

Write your name here

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Pearson
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Candidate Number

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Chemistry/Science

Unit C1: Chemistry in Our World

Higher Tier

Thursday 14 May 2015 – Morning

Time: 1 hour

Paper Reference

5CH1H/01

You must have:

Calculator, ruler

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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The Periodic Table of the Elements

1	2	3	4	5	6	7	0	
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 O oxygen 8	16 F fluorine 9	18 Ne neon 10
19 K potassium 19	20 Ca calcium 20	23 Sc scandium 21	24 Ti titanium 22	25 V vanadium 23	26 Cr chromium 24	27 Mn manganese 25	28 Fe iron 26	29 Co cobalt 27
37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium 43	44 Ru ruthenium 44	45 Rh rhodium 45
55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	58 Ce cerium 58	59 Pr praseodymium 59	60 Nd neodymium 60	61 Pm promethium 61	62 Sm samarium 62	63 Eu europium 63
87 Fr francium 87	88 Ra radium 88	89 Ac* actinium 89	90 Th thorium 90	91 Pa protactinium 91	92 U uranium 92	93 Np neptunium 93	94 Pu plutonium 94	95 Am americium 95
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	140 Ce cerium 58	141 Pr praseodymium 59	142 Nd neodymium 60	143 Pm promethium 61	144 Sm samarium 62	145 Eu europium 63
223 Fr francium 87	226 Ra radium 88	227 Ac* actinium 89	228 Th thorium 90	231 Pa protactinium 91	232 U uranium 92	233 Np neptunium 93	234 Pu plutonium 94	235 Am americium 95
101 Bi bismuth 83	102 Po polonium 84	103 At astatine 85	104 Rn radon 86	105 Fr francium 87	106 Ra radium 88	107 Ac actinium 89	108 Th thorium 90	109 Pa protactinium 91
204 Tl thallium 81	207 Pb lead 82	208 Bi bismuth 83	209 Po polonium 84	210 At astatine 85	211 Rn radon 86	212 Fr francium 87	213 Ra radium 88	214 Ac actinium 89
115 In indium 49	119 Sb antimony 51	122 Te tellurium 52	125 I iodine 53	127 Xe xenon 54	128 At astatine 85	129 Rn radon 86	130 Fr francium 87	131 Ra radium 88
112 Cd cadmium 48	115 In indium 49	118 Xe xenon 54	120 Hg mercury 80	122 Pb lead 82	123 Bi bismuth 83	124 Po polonium 84	125 At astatine 85	126 Rn radon 86
65 Zn zinc 30	68 Cu copper 29	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	76 Se selenium 34	77 Br bromine 35	78 Kr krypton 36	79 Sr strontium 38
59 Ni nickel 28	59 Co cobalt 27	60 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	68 Cu copper 29	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33
106 Pd palladium 46	106 Pd palladium 46	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sb antimony 51	122 Te tellurium 52	125 I iodine 53
192 Ir iridium 77	192 Ir iridium 77	192 Ir iridium 77	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 At astatine 85
268 Mt meitnerium 109	268 Mt meitnerium 109	268 Mt meitnerium 109	271 Ds darmstadtium 110	272 Rg roentgenium 111	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 At astatine 85
277 Hs hassium 108	277 Hs hassium 108	277 Hs hassium 108	277 Hs hassium 108	277 Hs hassium 108	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 At astatine 85
264 Bh bohrium 107	264 Bh bohrium 107	264 Bh bohrium 107	264 Bh bohrium 107	264 Bh bohrium 107	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 At astatine 85
266 Sg seaborgium 106	266 Sg seaborgium 106	266 Sg seaborgium 106	266 Sg seaborgium 106	266 Sg seaborgium 106	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 At astatine 85
262 Db dubnium 105	262 Db dubnium 105	262 Db dubnium 105	262 Db dubnium 105	262 Db dubnium 105	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 At astatine 85
261 Rf rutherfordium 104	261 Rf rutherfordium 104	261 Rf rutherfordium 104	261 Rf rutherfordium 104	261 Rf rutherfordium 104	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 At astatine 85
227 Ac* actinium 89	227 Ac* actinium 89	227 Ac* actinium 89	227 Ac* actinium 89	227 Ac* actinium 89	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 At astatine 85
226 Ra radium 88	226 Ra radium 88	226 Ra radium 88	226 Ra radium 88	226 Ra radium 88	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 At astatine 85
101 Bi bismuth 83	102 Po polonium 84	103 At astatine 85	104 Rn radon 86	105 Fr francium 87	106 Ra radium 88	107 Ac actinium 89	108 Th thorium 90	109 Pa protactinium 91
Elements with atomic numbers 112-116 have been reported but not fully authenticated								

1
H
hydrogen
1

relative atomic mass
atomic symbol
name
atomic (proton) number

* 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.



