

	Centre Number				
Candidate Number					
		Can	didat	e Nu	mber
		Can	didat	e Nu	mber

General Certificate of Secondary Education 2015

GCSE Chemistry

Unit 2

Foundation Tier



GCH21

[GCH21]

WEDNESDAY 17 JUNE, MORNING

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 boxed area on 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 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 2(a).

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





Spanning

Rowardin
Page Learning

ng Learning
Rewardin

PD Rewardin ag Learning G. DED og Learning Rewardin Rewardin G. DED na Learning GC: ng Learning Rewardin DED Na Learning Bewardin DED ig Learning Rewardin) Seaming

Rewardin

20
30
30
30
Searning

Rowardin

ng Learning
Rewarding

Learning G



belo	DW.	
	© CCEA	
(i)	Write the chemical formula for water.	
		[1
(ii)	State the number and type of each different atom present in one molec of water.	ule
		[2
(iii)	Describe a chemical test for water and state the observations for a positive test.	
		[3
(iv)	What name is given to the solid form of water?	_ [-
(14)	what hame is given to the solid form of water:	[1

Rewording L

Delicarring

Learning

9373

[lurn over



	ater supplied to some homes is described as hard water.	
(i	What is meant by hard water?	
		_
(i	Explain the difference between temporary hardness and permanent hardness in water.	
(i	i) State one advantage of hardness in a domestic water supply.	

ng Learning
Rewardin

Rowardin

Powerdin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rewardin

Remarding
Sp Learning

Rewardin

Rewardin

Page 1 Learning

Page 2 Learning

Page 2 Learning

Page 3 Learning

Page 3 Learning

Page 3 Learning

Page 4 Learning

Page 5 Learning

Rewarding ag Learning Rewarding

Rewardin Department

Rewardin

Rewardin 200 201 Learning



_		-
2	Eth	anol (C ₂ H ₅ OH) can be manufactured by fermentation.
	(a)	Describe the production of ethanol by fermentation.
		In your answer you should include:
		the names of the starting materials the conditions required.
		the conditions requiredthe names of any other products (apart from ethanol)
		In this question you will be assessed on your written communication skills including the use of specialist scientific terms.
		[6]
		[Turn ove

Œ

Rewording L

Rewarding L

Animolog L.

J. Learning

G. G.

Rowarding L.

G. G.

Rowarding L.

J. Learning

Rewarding L

Rowarding L



	(b)	Pet	come countries ethanol is mixed with petrol to make fuels for use in cars. rol is mainly octane, an alkane with 8 carbon atoms. Octane is a procarbon fuel.	
		(i)	What is meant by the term hydrocarbon?	
				_ [1]
		(ii)	The general formula of the alkanes is C _n H _{2n+2}	
			Write the molecular formula of octane.	
				_ [1]
		(iii)	Name the two products of complete combustion of octane. 1	
			2	[2]
	(c)	(i)	Calculate the percentage of carbon by mass in ethanol.	
		% b	by mass of carbon = $\frac{\text{number of carbon atoms} \times \text{RAM of carbon}}{\text{RFM of ethanol } (\text{C}_2\text{H}_5\text{OH})} \times 100$	
			Percentage of carbon:	_ [2]
		(ii)	Explain why incomplete combustion of ethanol is dangerous.	
				[2]
9373				

Signaming

Rewarding

Signaming

Rewardin

Remarded, Sp. Learning Sp. Lear

Rewardin

Remorating
To Learning
To Lear

rewarding ag Learning Rewarding

Rewardin 200 201 Learning



3		_	f magnesium ribbon reacted with excess dilute hydrochloric acid at room ature. The volume of gas produced was recorded every 20 seconds.	
	(a)	(i)	Name the gas produced when magnesium reacts with hydrochloric acid.	
			[1]	
		(ii)	Name the piece of apparatus which is used to collect and record the volume of gas produced.	
			[1]	

