

Write your name here

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**Edexcel GCSE**

Centre Number

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Candidate Number

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# Chemistry/Science

## Unit C1: Chemistry in Our World

**Higher Tier**

Thursday 18 May 2017 – 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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**Pearson**

# The Periodic Table of the Elements

1	2	3	4	5	6	7	0	
7 <b>Li</b> lithium 3	9 <b>Be</b> beryllium 4	11 <b>Na</b> sodium 11	12 <b>C</b> carbon 6	13 <b>Al</b> aluminium 13	14 <b>N</b> nitrogen 7	15 <b>O</b> oxygen 8	16 <b>F</b> fluorine 9	18 <b>Ne</b> neon 10
19 <b>K</b> potassium 19	20 <b>Ca</b> calcium 20	23 <b>Sc</b> scandium 21	24 <b>Ti</b> titanium 22	25 <b>V</b> vanadium 23	26 <b>Cr</b> chromium 24	27 <b>Mn</b> manganese 25	28 <b>Fe</b> iron 26	30 <b>Co</b> cobalt 27
37 <b>Rb</b> rubidium 37	38 <b>Sr</b> strontium 38	39 <b>Y</b> yttrium 39	40 <b>Zr</b> zirconium 40	41 <b>Nb</b> niobium 41	42 <b>Mo</b> molybdenum 42	43 <b>Tc</b> technetium 43	44 <b>Ru</b> ruthenium 44	45 <b>Rh</b> rhodium 45
55 <b>Cs</b> caesium 55	56 <b>Ba</b> barium 56	57 <b>La*</b> lanthanum 57	72 <b>Hf</b> hafnium 72	73 <b>Ta</b> tantalum 73	74 <b>W</b> tungsten 74	75 <b>Re</b> rhenium 75	76 <b>Os</b> osmium 76	77 <b>Ir</b> iridium 77
[223] <b>Fr</b> francium 87	[226] <b>Ra</b> radium 88	[227] <b>Ac*</b> actinium 89	[261] <b>Rf</b> rutherfordium 104	[262] <b>Db</b> dubnium 105	[266] <b>Sg</b> seaborgium 106	[264] <b>Bh</b> bohrium 107	[277] <b>Hs</b> hassium 108	[268] <b>Mt</b> meitnerium 109
133 <b>Cs</b> caesium 55	137 <b>Ba</b> barium 56	139 <b>La*</b> lanthanum 57	178 <b>Hf</b> hafnium 72	181 <b>Ta</b> tantalum 73	184 <b>W</b> tungsten 74	186 <b>Re</b> rhenium 75	190 <b>Os</b> osmium 76	192 <b>Ir</b> iridium 77
85 <b>Rb</b> rubidium 37	88 <b>Sr</b> strontium 38	89 <b>Y</b> yttrium 39	91 <b>Zr</b> zirconium 40	93 <b>Nb</b> niobium 41	96 <b>Mo</b> molybdenum 42	[98] <b>Tc</b> technetium 43	101 <b>Ru</b> ruthenium 44	103 <b>Rh</b> rhodium 45
65 <b>Zn</b> zinc 30	63.5 <b>Cu</b> copper 29	59 <b>Ni</b> nickel 28	56 <b>Fe</b> iron 26	55 <b>Mn</b> manganese 25	52 <b>Cr</b> chromium 24	51 <b>V</b> vanadium 23	48 <b>Ti</b> titanium 22	45 <b>Rh</b> rhodium 45
115 <b>In</b> indium 49	112 <b>Cd</b> cadmium 48	106 <b>Pd</b> palladium 46	108 <b>Ag</b> silver 47	103 <b>Rh</b> rhodium 45	101 <b>Ru</b> ruthenium 44	100 <b>Pd</b> palladium 46	106 <b>Pd</b> palladium 46	112 <b>Cd</b> cadmium 48
207 <b>Pb</b> lead 82	204 <b>Tl</b> thallium 81	201 <b>Hg</b> mercury 80	197 <b>Au</b> gold 79	195 <b>Pt</b> platinum 78	192 <b>Ir</b> iridium 77	190 <b>Os</b> osmium 76	186 <b>Re</b> rhenium 75	184 <b>W</b> tungsten 74
127 <b>I</b> iodine 53	128 <b>Te</b> tellurium 52	122 <b>Sb</b> antimony 51	112 <b>Cd</b> cadmium 48	106 <b>Pd</b> palladium 46	103 <b>Rh</b> rhodium 45	101 <b>Ru</b> ruthenium 44	100 <b>Pd</b> palladium 46	108 <b>Ag</b> silver 47
[222] <b>Rn</b> radon 86	[209] <b>Po</b> polonium 84	209 <b>Bi</b> bismuth 83	201 <b>Hg</b> mercury 80	195 <b>Pt</b> platinum 78	192 <b>Ir</b> iridium 77	190 <b>Os</b> osmium 76	186 <b>Re</b> rhenium 75	184 <b>W</b> tungsten 74
84 <b>Kr</b> krypton 36	80 <b>Br</b> bromine 35	75 <b>As</b> arsenic 33	73 <b>Ge</b> germanium 32	70 <b>Ga</b> gallium 31	65 <b>Zn</b> zinc 30	63.5 <b>Cu</b> copper 29	59 <b>Ni</b> nickel 28	56 <b>Fe</b> iron 26
40 <b>Ar</b> argon 18	35.5 <b>Cl</b> chlorine 17	32 <b>S</b> sulfur 16	28 <b>Si</b> silicon 14	27 <b>Al</b> aluminium 13	26 <b>Fe</b> iron 26	25 <b>Mn</b> manganese 25	24 <b>Cr</b> chromium 24	23 <b>V</b> vanadium 23
20 <b>Ne</b> neon 10	19 <b>F</b> fluorine 9	16 <b>O</b> oxygen 8	14 <b>N</b> nitrogen 7	12 <b>C</b> carbon 6	11 <b>B</b> boron 5	9 <b>Be</b> beryllium 4	7 <b>Li</b> lithium 3	4 <b>He</b> helium 2

