Write your name here

Surname	Other names

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

Centre Number | | | | | |

Candidate Number | | | | |

Combined Science

Paper 3: Chemistry 1

Foundation Tier

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

Paper Reference
1SC0/1CF

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.

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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S 5 0 0 5 7 A 0 1 2 0

PEARSON

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

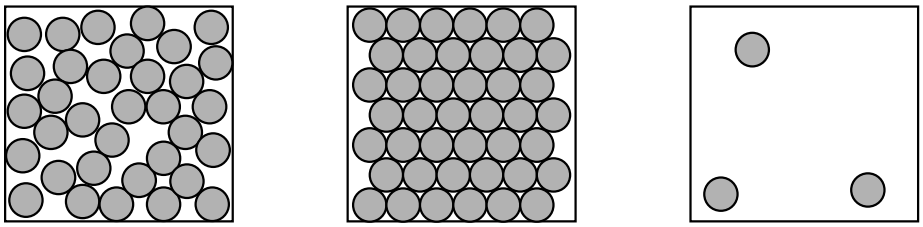
Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 There are three states of matter: solid, liquid and gas.

(a) The three boxes in Figure 1 show the arrangement of particles in different states.

(i) Under each box write the name of the state of matter shown.

(2)



....

Figure 1

(ii) A student is given some solid wax.

Use words from the box to name **two** pieces of equipment that the student should use to convert the solid wax into a liquid.

Bunsen burner	test tube	filter funnel
burette	pipette	

(2)

1 .....

2 .....

(b) Some liquid is left in a warm room.

After a few days no liquid can be seen.

Give the name of the process that has occurred.

(1)

.....

(c) The freezing point of water is 0 °C.

(i) Describe how the movement and arrangement of water particles changes when water is cooled from 10 °C to –10 °C.

(2)

.....

.....

.....

.....

(ii) What is the structure of water?

(1)

☒ **A** ionic

☒ **B** simple molecular (covalent)

☒ **C** giant covalent

☒ **D** metallic

(Total for Question 1 = 8 marks)

2 Unreactive metals are found as uncombined metals in the Earth's crust.

(a) Which of the following metals is found uncombined in the Earth's crust?

(1)

☒ **A** aluminium

☒ **B** gold

☒ **C** sodium

☒ **D** zinc

(b) When iron oxide is heated with carbon, iron is produced.

(i) Complete the word equation for the reaction.

(2)

iron oxide + carbon → ..... + ...

(ii) What happens to the iron oxide during this reaction?

(1)

☒ **A** the iron oxide burns

☒ **B** the iron oxide is neutralised

☒ **C** the iron oxide is oxidised

☒ **D** the iron oxide is reduced

(c) Copper ore contains copper carbonate, $CuCO_3$.

In the first stage of the extraction process, the copper carbonate is decomposed by heating to form copper oxide, CuO, and carbon dioxide.

$$CuCO_3 \rightarrow CuO + CO_2$$

When 100 g of copper carbonate is decomposed completely in this way, it is found that the total mass of products is 100 g.

Give a reason why the starting mass of copper carbonate is **always** the same as the mass of the products formed.

(1)

.....

.....

(d) Zinc can be extracted from its ore by electrolysis or by heating the ore with carbon.

Give a reason for the method that is used.

(1)

.....

.....

(e) Figure 2 gives information about aluminium and tin.

metal	cost of 1 kg / £	amount in Earth's crust / %
aluminium	1.31	8
tin	12.60	0.0002

Figure 2

Give **two** reasons why it could be more important to recycle tin than to recycle aluminium. Use the information in Figure 2.

(2)

Reason 1

.....

.....

Reason 2

.....

.....

(Total for Question 2 = 8 marks)

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3 An electrolysis experiment is carried out on different solutions, **J**, **K** and **L**.

Electricity is passed through each solution as shown in Figure 3.

