Write your name here

Surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9-1)

Centre Number	Candidate Number

Combined Science

Paper 4: Chemistry 2

Foundation Tier

Sample Assessment Materials for first teaching September 2016
Time: 1 hour 10 minutes

Paper Reference
1SC0/2CF

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.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

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.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- There is a periodic table on the back cover of the paper.

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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1/

S 6 0 2 3 1 A 0 1 2 4

Pearson

Answer ALL questions. Write your answers in the spaces provided.

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 ☒.

1 (a) Four gases were present in the Earth's early atmosphere.

Figure 1 shows the percentages of these gases thought to have been present.

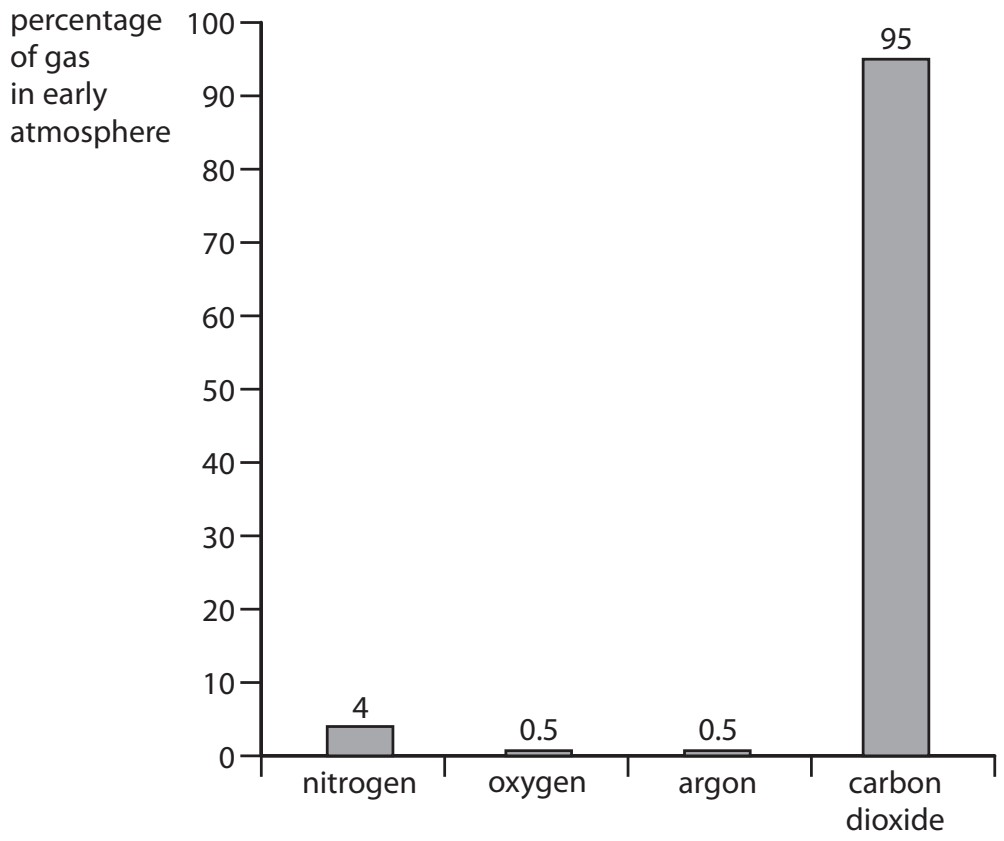

Figure 1

State from where these gases entered the atmosphere.

(1)

.....

(b) Figure 2 shows the percentages of these four gases in the atmosphere of the Earth today.