1 <b>H</b> hydrogen 1
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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.

Elements with atomic numbers 112-116 have been reported but not fully authenticated

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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 Carbon dioxide dissolves in the water in the Earth's oceans.

(a) Describe how these oceans were originally formed.

(2)

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(b) Some rocks are formed from dissolved carbon dioxide.

(i) Describe how this happens.

(2)

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

(1)

The substance formed in these rocks is

- A calcium carbonate
- B sodium chloride
- C calcium hydroxide
- D iron oxide

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- (c) Iron seeding is the introduction of iron into the ocean.  
This stimulates the growth of small plants.

Explain how the growth of these plants affects the amount of carbon dioxide in the atmosphere.

(2)

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- (d) Carbon dioxide is one of the products of the complete combustion of methane in air.

Write the word equation for this reaction.

(2)

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**(Total for Question 1 = 9 marks)**



## Acids and electrolysis

2 Acids can undergo neutralisation to form salts.

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

(1)

An acid reacts with a metal oxide to form

- A a salt + carbon dioxide
- B a salt + hydrogen
- C a salt + oxygen
- D a salt + water

(b) Acids also react with metal carbonates.

The equation for the reaction of calcium carbonate with dilute hydrochloric acid is



Describe what you would **see** when solid calcium carbonate reacts with dilute hydrochloric acid.

(2)

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(c) Hydrogen and oxygen are produced by the electrolysis of water, acidified with a small amount of dilute sulfuric acid.

(i) Explain what is meant by **electrolysis**. (2)

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(ii) Describe the test to show that a gas is oxygen. (2)

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(iii) Describe the test to show that a gas is hydrogen. (2)

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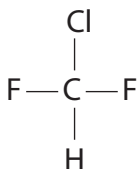
**(Total for Question 2 = 9 marks)**



## Organic compounds

- 3 (a) (i) Methane, CH<sub>4</sub>, is a hydrocarbon.

Chlorodifluoromethane can be formed from methane.  
A diagram of one molecule of this compound is



Explain whether or not this molecule is a hydrocarbon.

(2)

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- (ii) Chlorodifluoromethane is a gas.

When it is bubbled through bromine water, the orange colour remains.

State what this shows about the structure of this compound.

(1)

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- (b) Gases in the atmosphere that trap heat from the Sun are known as 'greenhouse gases'.

- (i) Give one possible consequence of an increase in the amount of these gases in the atmosphere.

(1)

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(ii) Complete the sentence by putting a cross (☒) in the box next to your answer. (1)

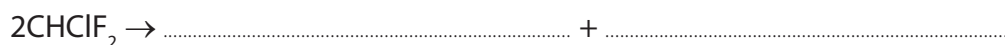
Chlorodifluoromethane is a gas that traps heat from the Sun.

Another gas that traps heat from the Sun is

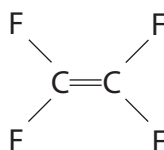
- A argon
- B nitrogen
- C oxygen
- D water vapour

(c) When chlorodifluoromethane,  $\text{CHClF}_2$ , is strongly heated, it decomposes to form tetrafluoroethene,  $\text{C}_2\text{F}_4$ , and hydrogen chloride.