[Turn over

9373

Œ

Rewarding L

Rewarding L

Committee Com

Rewarding L

I Learning

C. C. Rewarding I.

C. Rewarding I.

C. C. Rewarding I.

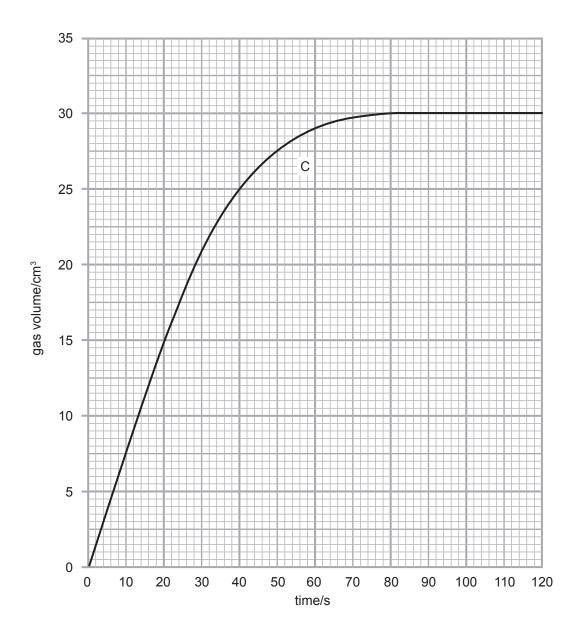
C. C. Rewarding I.

Rewarding L

Rowarding L



(b) The results obtained in the experiment, using 0.03g of magnesium ribbon and **excess** dilute hydrochloric acid, are shown as line C on the graph below.





Rewarding L
.eaming
Œ
Rewarding L
E
earning
ŒĠ
Rewarding L
E)
eaming
Œ
2
Y=1)
eaming
GG Rewarding L
Rewarding L
E)
aamina
.aaning
0==
eaming Rewarding L
\mathcal{F}
earning
ooning .
eaming Rewarding L
22
rrewarding L
E
E Rewarding L
Rewarding L
earning
(3)
eaming
eaming Rewarding L
E
eamina
9=
GG Rewarding L
Rewarding L
Rewarding L
E
E
E
E
eaming GE Rewarding L
eaming GE Rewarding L
eaming GE Rewarding L
Serring Rowarding L Serring
Serring Rowarding L Serring
Serring Rowarding L Serring
Seaming OS Rowarding L Seaming OS Rewarding L Rewarding L
Seaming OS Rowarding L Seaming OS Rewarding L Rewarding L
Serring Rowarding L Serring
Saming Rowarding L Rowarding L Saming Rowarding L
Saming Rowarding L Rowarding L Saming Rowarding L
Seaming OS Rowarding L Seaming OS Rewarding L Rewarding L
Sourming Rewarding L Sourming Rewarding L Sourming Rewarding L Rewarding L Rewarding L
Sourming Rewarding L Sourming Rewarding L Sourming Rewarding L Rewarding L Rewarding L
Saming Rowarding L Rowarding L Saming Rowarding L
Saming
Saming
Sourming Rewarding L Sourming Rewarding L Sourming Rewarding L Rewarding L Rewarding L
Saming
Saming
Saming
Rowarding L
Rowarding L
Rowarding L
Rowarding L Amending L
Rowarding L Amending L
Rowarding L Amending L
Rowarding L
Rowarding L
Rowarding L
Remeding L
Remeding L
Remeding L
Remeding L
Remeding L
Remeding L
Rowarding L Amending L
Rowarding L Amending L
Rowarding L Amending L
Remeding L
Rowarding L Amening
Rowarding L Amening
Rowarding L Amending L
Rowarding L Amending L Amend
Rowarding L Amending L Amend
Rowarding L Amening

(i) Use the graph to determine the time taken for the reaction to finish.

time taken _____s [1]

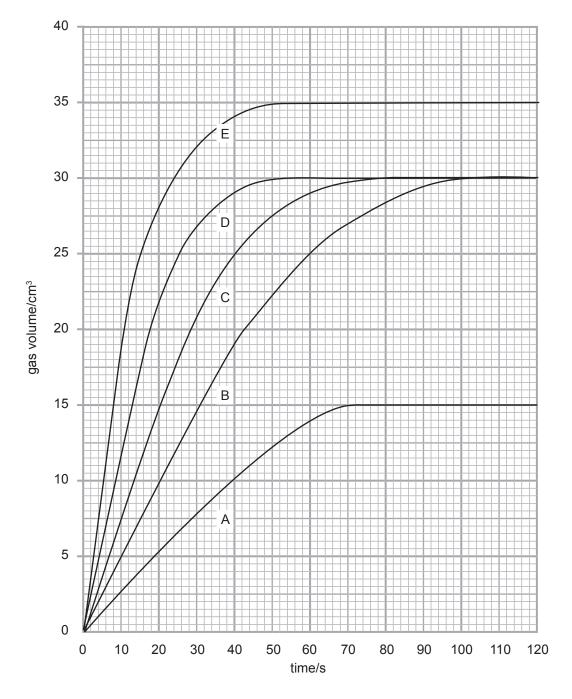
(ii) Calculate the rate of this reaction.