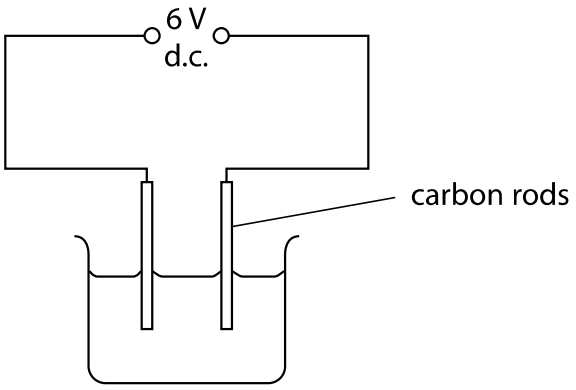


Figure 3

Any products formed at the electrodes are identified.

The results are given in Figure 4.

solution	solution conducts electricity	product at cathode	product at anode
J	yes	copper	chlorine
K	no	none	none
L	yes	hydrogen	chlorine

Figure 4

(a) (i) State an improvement that can be made to the circuit to show that a current is flowing during the electrolysis.

(1)

.....

Some of these solutions are electrolytes.

(ii) State what is meant by the term **electrolyte**.

(2)

.....

.....

.....

.....

(iii) Which of **J**, **K** and **L** are electrolytes?

(1)

☒ **A** **K** only

☒ **B** **J** and **L** only

☒ **C** **K** and **L** only

☒ **D** **J**, **K** and **L**

(b) Copper sulfate solution was electrolysed for five minutes using copper electrodes.

Figure 5 shows the mass of the anode and of the cathode before electrolysis and after electrolysis.

	anode	cathode
mass of electrode before electrolysis / g	1.16	1.28
mass of electrode after electrolysis / g	0.85	1.57

Figure 5

Calculate the mass of copper deposited.

(2)

mass of copper deposited = ... g

(c) Identify the products formed at the anode and cathode when molten potassium iodide is electrolysed.

(2)

Anode .....

Cathode .....

(d) In a different electrolysis, molten sodium fluoride is decomposed.

$$2NaF \rightarrow 2Na + F_2$$

(relative masses: NaF = 42, Na = 23, F_2 = 38)

Calculate the maximum mass of sodium that could be formed from 168 g of sodium fluoride.

(2)

mass = ... g

(Total for Question 3 = 10 marks)

4 The apparatus in Figure 6 shows a piece of magnesium ribbon being heated.

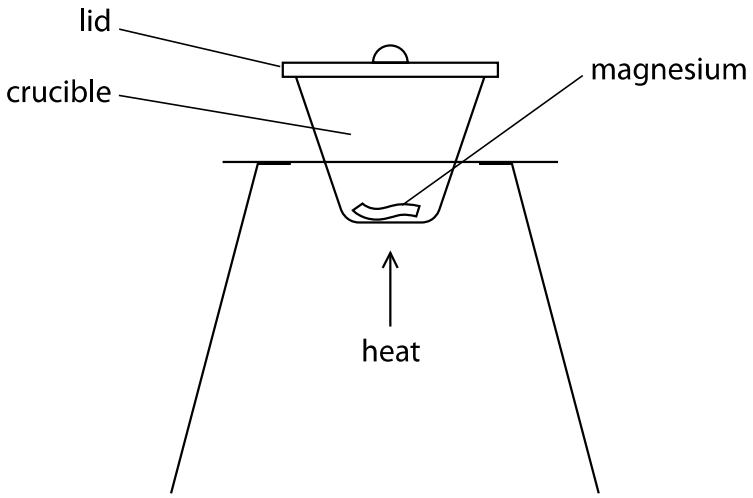


Figure 6

During the heating, the magnesium reacts with oxygen from the air. The lid of the crucible was raised slightly from time to time. Magnesium oxide was formed as a white powder.

The experiment was repeated with different masses of magnesium.

