Edexcel GCSE

Centre Number

Candidate Number

Chemistry/Science
Unit C1: Chemistry in our World

Higher Tier

Wednesday 7 November 2012 – 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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PEARSON

The Periodic Table of the Elements

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

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

* 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 ☒.

Hydrochloric acid and chlorine

1 (a) Hydrochloric acid can be electrolysed using this apparatus.
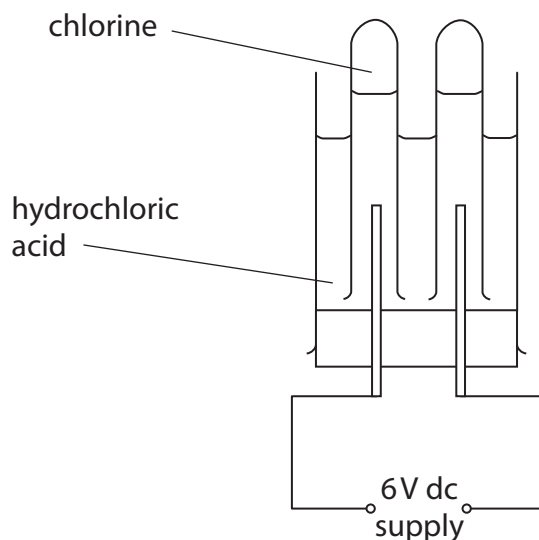
(i) State the form of energy used to carry out the electrolysis.

(1)

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(ii) Chlorine gas is formed at one electrode.

Name the gas formed at the other electrode.

(1)

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

(2)

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(b) Which of these can be used to obtain chlorine from sea water?

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

(1)

☒ **A** corrosion

☒ **B** electrolysis

☒ **C** fractional distillation

☒ **D** neutralisation

(c) Acids react with metal carbonates.

Complete the word equation for this type of reaction.

(1)

acid + metal carbonate → salt + water + ...

(d) Acids also react with metal oxides.

Complete and balance the equation for the reaction between copper oxide, CuO, and dilute hydrochloric acid, HCl.

(2)

$$CuO + \text{............} HCl \rightarrow CuCl_2 + \text{............................}$$
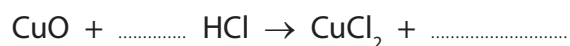
(Total for Question 1 = 8 marks)

Fuels

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

Crude oil is a mixture of mainly

(1)

☒ **A** alkenes

☒ **B** carbon and hydrogen

☒ **C** hydrocarbons

☒ **D** polymers

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

Fuel oil is used as a fuel in

(1)

☒ **A** aircraft engines

☒ **B** car engines

☒ **C** cooking stoves

☒ **D** power station furnaces

(c) (i) Methane, CH_4, is a gas that can be used as a fuel.

During complete combustion, it burns in oxygen to produce carbon dioxide and water.

Write the balanced equation for the complete combustion of methane.

(3)

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(ii) The table shows the amount of heat energy produced when different masses of methane and octane are burnt.

fuel	mass burnt / g	heat energy released / kJ
methane	16	896
octane	114	5472

When 1 g of methane is burnt, 56 kJ of heat energy is produced.

Calculate the heat energy produced when 1 g of octane is burnt.

(1)

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heat energy produced = ... kJ

(iii) State **two** factors that make a good fuel.

(2)

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(Total for Question 2 = 8 marks)

Carbon dioxide

3 (a) Which of these shows the relative amounts of carbon dioxide and oxygen in the Earth's early atmosphere?

(1)

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

☒ **A** large amount of carbon dioxide and large amount of oxygen

☒ **B** large amount of carbon dioxide and small amount of oxygen

☒ **C** small amount of carbon dioxide and large amount of oxygen

☒ **D** small amount of carbon dioxide and small amount of oxygen

(b) The concentration of carbon dioxide in the Earth's atmosphere depends on the balance between the processes that remove carbon dioxide from the atmosphere and those that release carbon dioxide into the atmosphere.

