 moles.		
		Mass of copper(II) sulfate [2]		
(c)	and	netal ore with the formula XO ₂ was isolated from the Earth's crust I found to have a relative formula mass of 80. Determine the tive atomic mass and identity of metal X.		
	You	u may find your Data Leaflet useful in answering this question.		
	Rel	ative atomic mass of X		
		dentity of metal X [2]		
			Total Que	estion 3
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4	(a)	The pH values of four solutions were determined by adding universal
		indicator and comparing the final colour to the colour chart.

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(i) Complete the table below.

Solution	Colour in universal indicator	рН
Deionised water	Green	
Milk		6
Washing soda		12
Sulfuric acid	Red	

[4]

(ii)	Select from	the table	above an	example of	each	of the	following:
------	-------------	-----------	----------	------------	------	--------	------------

A weak acid _____

A strong alkali _____ [2]

(b) The following experiment was carried out to determine if the reaction between hydrochloric acid and sodium hydroxide was exothermic.

- 25 cm³ of 1.0 mol/dm³ hydrochloric acid were measured out and placed in a polystyrene cup.
- The temperature of the hydrochloric acid was recorded.
- 25 cm³ of 1.0 mol/dm³ sodium hydroxide solution were then added gradually in 5 cm³ portions to the hydrochloric acid, stirring after each addition.



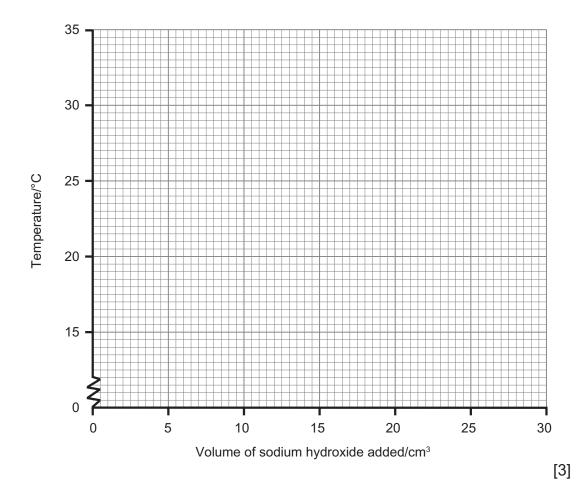
The temperature of the reaction mixture was recorded and the results are shown in the table below.

Volume of sodium hydroxide added/cm ³	0	5	10	15	20	25
Temperature of reaction mixture/°C	20.5	21.5	22.5	23.5	25.5	28.0

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(i) Use the results in the table to plot a graph of temperature against volume of sodium hydroxide added.



(ii) How does your graph prove that this reaction is exothermic?