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Questions begin on next page.



Answer ALL questions

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

Limestone

1 Limestone is a sedimentary rock.

(a) Describe how sedimentary rocks, such as limestone, are formed.

(3)

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(b) Limestone in the Earth's crust is converted into marble by the action of heat and pressure.

State the type of rock formed.

(1)

.....



(c) Limestone is a natural form of calcium carbonate.

A piece of calcium carbonate is heated strongly.

It forms solid calcium oxide and a gas.

The masses of the solids before and after heating were found.

mass of calcium carbonate before heating = 3.75 g

mass of calcium oxide remaining after heating = 2.10 g

(i) Calculate the mass of gas that was given off.

(1)

mass of gas given off = g

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

The gas given off when calcium carbonate is heated is

(1)

A carbon

B oxygen

C carbon monoxide

D carbon dioxide

(d) Calcium carbonate and calcium hydroxide are both used by farmers to treat some soils.

Explain why calcium carbonate and calcium hydroxide are used in this way.

(2)

(Total for Question 1 = 8 marks)

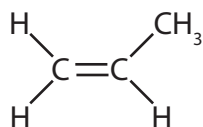


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Propene

2 The structure of a molecule of propene is



(a) Propene is an unsaturated hydrocarbon.

(i) Explain what is meant by **unsaturated hydrocarbon**.

(3)

.....

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

Propene can be made by using heat to decompose large alkane molecules into smaller, more useful molecules.

This process is known as

(1)

- A combustion
- B cracking
- C fractional distillation
- D polymerisation

(iii) Describe what is seen when a sample of propene is shaken with bromine water.

(2)

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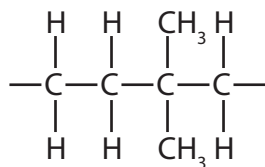
(b) Molecules of propene can be combined to form a molecule of poly(propene).

(i) Which of these shows part of the structure of a molecule of poly(propene)?

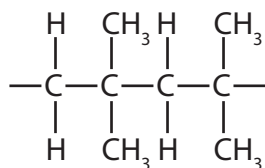
Put a cross (☒) in the box next to your answer.

(1)

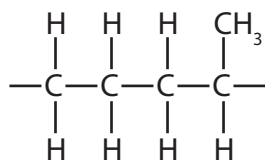
A



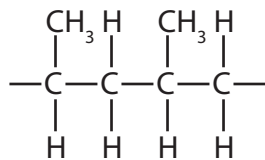
B



C



D



(ii) Ropes used on boats are often made from poly(propene).

poly(propene) rope



State a property of poly(propene) that makes it suitable for use as ropes on boats.

(1)

(iii) State a problem caused by the disposal of poly(propene) ropes in landfill sites.

(1)

(Total for Question 2 = 9 marks)



The atmosphere

3 The Earth's atmosphere today has changed, when compared with the Earth's earliest atmosphere.

(a) Two processes that caused changes were the cooling of the atmosphere and photosynthesis.

(i) State how cooling changed the composition of the Earth's atmosphere.

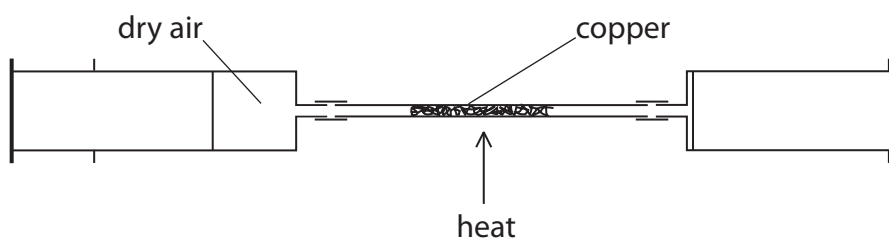
(1)

(ii) Explain how photosynthesis changed the composition of the Earth's atmosphere.

(2)

(b) In an experiment, dry air is passed backwards and forwards over hot, excess copper in the apparatus shown.

The oxygen in the air reacts with the hot copper to form copper oxide, CuO.



(i) Write the balanced equation for the reaction of copper with oxygen.

(3)



(ii) When the copper has reacted with all the oxygen, the apparatus is allowed to cool.

The initial volume of dry air in the apparatus was 50 cm^3 , measured at room temperature and pressure.