(i) Explain how carbon dioxide is removed from the atmosphere.

(2)

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(ii) Explain how carbon dioxide is released into the atmosphere.

(2)

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(c) Describe the test to show that a gas is carbon dioxide.

(2)

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(d) The graphs show the concentration of carbon dioxide in the atmosphere and the mean global temperature between 1960 and 2000.

concentration of
carbon dioxide / ppm

mean global
temperature / °C
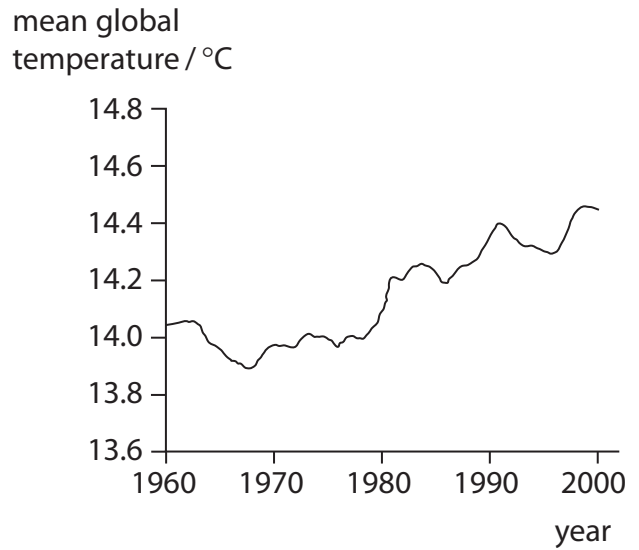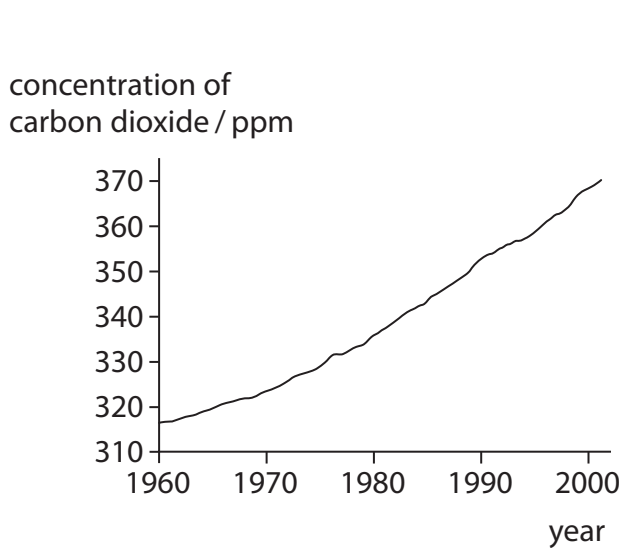
Explain whether or not these graphs provide evidence that human activity is causing the Earth's temperature to rise.

(3)

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(Total for Question 3 = 10 marks)

Calcium carbonate

4 (a) Marble and limestone are both forms of calcium carbonate.

Which of the following is a rock that is another form of calcium carbonate?

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

(1)

☒ **A** chalk

☒ **B** glass

☒ **C** granite

☒ **D** magma

(b) When calcium carbonate is heated strongly it undergoes thermal decomposition.

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

2.50 g of calcium carbonate was heated strongly.

1.40 g of solid remained after heating.

(i) Calculate the mass of carbon dioxide produced during this reaction.

(1)

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mass of carbon dioxide = ... g

(ii) It is possible that not all of the calcium carbonate decomposed when it was heated.

Suggest what could be done to confirm that the decomposition was complete.

(2)

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(iii) Calcium oxide reacts with water to form calcium hydroxide.

Write the balanced equation for this reaction.