(iii) What is the final volume of gas produced?

[Turn over



(c) The experiment was repeated using different conditions and the results obtained plotted as lines A, B, D and E, on the graph below. Line C shows the original experiment with 0.03 g of magnesium ribbon and excess dilute hydrochloric acid at room temperature.



© CCEA



	Line:	[1]
	Explanation:	
		[2
(ii)	Which line, A, B, D or E, was obtained when 0.03 g of magnesiur reacted with excess dilute hydrochloric acid at a temperature be temperature?	
	Line:	[1
(iii)		
iii)	State and explain which line, A, B, D or E, was obtained when 0. magnesium ribbon reacted with excess dilute hydrochloric acid temperature:	_
iii)	magnesium ribbon reacted with excess dilute hydrochloric acid	at room
(iii)	magnesium ribbon reacted with excess dilute hydrochloric acid a temperature:	at room [1
iii)	magnesium ribbon reacted with excess dilute hydrochloric acid a temperature: Line:	at room [1
(iii)	magnesium ribbon reacted with excess dilute hydrochloric acid a temperature: Line:	at room [1
(iii)	magnesium ribbon reacted with excess dilute hydrochloric acid a temperature: Line:	at room [1
(iii)	magnesium ribbon reacted with excess dilute hydrochloric acid a temperature: Line:	at room [1
(iii)	magnesium ribbon reacted with excess dilute hydrochloric acid a temperature: Line:	at room [1

Œ

Rewarding L

I Learning

C. C. Rewarding I.

C. Rewarding I.

C. C. Rewarding I.

C. C. Rewarding I.

Rewarding L

Rowarding L

9373

[Turn over



(d) In an experiment to find a suitable catalyst for a reaction, the following results were obtained. All of the reactions were carried out under the same conditions.

200 ng Learning

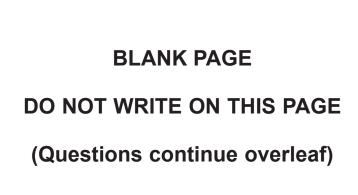
[1]

Substance under test as a catalyst	Time for the reaction to be completed/s
cobalt chloride	15
cobalt nitrate	12
potassium nitrate	41
sodium chloride	56

	your answer.	
	Substance:	[1]
	Explanation:	
		[1]
(ii)	Write the formula for potassium nitrate.	

(i) Which substance in the table is the best catalyst for this reaction? Explain





[Turn over



- 4 Many gases, for example sulfur dioxide and nitrogen, can be used as coolants in the food industry.
 - (a) Complete the table below about the properties of sulfur dioxide and nitrogen.

Gas Property	Sulfur dioxide	Nitrogen
Formula		
Colour		
Acidic, basic or neutral		neutral

[5]

ng Learning
Rewardin
ng Learning

)

G:

)

)

ng Learning
Rewardin

E

ng Learning

DED va Learning

)

E

)

0

a Learning

Rewarding ag Learning

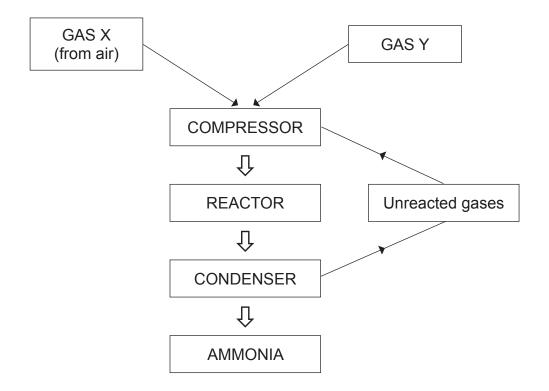
)

G:



(b) Ammonia is used to freeze water in ice rinks. State one other use of ammonia.

(c) Ammonia is produced in industry by the Haber process which is illustrated in the diagram below.



(i) Name the gas X used in the Haber process.

______[1]

(ii) Name the gas Y used in the Haber process.

[1]

(iii) State the pressure to which the gases are compressed.

