Please check the examination details below before entering your candidate information

Candidate surname	Other names

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

Centre Number | | | | | |

Candidate Number | | | | |

Thursday 16 May 2019

Morning (Time: 1 hour 10 minutes) | Paper Reference **1SC0/1CF**

Combined Science

Paper 2: Chemistry 1

Foundation Tier

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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P 6 0 2 4 4 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 The three states of matter are solid, liquid and gas.

(a) What is the name of the change of state when a liquid changes into a solid?

(1)

☒ **A** condensation

☒ **B** evaporation

☒ **C** freezing

☒ **D** melting

(b) A gas was left to cool to form a liquid.

Figure 1 shows how the temperature of the substance changed with time.

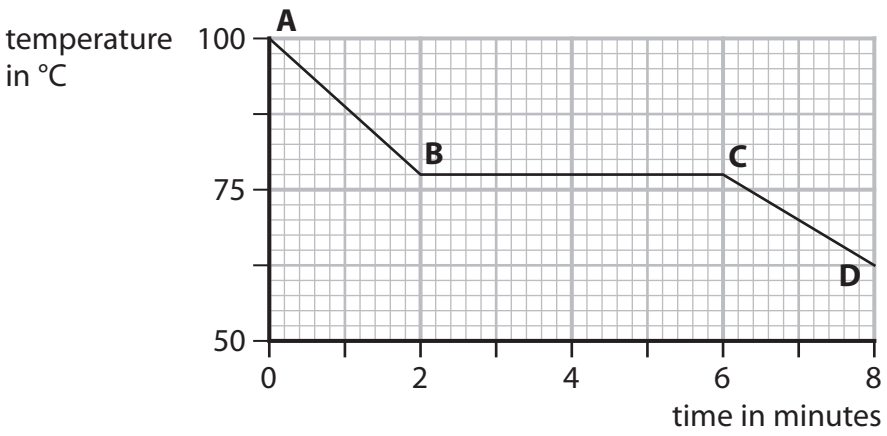


Figure 1

From **A** to **B** the substance is a gas.

From **C** to **D** the substance is a liquid.

(i) State the time when the gas first started to form a liquid.

(1)

2 / two (minutes) ..... minutes

(ii) Calculate the number of minutes it took from the gas first starting to form a liquid until the substance was completely liquid.

(1)

6 - 2 (= 4) / 4 / four (minutes)

.....

..... minutes

(c) Figure 2 shows the melting points and boiling points of four substances, **W**, **X**, **Y** and **Z**.

substance	melting point in °C	boiling point in °C
W	−220	−188
X	−101	−34
Y	−7	59
Z	114	184

Figure 2

Using the information in Figure 2

(i) give the letter of the substance that is a solid at 20 °C

(1)