Complete the balanced equation for this reaction. (2)



(d) The structure of a molecule of tetrafluoroethene is



A sample of this gas was kept in a cylinder under high pressure. The cylinder was left unused for a long time.

When the cylinder was opened no gas remained. Instead it contained a slippery, waxy, white solid.

(i) State the type of reaction that occurred when tetrafluoroethene gas formed the solid. (1)

(ii) Deduce the name of the solid formed. (1)

(Total for Question 3 = 9 marks)

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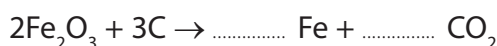
## Metals

4 (a) Most metals are extracted from rocks found in the Earth's crust.

- (i) Iron is extracted from iron oxide.  
The iron oxide,  $\text{Fe}_2\text{O}_3$ , is heated with carbon.

Complete the balancing of the equation for this reaction by putting numbers in the spaces provided.

(2)



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

(1)

When the iron oxide reacts with carbon to form iron and carbon dioxide

- A** carbon is reduced and iron oxide is reduced
- B** carbon is oxidised and iron oxide is oxidised
- C** carbon is reduced and iron oxide is oxidised
- D** carbon is oxidised and iron oxide is reduced

(b) Gold is used to make some items of jewellery.

Gold alloys, rather than pure gold, are often used in items of jewellery.

The table shows some information about the properties of two types of gold.

type of gold / carats	relative strength	cost / £ / g
18	medium	16
24	low	22

Use the information in the table to explain why gold alloys, rather than pure gold, are often used in items of jewellery.

(2)

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- (c) The table shows four metals in the order in which they appear in the reactivity series, from the most to the least reactive.

The methods of extraction for three of these metals from their ores are given.

metal	method of extraction
sodium	
aluminium	electrolysis
iron	heating with carbon
gold	found uncombined

- (i) Suggest the method used to extract sodium from its ore.

(1)

- (ii) Explain why this method has to be used.

(2)

- (d) Shape memory alloy tubes can be used in modern surgery as stents to repair damaged blood vessels.

Explain what is meant by a **shape memory alloy**.

(2)

(Total for Question 4 = 10 marks)



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### Fuels

5 Crude oil is fractionally distilled to produce fractions. These fractions have many uses.

(a) Complete the sentence by putting a cross (☒) in the box next to your answer. (1)

The fraction least likely to be used as a fuel is

- A bitumen
- B diesel oil
- C kerosene
- D gases

(b) Some of the fractions from crude oil are cracked.

(i) Describe what is meant by **cracking**. (2)

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(ii) When butane is cracked, a number of different hydrocarbons are formed.

Draw the structure of a molecule of one of these hydrocarbons, showing all bonds. (2)



\*(c) The following passage gives some information about hydrogen used as fuel in cars.

The fuel used in some cars is hydrogen. It is stored in pressurised tanks underneath the cars. The processes used to produce the hydrogen and pressurise it may require the use of fossil fuels.

The company expects sales of these cars to increase as more hydrogen filling stations are built.

Use your knowledge of hydrogen and petrol to explain the advantages and disadvantages of using hydrogen rather than petrol as the fuel in cars.

(6)

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(Total for Question 5 = 11 marks)



P 4 8 5 7 9 A 0 1 5 2 0

## Rocks

6 Calcium carbonate is an important raw material in the chemical industry.

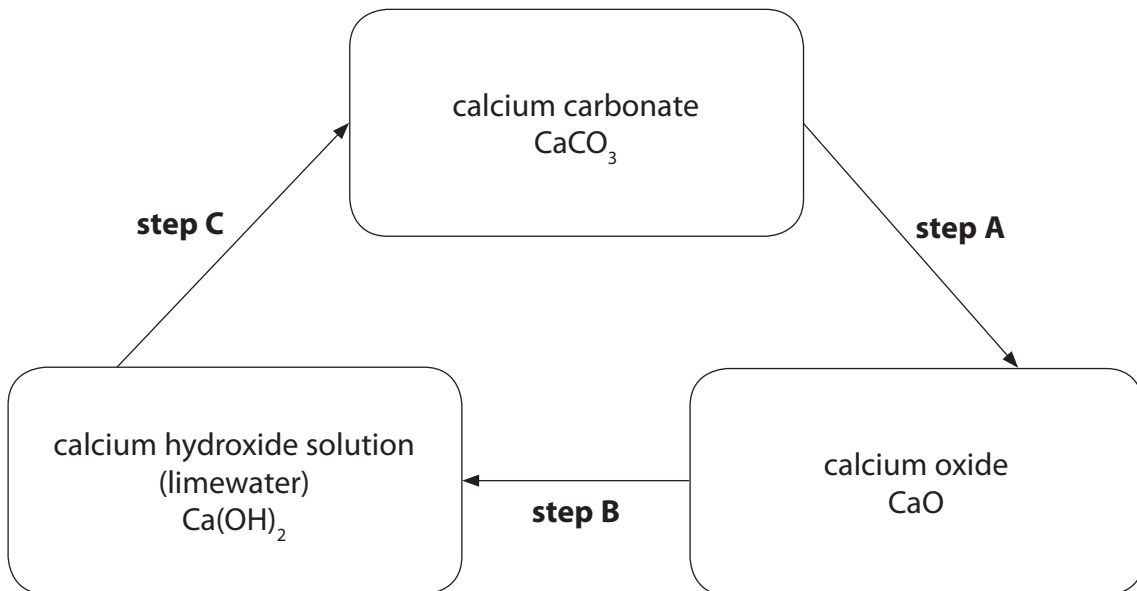
(a) Which of these is not made in a process using calcium carbonate?