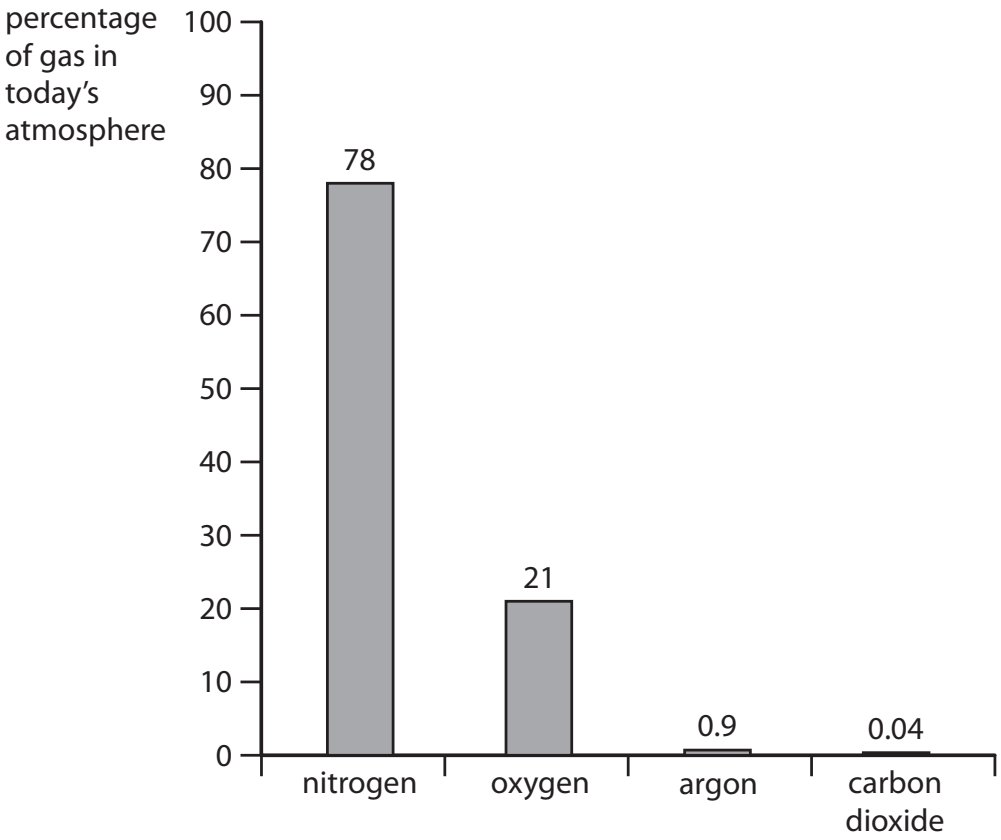

Figure 2

Which of the four gases has decreased by the largest percentage from the Earth's early atmosphere to today's atmosphere?

(1)

☒ **A** argon

☒ **B** carbon dioxide

☒ **C** nitrogen

☒ **D** oxygen

(c) When primitive plants started to grow on the Earth's surface, the percentage of oxygen changed.

Explain how the growth of plants affected the percentage of oxygen in the Earth's atmosphere.

(2)

.....

.....

.....

.....

(d) Figure 3 shows the percentage of carbon dioxide in the Earth's atmosphere and the mean temperature on the Earth's surface in 1960 and 2014.

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

Figure 3

(i) Calculate the increase in the percentage of carbon dioxide in the Earth's atmosphere from 1960 to 2014.

(1)

.....

.....

increase in percentage = ...

(ii) Give **two** reasons why the information in Figure 3 does not prove that the increase in the percentage of carbon dioxide causes the rise in temperature.

(2)

reason 1 .....

.....

reason 2 .....

.....

(Total for Question 1 = 7 marks)

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2 When solid ammonium chloride is added to water a colourless solution is formed.

(a) What process has occurred?

(1)

☒ **A** displacement

☒ **B** dissolving

☒ **C** neutralisation

☒ **D** precipitation

(b) During the process the temperature of the liquid decreases.

Describe how you would measure the change in temperature.

(2)

(c) What type of chemical change causes a decrease in temperature?