z

(ii) give the letter of a substance that is a liquid at 50 °C

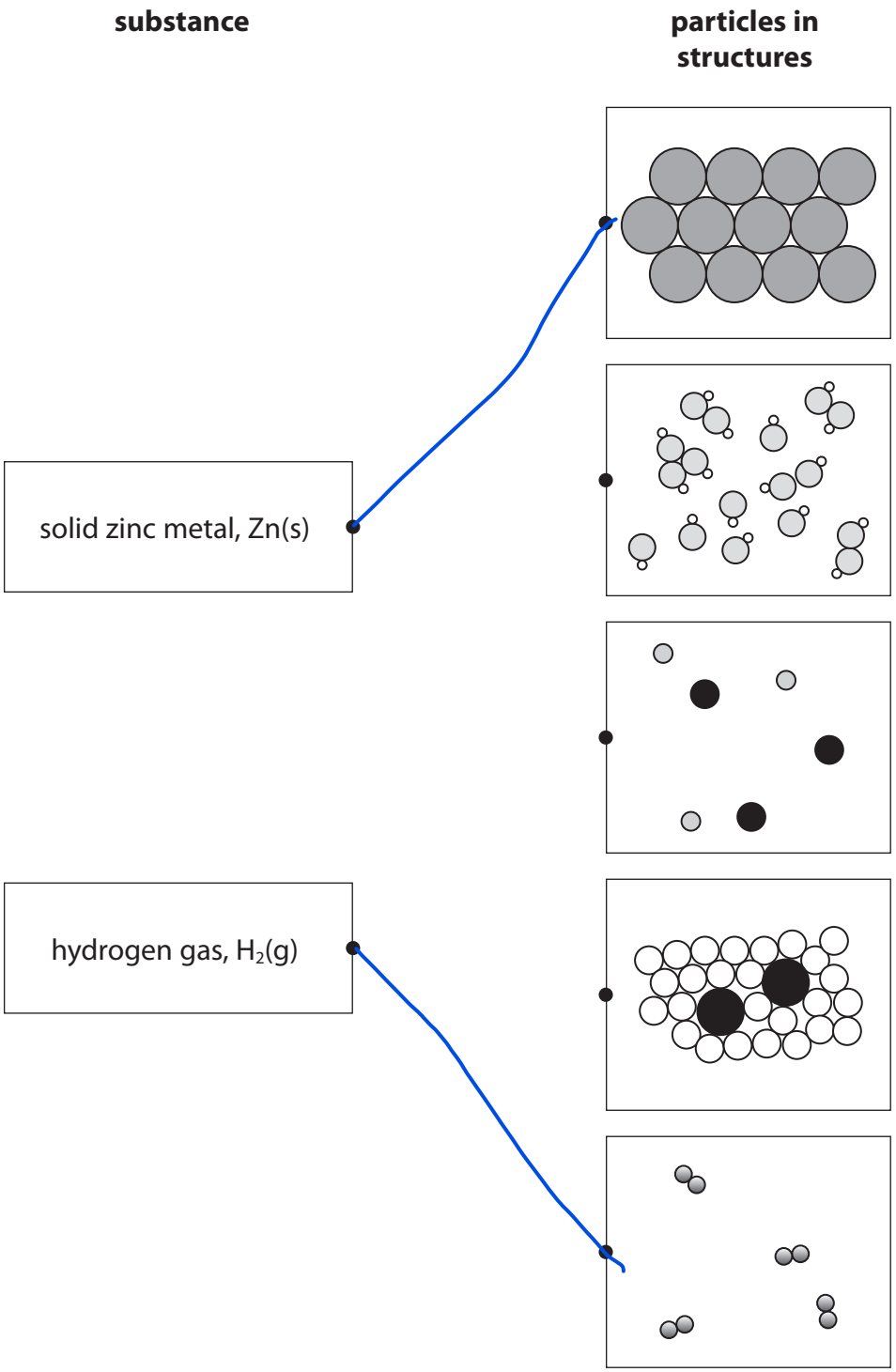
(1)

y

(d) The diagrams below show particles in five different structures.
The different circles show different particles.

Draw one straight line from each substance to its structure.

(2)



(Total for Question 1 = 7 marks)

2 Mixtures of substances can be separated using different techniques.

(a) Which of the following is a mixture of substances?

(1)

☒ **A** air

☒ **B** carbon dioxide

☒ **C** gold

☒ **D** titanium

(b) Figure 3 shows the apparatus that a student set up to obtain pure water from ink.

There are three mistakes in the way the apparatus has been set up.

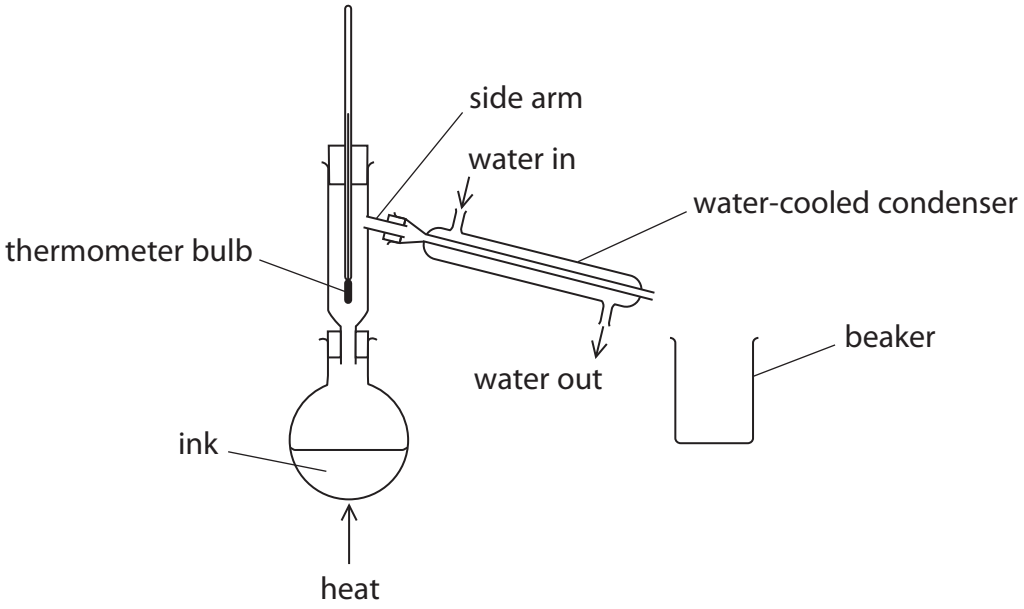


Figure 3

(i) One mistake is that the bulb of the thermometer is too low.

