Write your name here

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Pearson Edexcel GCSE

Centre Number | | | | | |

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Chemistry/Science

Unit C1: Chemistry in Our World

Higher Tier

Thursday 19 May 2016 – 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.
- 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
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

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 ☒.

Carbon dioxide

1 (a) The Earth's early atmosphere contained larger amounts of water vapour and carbon dioxide than it does today.

Explain how the amounts of water vapour and carbon dioxide in the Earth's atmosphere decreased.

(2)

(b) Describe how the presence of carbon dioxide in the atmosphere helps to keep the Earth warm.

(1)

(c) State a human activity, apart from burning fuels, that has increased the percentage of carbon dioxide in the atmosphere.

(1)

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(d) This table shows a set of data for the percentage of carbon dioxide in the atmosphere and the mean surface temperature of the Earth in the years 1960 and 2014.

year	percentage of carbon dioxide	mean surface temperature / °C
1960	0.0318	14.0
2014	0.0401	14.4

Suggest why this information does not prove that the increase in percentage of carbon dioxide alone has caused the increase in the mean surface temperature of the Earth.

(1)

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.....

(e) Hydrogen can be used as a fuel for cars.

(i) State one advantage and one disadvantage of using a car which uses hydrogen as the fuel rather than a car which uses petrol as the fuel.

(2)

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(ii) Write the word equation for the reaction between hydrogen and oxygen.

(1)

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(Total for Question 1 = 8 marks)

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Rocks

2 (a) Granite is an igneous rock.

The size of crystals in granite vary.

Describe how a sample of granite which contains large crystals was formed.

(2)

(b) Limestone and marble are natural forms of calcium carbonate.

Limestone is a sedimentary rock.

Marble is a metamorphic rock, formed from limestone.

Describe how marble is formed from limestone.

(2)

(c) Calcium carbonate is used to treat waste gases in coal-fired power stations.

Explain why calcium carbonate can be used in this way.

(2)

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(d) (i) When calcium carbonate is heated, it breaks down to form calcium oxide and carbon dioxide.

What type of reaction is this?

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

(1)

- ☐ **A** combustion
- ☐ **B** decomposition
- ☐ **C** oxidation
- ☐ **D** precipitation

(ii) Calcium oxide reacts with water to form calcium hydroxide, $Ca(OH)_2$.

Write the balanced equation for the reaction between calcium oxide and water.

(2)

.....

(Total for Question 2 = 9 marks)

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Acids and electrolysis

3 (a) Which of these substances is produced in the stomach to help digestion?

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

(1)

☒ **A** calcium oxide

☒ **B** hydrochloric acid

☒ **C** magnesium oxide

☒ **D** sulfuric acid

(b) Nitric acid reacts with magnesium carbonate to form a salt, water and a gas.

(i) State the name of the salt formed in this reaction.

(1)

.....

(ii) Which of these is the gas produced in this reaction?

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

(1)

☒ **A** carbon dioxide

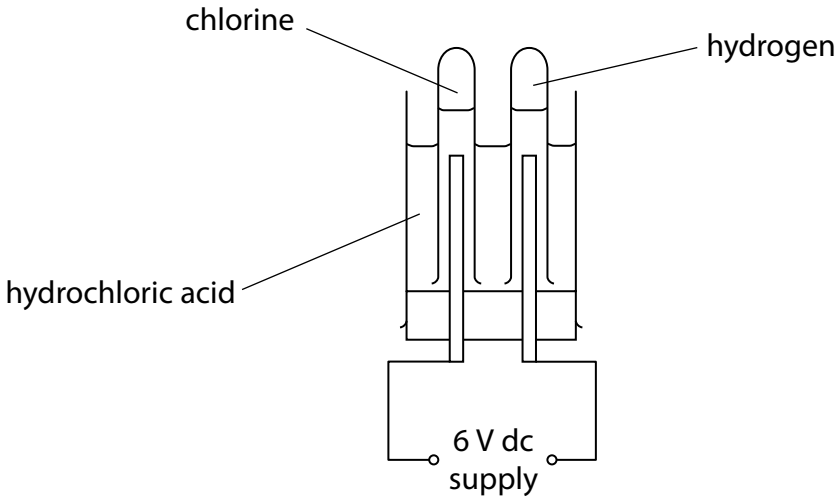
☒ **B** hydrogen

☒ **C** oxygen

☒ **D** nitrogen

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(c) Hydrochloric acid is electrolysed using this apparatus.
Hydrogen and chlorine are produced.



(i) Describe the test to show that a gas is chlorine.

(2)

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(ii) Chlorine is a toxic gas.

State a safety precaution that should be taken when chlorine gas is formed in a reaction.

(1)

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(iii) Write the balanced equation for the decomposition of hydrochloric acid to form hydrogen and chlorine.

(3)

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(Total for Question 3 = 9 marks)

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Alkenes and polymers

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

(1)

Alkenes are

☒ **A** saturated carbohydrates

☒ **B** saturated hydrocarbons

☒ **C** unsaturated carbohydrates

☒ **D** unsaturated hydrocarbons

(b) Propene is an alkene and has the molecular formula C_3H_6.

(i) Draw the structure of a propene molecule, showing all of the bonds.