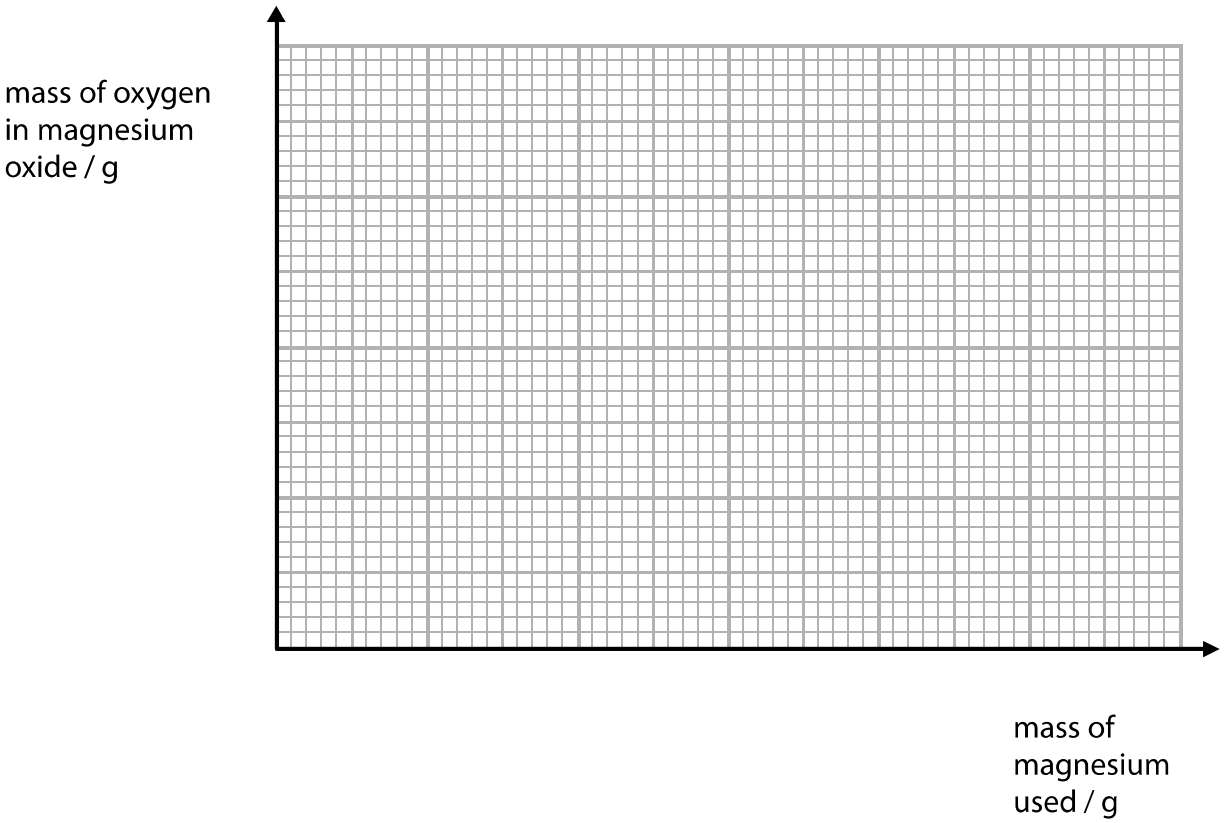
The results are shown in Figure 7.

experiment	mass of magnesium used / g	mass of magnesium oxide formed / g	mass of oxygen in magnesium oxide / g
1	0.10	0.16	0.06
2	0.15	0.24	0.09
3	0.25	0.40	0.15
4	0.30	0.48	0.18
5	0.35	0.49	0.14
6	0.50	0.80	0.30

Figure 7

(a) (i) Draw a graph of the mass of oxygen in magnesium oxide against the mass of magnesium used.

(3)



(ii) The result for experiment 5 is anomalous.
The masses were all measured accurately.