The bulb of the thermometer should be level with the side arm.

Give a reason why the bulb of the thermometer should be level with the side arm.

(1)

to measure the temperature of the {water vapour / steam / gas} passing into the condenser

(ii) State **one** other mistake in Figure 3.

(1)

beaker not under condenser exit / water entering condenser in wrong place / water flow in condenser wrong way round

(c) Paper chromatography is used to separate the substances in five different food colourings, **P**, **Q**, **R**, **S** and **T**.

Figure 4 shows the chromatogram at the end of the experiment.

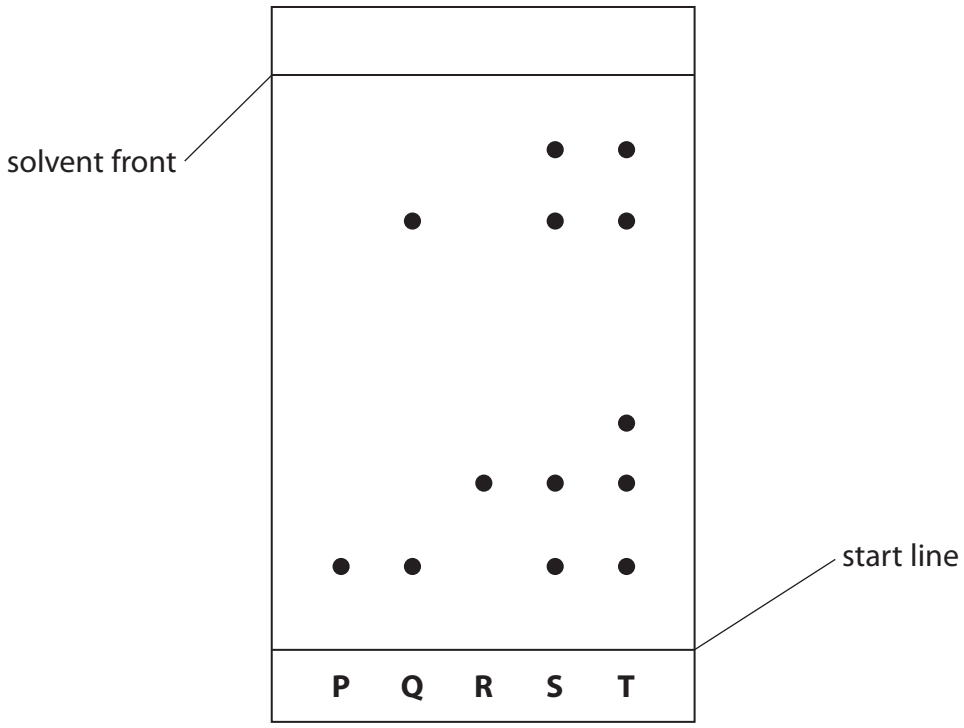


Figure 4

(i) The steps needed to carry out the chromatography experiment are listed below. They are not in the correct order.

1 leave the solvent to rise up the paper
2 put solvent in the beaker
3 draw a start line on the piece of paper
4 place the paper in the beaker
5 remove the paper when the solvent is near the top
6 put small spots of the food colourings on the start line

List the steps in the correct order.

The first two steps have been done for you.

(2)

2	**3**	6	4	1	5

(ii) Explain, using Figure 4, which food colouring contains the greatest number of coloured substances.

(2)

An explanation linking

• mixture T (1)
• because it gives {the greatest number / 5} spots (1)

(iii) During chromatography of the food colourings, the solvent front moved 8.00 cm and the food colouring **R** moved 2.30 cm.

Calculate the R_f value for food colouring **R**.
Give your answer to two significant figures.

(2)

Rf = $\frac{2.30}{8.00}$ (= 0.2875) (1)
= 0.29 (

R_f value = 0.29

(Total for Question 2 = 9 marks)

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3 (a) The reactivity of copper, magnesium and zinc was investigated.
Each metal was placed separately in dilute hydrochloric acid.
The amount of effervescence was observed.

(i) The same mass of metal was used in each experiment.
Which piece of apparatus should be used to find the mass of metal used?

(1)

☒ **A** a balance

☒ **B** a pipette

☒ **C** a stopwatch

☒ **D** a thermometer

(ii) State **two** variables, apart from the mass of the metals, that should be controlled in this investigation.

(2)

1 (same) volume of acid (1)

2 • (same) concentration of acid (1)

(iii) Magnesium produces the most vigorous effervescence.
Copper does not produce any effervescence.