______[1]

[Turn over



(iii)	Apart from exothermic, what other term is used to describe the type of reaction between an acid and an alkali?		Examin Marks	er Only Remark
		[1]		
(iv)	Write a balanced symbol equation for the reaction between sodium hydroxide and hydrochloric acid.			
		[2]		
			Total Qu	estion 4
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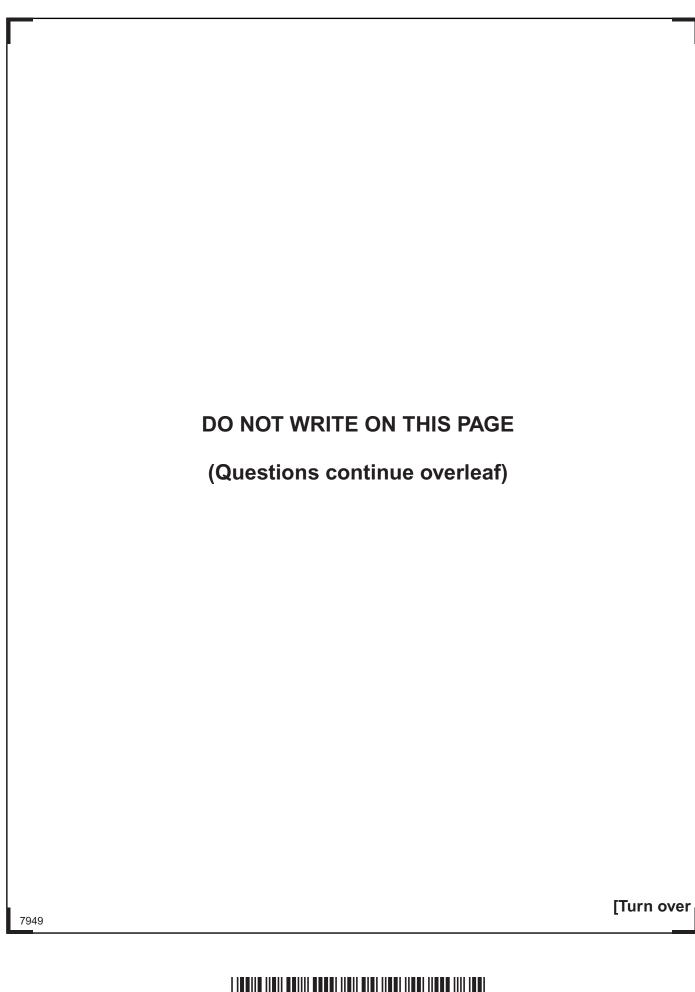
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5		used the following method to find the solubility of potassium room temperature (20°C).	Examin Marks	er Only Remark
	while stirr	g of deionised water in a beaker and add solid potassium nitrate ing until no more will dissolve. Filter the mixture. Place the filtra porating basin and heat using a Bunsen burner until all of the been removed. Measure the mass of solid obtained.		
	(a) What	is meant by the term solubility?	_	
	(b) Sugge	est why the mixture was filtered.		
			[1]	
	(c) Draw mixtu	a labelled diagram of the assembled apparatus used to filter th re.	e	
			[3]	
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	(d)	The student obtained 7.1g of potassium nitrate. Calculate the solubility of potassium nitrate at 20 °C.	Examin Marks	er Only Remark
		g/100 g water [1]		
			Total Qu	estion 5
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Gro	·						
(a)	(i)	Name the	e ion present in all	acid solutions.			
						[1]	
	(ii)	•	e the table to give t sted with red and b		ed when hydr	ochloric	
				Hydrochlo	oric acid		
		Colour	of red litmus paper				
		Colour o	of blue litmus pape	r			
	(iii)		ree acids are all st ntally determine w				
	(iii)					ı would	
	(iii)					ı would	
(b)	In a of th	experime n experime	entally determine we sent to determine we a few drops of silve th acid solution. Co	which of these acid	s is the stron	i would ngest. [2] in each to a	
(b)	In a of th	experime n experime ne acids, a	entally determine we sent to determine we a few drops of silve th acid solution. Co	which of these acid	s is the stron	in each to a pw the	

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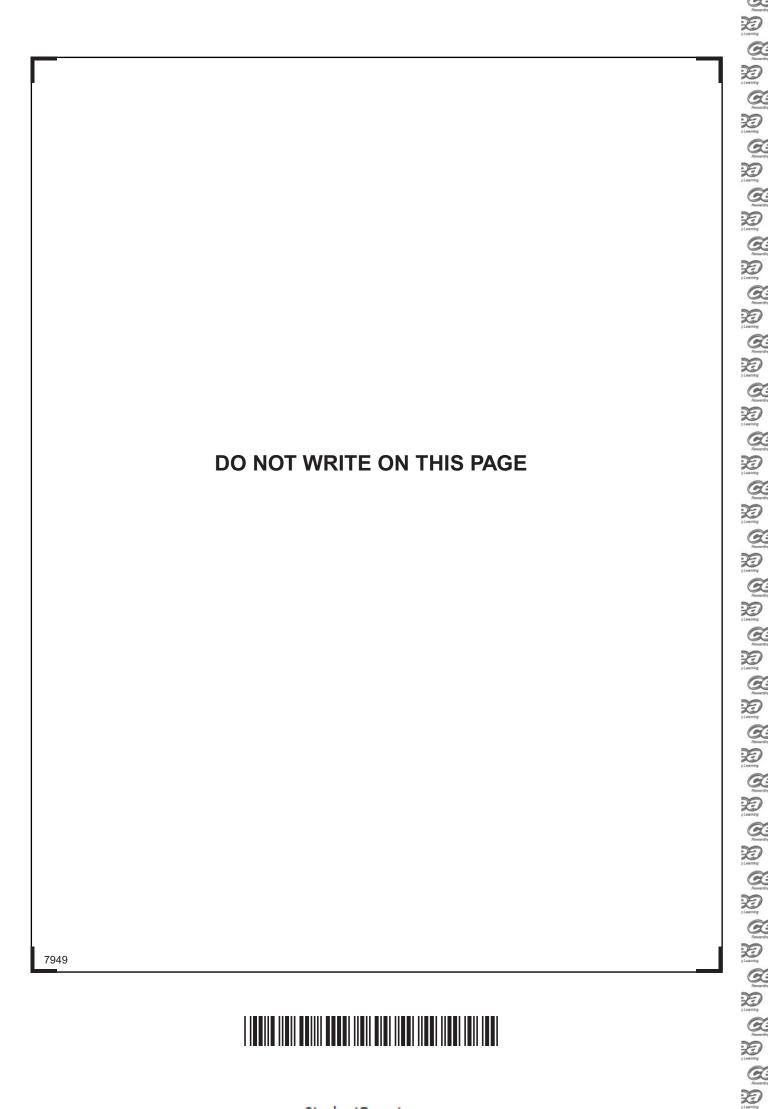