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

(1)

- A cement
- B concrete
- C glass
- D PVC

(b) The diagram shows reactions of some calcium compounds.





- (i) In step **A**, a known mass of calcium carbonate is heated in order to obtain calcium oxide.

The mass of the calcium oxide formed is found.

Suggest how to continue the experiment to prove that the reaction is complete.

(3)

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- (ii) The reaction in step **C** is the one that occurs in the test for carbon dioxide.

Write the balanced equation for the reaction of calcium hydroxide with carbon dioxide.

(2)

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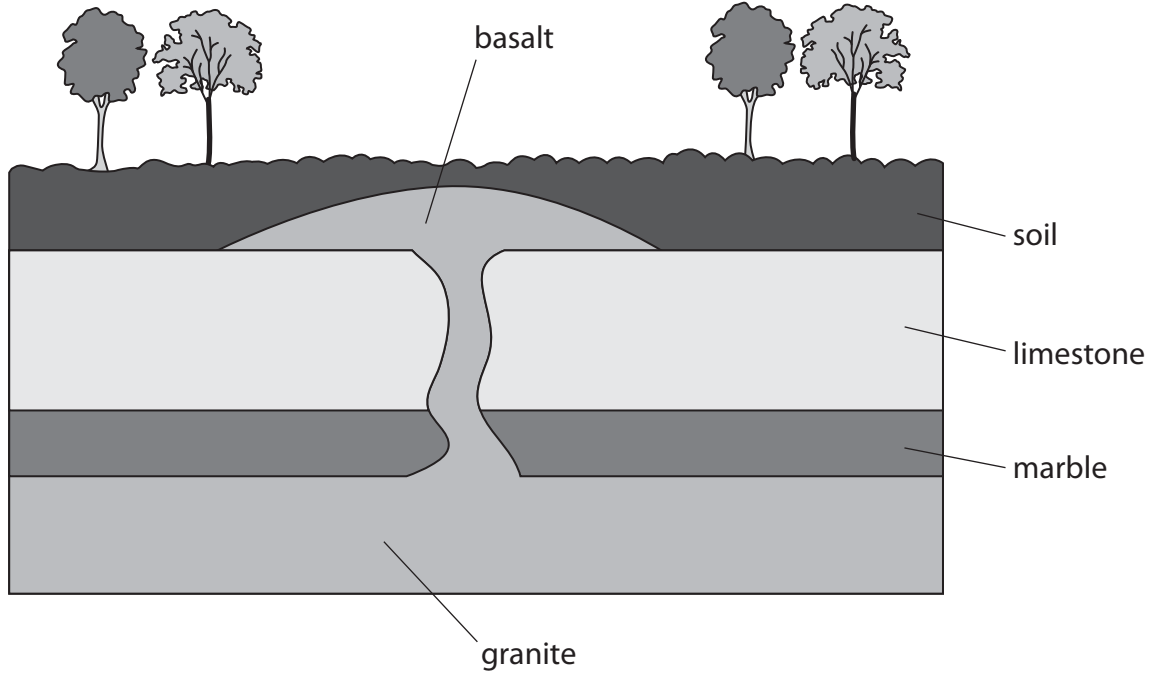
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\*(c) The diagram shows where the following rocks can be formed in the Earth's crust.

limestone, a sedimentary rock  
 marble, a metamorphic rock  
 basalt, an igneous rock consisting of small crystals  
 granite, an igneous rock consisting of large crystals



Explain how these rocks were formed.

(6)



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(Total for Question 6 = 12 marks)

**TOTAL FOR PAPER = 60 MARKS**



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