Give the reason why copper does not produce any effervescence.

(1)

copper is {not reacting / no reaction / unreactive / low in reactivity series / not reactive enough}

(iv) The magnesium reacts with dilute hydrochloric acid to form magnesium chloride solution and hydrogen gas.

The equation for the reaction is

$$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(\text{aq}) + H_2(\text{g})$$

Fill in the missing state symbols in the spaces provided.

(2)

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(b) Potassium carbonate reacts with dilute sulfuric acid to form potassium sulfate.

(i) Potassium sulfate contains potassium ions, K^+, and sulfate ions, SO_4^{2-}.

Write the formula of potassium sulfate.

(1)

K2SO4

(ii) Equal volumes of a solution of potassium carbonate were reacted separately with an excess of dilute sulfuric acid solution.
Pure dry samples of potassium sulfate were obtained from the resulting solutions.

The experiment was repeated three times using the same conditions.

The masses of potassium sulfate obtained were

experiment 1 = 5.22 g
experiment 2 = 5.24 g
experiment 3 = 5.21 g

Calculate the mean mass of potassium sulfate obtained, giving your answer to two decimal places.

(2)

$\frac{5.22 + 5.24 + 5.21}{3}$ (= 5.2233) (1)

= 5.22 (1)

mean mass of potassium sulfate = 5.22 g

(Total for Question 3 = 9 marks)

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4 Metals are extracted from substances naturally occurring in the Earth's crust.

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

(1)

☒ **A** calcium

☒ **B** gold

☒ **C** iron

☒ **D** magnesium

(b) Zinc can be extracted by heating zinc oxide with carbon.

The products are zinc and carbon dioxide.

(i) Write the word equation for this reaction.

(2)

zinc oxide + carbon -----> zinc + carbon dioxide

(ii) In this reaction zinc oxide loses oxygen.

State the type of reaction taking place when an oxide loses oxygen.

(1)

reduction

(c) Aluminium is extracted from aluminium oxide by electrolysis.
Aluminium oxide is made up of ions.

(i) The formula of aluminium oxide is Al_2O_3.

Give the number of ions in the formula Al_2O_3.

(1)

5

(ii) Complete the balanced equation for the overall reaction by putting numbers in the spaces.

(2)

$2Al_2O_3 \rightarrow$ 4 Al + 3 O_2

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(d) (i) The environmental impact of a product is assessed in a life-cycle assessment.

The stages in this assessment are given below.
They are not in the correct order.

A disposal of the product
B manufacturing the product
C obtaining and processing the raw materials
D using the product

List the stages of the life-cycle assessment, using letters **A**, **B**, **C**, **D**, in the correct order from start to finish.

(2)

C	B	D	A

(ii) Aluminium can be obtained by recycling aluminium waste.

Give **two** advantages of obtaining aluminium by recycling aluminium waste rather than mining the raw material and extracting aluminium from that raw material.

(2)

1 conserves {natural reserves of raw materials/ ore / aluminium ore} (1)

2 • less damage to {landscape / habitats} / less {noise /dust} (pollution) (1)

(Total for Question 4 = 11 marks)

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5 In Figure 5, the letters **A**, **E**, **G**, **J**, **X** and **Z** show the positions of six elements in the periodic table.

These letters are not the symbols of the atoms of these elements.