Suggest a reason for this anomalous result.

(1)

.....

.....

(b) Balance the equation for the reaction of magnesium with oxygen to form magnesium oxide.

(1)

..... Mg + ... O_2 → ..... MgO

(c) Calcium nitrate contains calcium ions and nitrate ions.

Calculate the relative formula mass of calcium nitrate, $Ca(NO_3)_2$.
(relative atomic masses: Ca = 40, N = 14, O = 16)

(2)

relative formula mass = ...

(d) Two oxides of lead, **R** and **S**, were analysed.

The empirical formula of oxide **R** was found to be PbO.

The results of the analysis of oxide **S** showed it contained 0.207 g of lead combined with 0.032 g of oxygen.

Show, by calculation, that the two oxides had different empirical formulae.
(relative atomic masses: O = 16, Pb = 207)

(3)

(Total for Question 4 = 10 marks)

5 Substances can be pure or they can be mixtures.

(a) Which of these is a mixture?

(1)

☒ **A** chlorine

☒ **B** sodium

☒ **C** sodium chloride

☒ **D** sodium chloride solution

(b) Figure 8 shows some mixtures to be separated and possible methods of separation.

Place a tick (✓) in one box in each row of the table to show the best method to separate the first named substance from each of the mixtures.

(3)

substance to separate	method of separation			
	crystallisation	**filtration**	**simple distillation**	**fractional distillation**
sand from a mixture of sand and sodium chloride solution				
copper sulfate crystals from copper sulfate solution				
useful liquids from crude oil				

Figure 8

(c) Paper chromatography was used to separate a mixture of blue and red inks.
A spot of the mixture was placed on chromatography paper as shown in Figure 9.

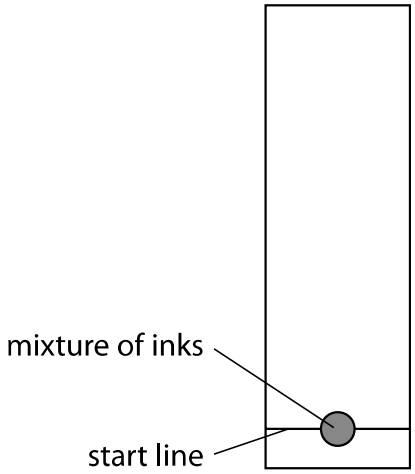


Figure 9

(i) Give a reason why the start line is drawn in pencil rather than in ink.

(1)

.....

.....

(ii) The chromatography paper, with the spot of mixture on it, was placed in a beaker with the bottom of the paper in water.

On Figure 10, complete the diagram showing the position of the chromatography paper with the spot of mixture at the start of the experiment.

(1)

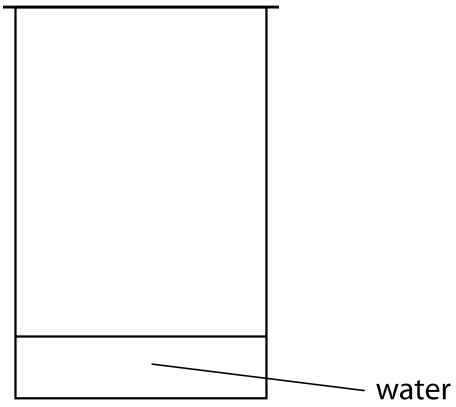


Figure 10

(iii) The chromatography was carried out and the result is shown in Figure 11.