(1)

☒ **A** combustion

☒ **B** endothermic

☒ **C** exothermic

☒ **D** neutralisation

(d) In another experiment the temperature change produced in water by dissolving a different solid can be found.

Give **two** variables that should be kept the same in this experiment, in order to be able to compare this temperature change fairly with the temperature change produced when the ammonium chloride dissolves in water.

(2)

(e) 0.25 g of ammonium chloride is mixed with water to make 25 cm^3 of solution.

Calculate the mass of ammonium chloride present in 10 cm^3 of solution.

(2)

.....

.....

.....

.....

mass = ... g

(Total for Question 2 = 8 marks)

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3 (a) Crude oil is separated into useful fractions by fractional distillation.

Figure 4 shows a fractional distillation column and the fractions obtained.

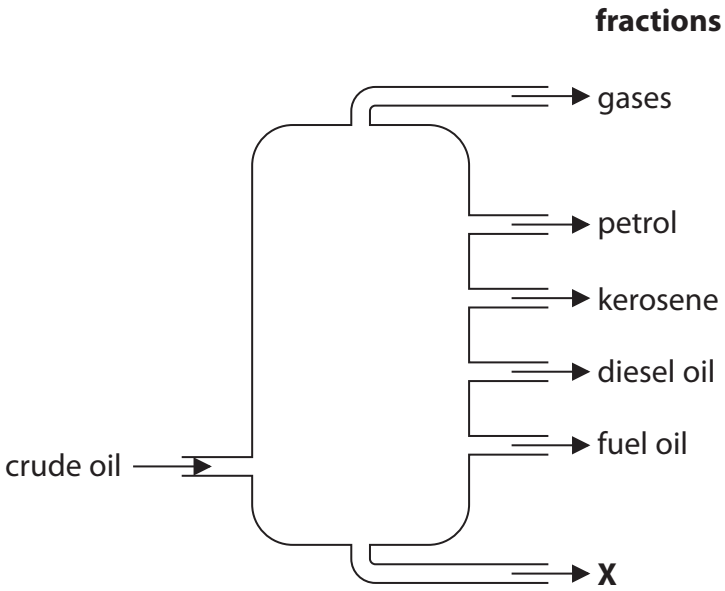

Figure 4

(i) State the name of the fraction labelled **X** in Figure 4.

(1)

.....

(ii) State the property of the fractions that allows them to be separated by fractional distillation.

(1)

.....

.....

(iii) Petrol and kerosene are two of the fractions obtained from crude oil.

Draw one straight line from each of the fractions to a use of that fraction.

(2)

fraction	**use**
	fuel for jet aircraft
petrol	fuel for trains
	fuel for cars
kerosene	surfacing roads and roofs
	fuel for large ships and power stations

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(b) Figure 5 shows the molecular formulae and boiling points of four alkanes.

alkane	molecular formula	boiling point in °C
propane	C_3H_8	–42
butane	C_4H_{10}	0
pentane	C_5H_{12}	36
hexane	C_6H_{14}	69

Figure 5

(i) Describe how the boiling points of these alkanes change as the numbers of carbon atoms in one of their molecules change.

(1)

.....

.....

(ii) Calculate the relative formula mass of a molecule of propane, C_3H_8.
(relative atomic masses: C = 12, H = 1)

(1)

.....

relative formula mass = ...

(iii) Propane reacts with excess oxygen to form carbon dioxide and water.

Write the word equation for this reaction.

(2)

.....

.....

(iv) Explain a problem caused by the incomplete combustion of propane.

(2)

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.....

.....

(Total for Question 3 = 10 marks)

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4 Lithium, sodium and potassium are metals in group 1 of the periodic table.

(a) State the name given to group 1 metals.

(1)

.....

(b) Lithium, sodium and potassium react with water.

Small pieces of each of these metals are added to separate large volumes of water.