[1]

[Turn over

[1]



(v)	Name the catalyst used in the reactor.	[3
		_ [1
(vi)	State the temperature used in the reactor.	_ [1]
(vii)	Choose the correct word from the box below to complete the sentence.	
	cooled heated oxidised	
	In the condenser, the gases are to separate ammo	nia
	ao a iliquia.	[1]

ag Learning
Rewardin

Rowardin

Powerdin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rewardin

Remarding
Sp Learning

Rewardin

Remarding
Towarding
Toward

Rewarding

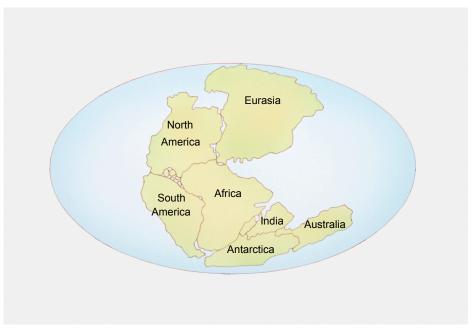
10 January 10 January

newarding og Learning Rewarding

Rewardin 200 201 Learning



5 (a) In 1912 Alfred Wegener proposed the theory that the continents on the Earth could move and were once arranged as shown in the diagram below.



© Dorling Kindersley / Thinkstock

Scientists at the time did not accept Wegener's theory, but in the 1960s some new evidence based on the physical properties of iron helped to establish the theory.

- (i) What name was given to Wegener's theory that the continents could move?

 [1]

[Turn over



(~)	Iron		
	(i)	State the conditions required for rusting to occur.	
	(ii)	State two methods used to prevent rusting. 1	
		2	
	(iii)	Describe the physical appearance of rust.	
	(iii)		
(c)			
(c)	In th		idised.
(c)	In th	ne following three reactions, A , B and C , iron is ox	idised. n(III) oxide
(c)	In the Rea	ne following three reactions, A , B and C , iron is ox action A : iron + oxygen + water → hydrated iron	idised. n(III) oxide ate + copper
(c)	In the Real Real Real	ne following three reactions, A , B and C , iron is ox action A : iron + oxygen + water → hydrated iron action B : iron + copper(II) sulfate → iron(II) sulfate	idised. n(III) oxide ate + copper

ag Learning
Rewardin

Rowardin

Powerdin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rowardin

Rewardin

Remarding
Sp Learning

Rewardin

Remarding
Towarding
Toward

Rewarding

10 January 10 January

newarding og Learning Rewarding

Rewardin 200 201 Learning



(ii)	Write a balanced s	symbol equation fo			_ [3]
(iii)	Explain why iron is	oxidised in React	ion A.		
					[2]
(iv)	Describe how you Reaction C.	would test for the	presence of hydro	ogen gas produce	d in
					_ [2]
(v)	Choose from the li	st below a term wh	nich can be used	to describe	
	Circle the correct t	erm.			
	decomposition	displacement	combustion	neutralisation	
					[1]
				[Tui	n over

Œ

Rewarding L

Remarking L

Committee L

Remarking L

Rewarding L

Learning

Rewarding L

Rowarding L

Rewarding L.

Rewarding L.

Rowarding L.

Rowarding L.

Rowarding L.

Rowarding L.

Rowarding L.



6	In 2013 the amount of household waste sent to landfill in Northern Ireland was at its
	lowest recorded level. This was due to the increase in recycling of waste.

(a) The table below shows some items found in a sample of household waste. Classify each item as being made from a synthetic or natural material by placing a tick (✓) in the relevant column.

Item	Natural	Synthetic
Glass bottle		
Woollen rug		
Plastic bucket		
Iron nail		

[4]

E

G:

)

)

E

E

20

)

)

G:

- (b) Aluminium is a metal which can be recycled.
 - (i) State two advantages of recycling aluminium.

1.				

2			
۷.			

		[2]
_		

(ii)	Name one	other	material	which	can	be	recycled	
------	----------	-------	----------	-------	-----	----	----------	--

		E41
		11



7 110	minium is extracted from its ore by electrolysis.	
(i)	What is meant by the term electrolysis?	
		[
/::\		
(11)	Name the ore from which aluminium is extracted.	
		[
(iii)	Aluminium is formed at the negative electrode.	
	What name is given to the negative electrode?	