(2)

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(c) In an experiment, calcium chloride solution reacted with sodium carbonate solution to produce solid calcium carbonate and sodium chloride solution.

$$CaCl_2(aq) \ + \ Na_2CO_3(aq) \rightarrow CaCO_3(s) \ + \ 2NaCl(aq)$$
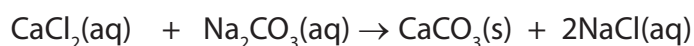
mass of calcium chloride solution used   = 11.00 g

mass of sodium carbonate solution used   = 10.50 g

mass of calcium carbonate solid produced   =   1.00 g

Calculate the mass of the solution left at the end of the reaction.

(2)

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mass of remaining solution = ... g

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

Explain why calcium carbonate is used in this way.

(2)

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(Total for Question 4 = 10 marks)

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Metals

5 This is part of the reactivity series of metals.

most reactive	magnesium
	aluminium
	zinc
	iron
	copper
	silver
least reactive	gold

(a) Iron is extracted by the reduction of iron oxide.

In the extraction process, iron oxide is reduced by heating it with carbon.

(i) The extraction process involves both reduction and oxidation reactions.

State what is oxidised in this process.

(1)

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(ii) Aluminium is extracted from its oxide by electrolysis.

Explain why iron can be extracted from iron oxide by heating it with carbon but electrolysis has to be used to extract aluminium from its oxide.

(2)

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(b) The photograph shows a mask discovered in Colombia.

It is made from a gold and copper alloy.

The diagrams show the structure of pure gold and of the alloy containing a few atoms of copper.

gold atom

gold atom
copper atom

gold   alloy
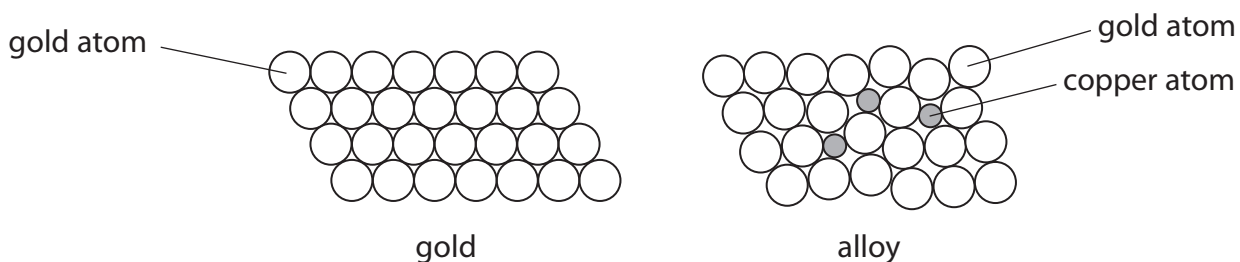
Explain how the presence of copper atoms results in an alloy with a higher strength than pure gold.

(3)

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*(c) Metals have specific uses based on their properties.

The table shows some properties of four metals.

metal	cost of 1 kg / £	density / g cm⁻³	relative strength	resistance to corrosion	electrical conductivity
aluminium	1	2.70	high	good	good
copper	5	8.92	high	good	very good
gold	33000	19.3	low	excellent	excellent
silver	620	10.5	low	very good	excellent

Use the data in the table to explain some uses of each of these metals in relation to their individual properties.

(6)

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(Total for Question 5 = 12 marks)

Propene

6 Propene is an alkene.

The formula of its molecule is C_3H_6.

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

(2)

(ii) One molecule of decane, $C_{10}H_{22}$, can be cracked to produce one molecule of propene and one molecule of an alkane **X** only.

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

The formula of a molecule of alkane **X** is

(1)

☒ **A** C_7H_{14}

☒ **B** C_7H_{16}

☒ **C** C_8H_{16}

☒ **D** $C_{13}H_{28}$

(b) Propane is an alkane.

Propane and propene are both gases.

Given a sample of each gas, describe a test to show which gas is propane and which gas is propene.

(3)

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*(c) Propene is used to make the polymer poly(propene).

Explain how poly(propene) molecules are formed from propene molecules and relate the properties of poly(propene) to its uses.

(6)

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(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

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