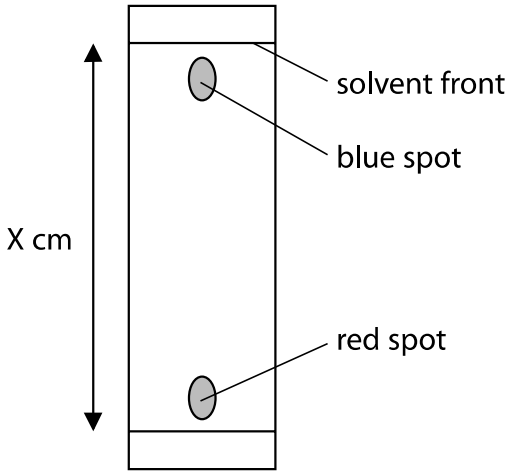


Figure 11

The blue spot had moved 14.5 cm and the solvent front had moved 15.3 cm

Calculate the R_f value of the substance in the blue spot, giving your answer to 2 significant figures.

$$R_f \text{ value} = \frac{\text{distance travelled by a dye}}{\text{distance travelled by solvent front}}$$

(2)

R_f value = ...

(d) **P**, **Q**, **R** and **S** are mixtures of food colourings.

They are investigated using paper chromatography.

Figure 12 shows the chromatogram at the end of the experiment.

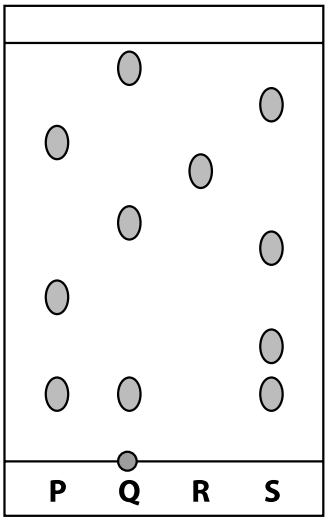


Figure 12

(i) Which mixture contains an insoluble food colouring?

(1)

☒ **A** mixture **P**

☒ **B** mixture **Q**

☒ **C** mixture **R**

☒ **D** mixture **S**

(ii) Give a change that could be made to the experiment to obtain an R_f value for the insoluble colouring.

(1)

.....

.....

(iii) Explain, by referring to Figure 12, which mixture is separated into the greatest number of soluble food colourings by this chromatography experiment.

(2)

.....

.....

.....

.....

(Total for Question 5 = 12 marks)

6 Ionic compounds contain ions.

(a) The numbers of electrons, neutrons and protons in four particles, **W**, **X**, **Y** and **Z**, are shown in Figure 13.

particle	electrons	neutrons	protons
W	9	10	9
X	10	14	12
Y	16	16	16
Z	18	18	16

Figure 13

Explain which particle, **W**, **X**, **Y** or **Z**, is a negative ion.

(2)

.....

.....

.....

.....

(b) The electronic configurations of a lithium atom and of a fluorine atom are shown in Figure 14.

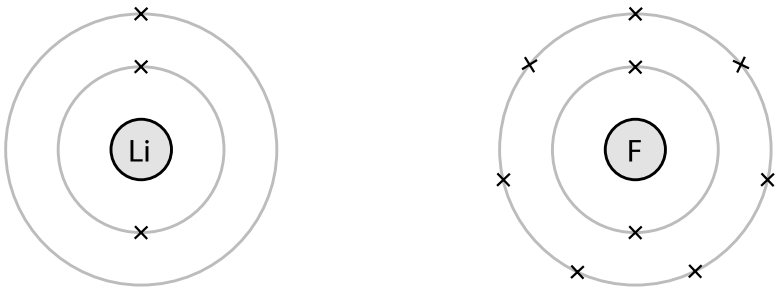


Figure 14

Lithium fluoride, LiF, is an ionic compound.

It contains lithium cations and fluoride anions.

Complete Figure 15 to show the electronic configurations and charges of the ions in lithium fluoride.

(4)

charge on ion ..... charge on ion .....

Figure 15

*(c) Figure 16 shows the ability of different substances to conduct electricity.

substance	conducts electricity
solid calcium chloride	no
molten calcium chloride	yes
diamond	no
zinc	yes

Figure 16

Explain these results by referring to the structures of the substances.

(6)

(Total for Question 6 = 12 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
[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.