Figure 6 shows the time each metal takes to react completely and the observations during the reaction.

metal	time for metal to react completely in s	observations
lithium	20	effervescence moves slowly on the surface makes an alkaline solution
sodium	10	melts vigorous effervescence moves quickly on the surface makes an alkaline solution
potassium	5	melts vigorous effervescence gas evolved catches fire moves very quickly on the surface makes an alkaline solution

Figure 6

In all three reactions the same gas is produced.

What is the name of this gas?

(1)

☒ **A** carbon dioxide

☒ **B** chlorine

☒ **C** hydrogen

☒ **D** oxygen

(c) Rubidium is below potassium in group 1.

In another experiment, a small piece of rubidium is added to water.

(i) Use Figure 6 to predict the time taken for this piece of rubidium to react completely.

(1)

time taken = ... s

(ii) Give **two** observations you would expect to make when rubidium is added to water.

(2)

1 .....

.....

2 .....

.....

(d) State a safety precaution that should be taken when group 1 metals are added to water.

(1)

.....

.....

(e) When heated calcium burns in air to form calcium oxide.

(i) Write the word equation for this reaction.

(2)

.....

.....

(ii) In an experiment to determine the empirical formula for calcium oxide, 1.05 g of calcium combined with 0.42 g of oxygen.

Calculate the empirical formula of the calcium oxide.
(relative atomic masses: Ca = 40, O = 16)

You must show your working.

(3)

.....

.....

.....

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.....

.....

.....

empirical formula of calcium oxide = ...

(Total for Question 4 = 11 marks)

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5 (a) Sodium has an atomic number of 11.

Which line in the table shows the correct numbers of protons, neutrons and electrons in a positively charged sodium ion, Na^+?

(1)

	number of		
	protons	**neutrons**	**electrons**
☒ **A**	10	12	11
☒ **B**	10	11	10
☒ **C**	11	10	11
☒ **D**	11	12	10

(b) Fluorine has an electronic configuration 2.7.

Fluorine gas exists as diatomic molecules.
In each molecule of fluorine, the two fluorine atoms are joined by a covalent bond.

Draw a dot and cross diagram to show the electrons in a molecule of fluorine, F_2.

Show outer electrons only.

(2)

(c) Sodium reacts with fluorine to form sodium fluoride, NaF.

Complete the balanced equation for this reaction.

(2)

2Na + ... → .....NaF

(d) Sodium fluoride is an ionic compound.

(i) Describe how a sodium atom and a fluorine atom interact to form a sodium ion, Na^+, and a fluoride ion, F^-.

(2)

(ii) Explain why sodium fluoride is able to conduct electricity when it is molten but not when it is solid.

(2)

(e) (i) Figure 7 shows the melting point of the metals in group 1 of the periodic table.

element	melting point in °C
lithium	181
sodium	98
potassium	64
rubidium	
caesium	29
francium	27

Figure 7

Estimate the melting point of rubidium.

(1)

..... °C

(ii) Each of the metals in Figure 7 reacts with fluorine to form a metal fluoride.

Give the name of a group 1 metal that reacts with fluorine more vigorously than sodium.

(1)

.....

(Total for Question 5 = 11 marks)

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6 (a) A student investigated the rate of reaction between magnesium ribbon and excess dilute hydrochloric acid.

The word equation for the reaction is

magnesium + hydrochloric acid → magnesium chloride + hydrogen

The total volume of hydrogen evolved was measured every 10 seconds for 120 seconds.

The graph in Figure 8 shows the results obtained by the student.