[Turn over

9373

Œ

Rewarding L

Learning

Rewarding L

Rowarding L



the	n is extracted from its ore in the Blast Furnace. During the extraction procestiron ore (mainly iron(III) oxide) undergoes reduction during a reaction with the monoxide as described by the word equation below.	
iro	n(III) oxide + carbon monoxide → iron + carbon dioxide	
(i)	Write a balanced symbol equation for the reaction of iron(III) oxide with carbon monoxide.	
		_ [3
(ii)	Explain what you understand by the term reduction.	
		_ [1
(iii	Name the ore from which iron metal is extracted.	_ [1
	d aluminium are extracted from their ores by different methods due to a ce in their reactivity.	
(e) Wh	nich metal, iron or aluminium, is less reactive?	
		_ [1

ag Learning G.) g Learning G: DED ya Leemina Rewardin DED ya Learning 0 ag Learning G: DED og Learning Rewardin 0 **P** G. G. DED og Learning Rewardin **PD** Rewardin) og Learning G. DED og Learning Rewardin GG: G. DED og Learning

Rowardin

Pan

Ty Learning

Rowardin

Pan

Ty Learning

Rowardin

Pan

Ty Learning

Ty Learning

Ty Learning

Ty Learning

Ty Learning

Rewardin

20
30
30
30
Searning

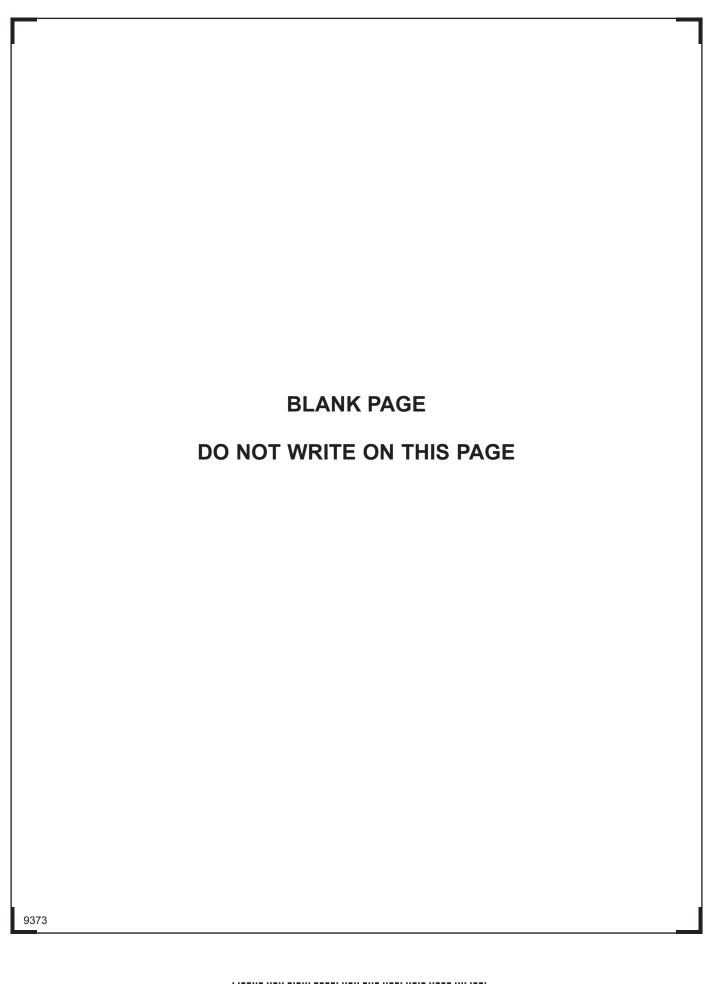
Rowardin

ng Learning
Rewarding

Œ.

THIS IS THE END OF THE QUESTION PAPER







DO NOT WRITE ON THIS PAGE

For Examiner's use only			
Question Number	Marks		
1			
2			
3			
4			
5			
6			

To Learning

Rewardin

Rewardin

Rewardin

Rewardin

Rewardin

ng Learning

Rewardin

)

Rewarding

Page 1

Rewarding

Rewarding

E

ng Learning
Rewarding
ng Learning

ng Learning

Rowarding

Rowarding

Rowarding

Rowarding

Rowarding

)

G.

ag Learning

Rewards

20 xg Learning

Rowarding Signature Control of the C

Rewardin

G:

Total Marks

Examiner Number

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.