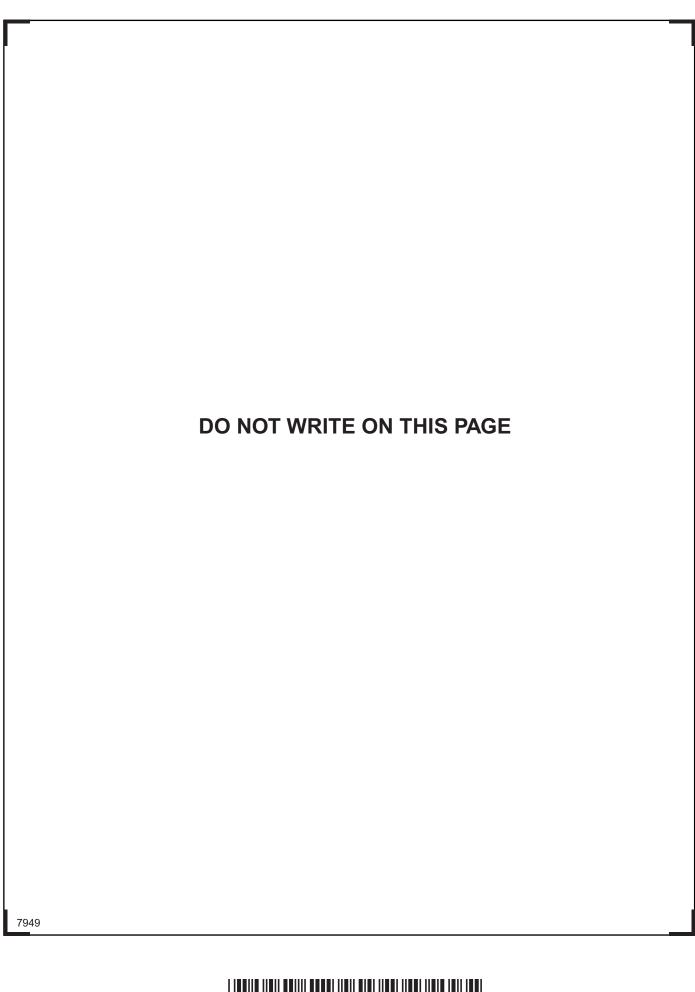
.,	To identify the metal carried out. Complet each of the metal ior	e the table			for		
	Metal ion	Flan	ne colour				
	Potassium						
	Calcium						
	Copper						
				_	[3]		
	The metal ion in a san hydroxide solution. Uthe metal ion presen	Jse the resu t in salt A a	ults in the table b nd salt B.	elow to identify	/		
Salt	Observation on a few drops of s hydroxide sol	odium	Observation o excess of hydroxide	sodium			
Α	Blue precipi	tate	Blue precipita	ate remains			
В	White precip	itate	White precipit	ate remains			
	Metal ion in salt A _						
	Metal ion in salt B $_$				[2]		
THIS	S IS THE END	OF THE	QUESTION	PAPER			
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