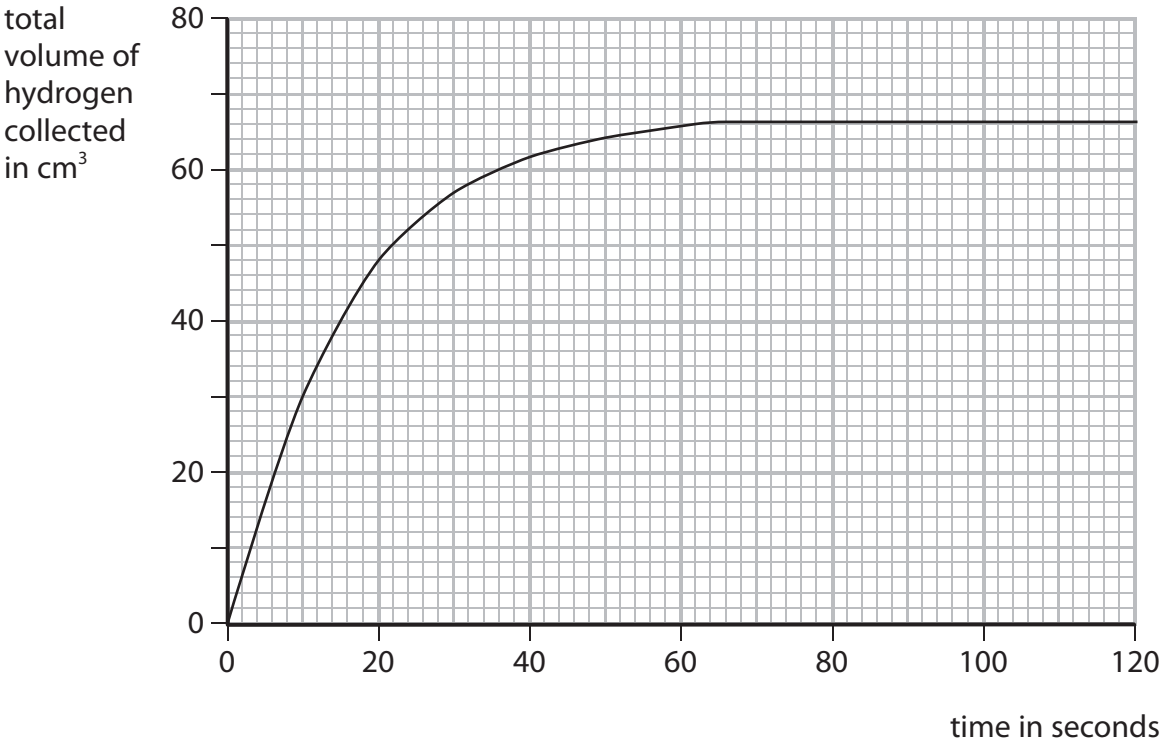

Figure 8

(i) Using the graph, give the time in seconds at which the reaction stopped.

(1)

..... s

(ii) Give the reason why the reaction stopped.

(1)

.....

.....

(iii) Use the graph to calculate the average rate of reaction during the first 20 seconds, in cm^3 of hydrogen produced per second.

(2)

.....

.....

.....

average rate of reaction = ... $cm^3 s^{-1}$

(iv) The experiment was repeated at a higher temperature, keeping all other conditions exactly the same.
This change caused the reaction to take place more quickly.

On the graph in Figure 8, sketch a line to show the results you would expect in this experiment.

(2)

(v) The rate of the reaction can be changed by adding a solid catalyst to the reaction mixture.

Which line in the table shows how the final volume of hydrogen produced and the mass of the catalyst change?

(1)

		change in final volume of hydrogen	change in mass of catalyst
☒	**A**	increases	no change
☒	**B**	no change	decreases
☒	**C**	no change	no change
☒	**D**	increases	decreases

*(b) Calcium carbonate reacts with dilute hydrochloric acid to produce carbon dioxide gas.

The word equation for the reaction is

calcium carbonate + hydrochloric acid → calcium chloride + carbon dioxide + water

Two samples of calcium carbonate are provided.
One sample is in the form of large marble chips and the other sample is in the form of small marble chips.

Describe, in detail, an investigation to find the effect of using small marble chips rather than large marble chips on the rate of this reaction.

(6)

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

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

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The elements with atomic numbers from 58 to 71 are omitted from this part of the periodic table.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.