(2)

(ii) Propane is an alkane.
Propane and propene are both gases.

Given a sample of each gas, describe a test, carried out on both gases, to show which gas is propane and which gas is propene.

(3)

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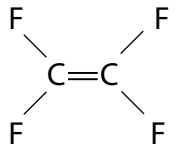
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(c) The diagram shows the structure of a tetrafluoroethene molecule.



Tetrafluoroethene can form the polymer PTFE.

(i) Draw a diagram to show part of a PTFE molecule formed from two tetrafluoroethene molecules.

(2)

(ii) PTFE does not allow other substances to stick to it.
State a use of PTFE related to this property.

(1)

.....

.....

(d) Many polymers cause problems because they persist for a long time when they are put in landfill sites.

State an alternative way of disposing of polymer waste.

(1)

.....

.....

(Total for Question 4 = 10 marks)

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Metals

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

(1)

Aluminium is extracted from aluminium oxide by electrolysis.

The overall equation for this reaction is

$$2Al_2O_3 \rightarrow 4Al + 3O_2$$

In this reaction

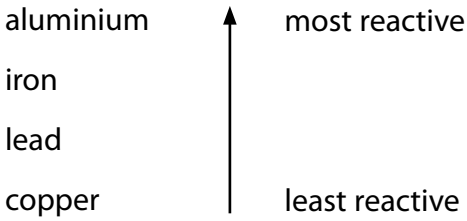
☒ **A** aluminium oxide is oxidised

☒ **B** aluminium oxide is reduced

☒ **C** aluminium metal is reduced

☒ **D** oxygen gas is oxidised

(ii) Part of the reactivity series is shown



Lead is extracted from its oxide by heating the oxide with carbon rather than by using electrolysis.

Explain why.

(2)

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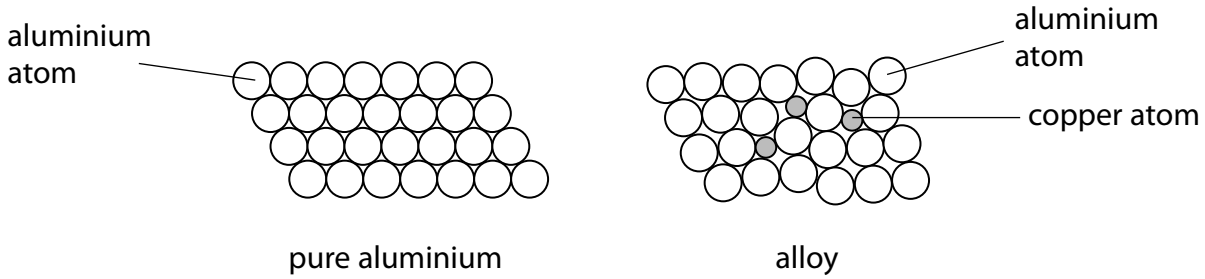
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(b) Pure aluminium is too weak for many uses.
Copper can be mixed with aluminium to produce an alloy.
The alloy is stronger than pure aluminium.

The diagrams show the structures of pure aluminium and the alloy.



pure aluminium alloy

Explain, in terms of these structures, how the presence of copper atoms in the alloy results in the alloy being stronger than pure aluminium.

(3)

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*(c) Iron in the form of steel, aluminium and copper are used to manufacture many useful articles.
These uses depend on their density, strength, electrical conductivity and resistance to corrosion.

Describe some uses of each of these metals in relation to their properties and the advantages of recycling these metals rather than extracting more of the metals from their ores.

(6)

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(Total for Question 5 = 12 marks)

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Products from crude oil

6 Crude oil is separated into different fractions by fractional distillation.

(a) Fraction X is obtained from near the top of the fractionating column.
Fraction Y is obtained from near the bottom of the fractionating column.

Which row of the table shows the boiling point, ease of ignition and viscosity of fraction X compared with fraction Y?

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

(1)

	boiling point	ease of ignition	viscosity
☒ **A**	lower than Y	more difficult than Y	higher than Y
☒ **B**	lower than Y	easier than Y	lower than Y
☒ **C**	higher than Y	more difficult than Y	lower than Y
☒ **D**	higher than Y	easier than Y	higher than Y

(b) Pentane, C_5H_{12}, can be obtained from crude oil.
When pentane burns completely in air, it forms carbon dioxide and water.

Write the balanced equation for this reaction.

(3)

(c) Sulfur is present as an impurity in some fuels.

Explain how the product of combustion of this impurity in a fuel can damage the environment.

(2)

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*(d) The table below shows the percentages of three fractions obtained from crude oil and the percentages of these fractions required by customers.

fraction	number of carbon atoms in molecules	percentage obtained from crude oil	percentage required by customers
gases	1 to 4	2	5
petrol	5 to 10	10	26
kerosene	10 to 16	13	8

Oil companies use cracking to convert some of the molecules in the kerosene fraction into molecules with fewer carbon atoms.

Cracking can also be carried out on a small scale using liquid paraffin in a school laboratory.

Describe how cracking can be carried out in the laboratory experiment, explaining why it is necessary for oil companies to use cracking on some fractions obtained from crude oil.

You may wish to use diagrams to help parts of your answer.

(6)

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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