During the experiment the volume of gas in the apparatus decreased.

Calculate the final volume of gas remaining in the apparatus after allowing it to cool to room temperature.

(percentage of oxygen in dry air is 21%)

(2)

.....

.....

.....

.....

final volume of gas remaining in apparatus = cm^3

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

After the reaction between dry air and copper is complete, most of the gas remaining in the apparatus is

(1)

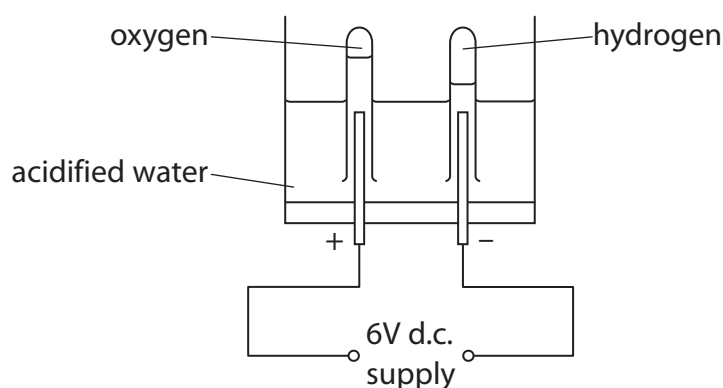
- A argon
- B carbon dioxide
- C nitrogen
- D oxygen

(Total for Question 3 = 9 marks)



Electrolysis and acids

- 4 (a) Water, acidified with a small amount of dilute sulfuric acid, can be decomposed by electrolysis using the apparatus shown.



- (i) State the form of energy used to carry out the electrolysis.

(1)

- (ii) During the electrolysis, hydrogen is formed at one of the electrodes.

Describe a test to show that this gas is hydrogen.

(2)

- (b) Electrolysis is also used to produce chlorine on a large scale.

Name a raw material that can be electrolysed to produce chlorine.

(1)



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

Acids are neutralised by metal hydroxides to form

(1)

- A salt only
- B salt and hydrogen only
- C salt and oxygen only
- D salt and water only

(ii) Acids can also be neutralised by metal carbonates.

Dilute sulfuric acid is neutralised by copper carbonate as shown in the word equation.



Copper carbonate is a green powder.

Describe what you would **see** when copper carbonate powder is added to dilute sulfuric acid.

(2)

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.....



- (d) Two experiments were carried out to test the effectiveness of tablets of three different indigestion remedies, A, B and C.

For each remedy, the experiments were carried out on both a whole and a crushed tablet.

In experiment 1, each tablet was added to excess hydrochloric acid and the time taken for the tablet to react completely was recorded.

In experiment 2, the volume of acid neutralised by each tablet was determined.

The table shows the results obtained for the investigation.

tablet of	state of tablet	experiment 1 : time taken for the tablet to react completely / s	experiment 2 : volume of acid neutralised / cm ³
A	whole	75	25.0
	crushed	30	25.0
B	whole	59	25.0
	crushed	19	25.0
C	whole	120	50.0
	crushed	44	50.0

- (i) Explain, using information from the table, which of the tablets contains the most of the active ingredient to overcome indigestion.

(2)

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- (ii) Explain, using information from the table, whether faster relief of indigestion is achieved by using a given tablet whole or crushed.

(1)

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(Total for Question 4 = 10 marks)



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Fuels and crude oil

- 5 (a) Some fuels are better fuels than others.

State one factor that makes a good fuel.

(1)

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.....

- (b) Bioethanol is a fuel that can be obtained from the plant, sugar beet.

- (i) Bioethanol and petrol can both be used as fuels.

Explain one advantage of using bioethanol produced from sugar beet, rather than petrol produced from crude oil.

(2)

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- (ii) The main component of bioethanol is ethanol.

When burnt completely, ethanol, C_2H_5OH , reacts with oxygen to produce carbon dioxide and water.

Write the balanced equation for this reaction.

(3)

.....



Metals

6 The list shows some metals in order of reactivity.

most reactive	sodium
	aluminium
	zinc
	iron
	copper
least reactive	gold

(a) Aluminium and iron are extracted by reduction of their oxides.

State what is meant by reduction.

(1)

(b) Electrolysis and heating with carbon are two methods of reduction.

Explain why aluminium needs to be extracted from its ore by electrolysis, rather than by heating with carbon.

(2)

(c) Iron is extracted from iron oxide, Fe_2O_3 .

In the extraction process the iron oxide is heated with carbon to form iron and carbon dioxide.

Write the balanced equation for this reaction.

(3)



(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS



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