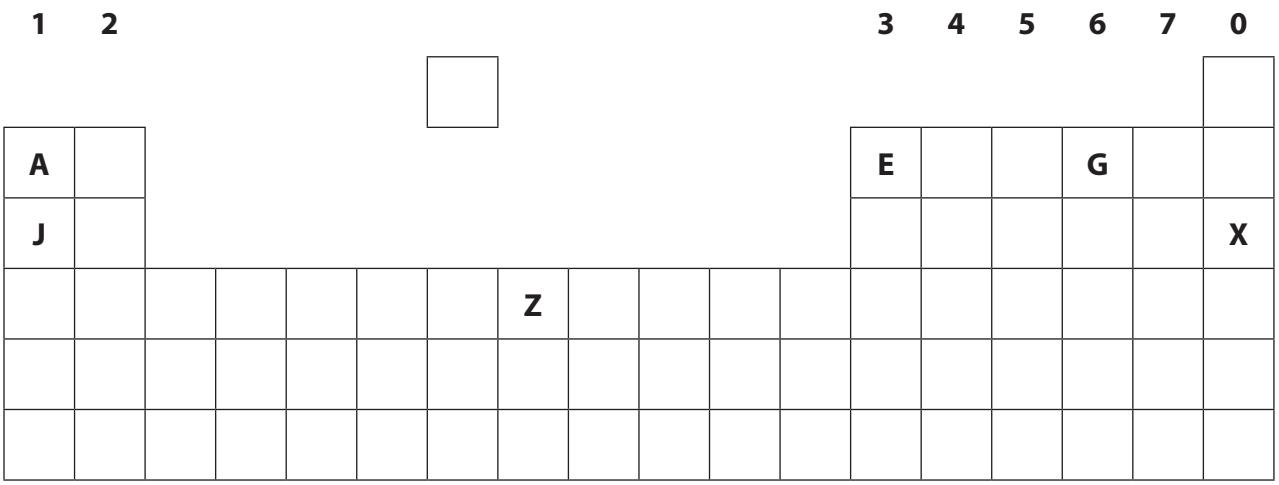

Figure 5

(a) Using the letters **A**, **E**, **G**, **J**, **X** and **Z**

(i) give the letters of the **two** elements that are non-metals

(1)

any two from
E, G and X

(ii) give the letters of **two** elements in period 2

(1)

any two from
A, E and G

(iii) give the letter of an element that normally forms an ion with a charge of +1.

(1)

A / J

(b) Element **E** has an atomic number of 5.
In a sample of **E** there are two isotopes. One isotope has a mass number of 10 and the other isotope has a mass number of 11.

(i) Explain, in terms of subatomic particles, what is meant by the term **isotopes**.

(2)

An explanation linking:

• (atoms with) same (number of) protons (1)

• (atoms with) different (number of) neutrons (1)

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(ii) All atoms of element **E** in this sample contain

(1)

☒ **A** 5 protons

☐ **B** 5 neutrons

☐ **C** 6 protons

☐ **D** 6 neutrons

(c) Element **X** has an atomic number of 18.

State the electronic configuration of an atom of element **X**.

(1)

2,8,8

(d) In an experiment, 3.5 g of element **A** reacted with 4.0 g of element **G** to form a compound.

Calculate the empirical formula of this compound.
(relative atomic masses: **A** = 7, **G** = 16)

You must show your working.

(3)

MP1 for dividing by atomic mass

A : G

$\frac{3.5}{7}$: $\frac{4.0}{16}$ (1)

MP2 for deriving ratio from MP1

0.5 : 0.25

OR

2 : 1 (1)

MP3 for ratio in MP2 to formula empirical formula A2G (1)

empirical formula of this compound = ...

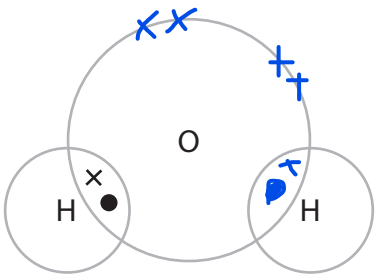
(e) An oxygen atom has six electrons in its outer shell.

A hydrogen atom has one electron in its outer shell.

Complete the dot and cross diagram of a molecule of water, H_2O.

Show outer shell electrons only.

(2)



(Total for Question 5 = 12 marks)

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6 (a) Water, acidified with sulfuric acid, is decomposed by electrolysis.
The water is decomposed to produce hydrogen and oxygen.

(i) A sample of hydrogen is mixed with air and ignited.

State what would happen.

(1)

(squeaky) pop / gas burns / water forms

(ii) Throughout the experiment the volume of hydrogen and the volume of oxygen are measured at two-minute intervals.

The results are shown in Figure 6.

time in minutes	volume of hydrogen in cm^3	volume of oxygen in cm^3
0	0	0
2	4	2
4	8	4
6	12	6
8	16	8

Figure 6

Describe, using the data in Figure 6, what the results show about the volumes of hydrogen and of oxygen produced in this experiment.

(2)

A description to include
• volumes going up: (oxygen/ hydrogen/ gas) increase (with time) / volume (directly) proportional to time (1)

• quantitative comparing hydrogen and oxygen: (volume of) hydrogen double (volume of) oxygen / ORA / 2:1 ratio (1)

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(b) Molten lead bromide is electrolysed.

The products of this electrolysis are

(1)

- ☒ **A** hydrogen and bromine
- ☒ **B** hydrogen and oxygen
- ☒ **C** lead and bromine
- ☒ **D** lead and oxygen

(c) Calcium nitrate and calcium carbonate are both ionic compounds.

Calcium nitrate mixed with water behaves as an electrolyte.
Calcium carbonate mixed with water does not behave as an electrolyte.

Explain, in terms of solubility and movement of ions, this difference in behaviour.

(2)

An explanation linking:

• (calcium) nitrate {is soluble/ dissolves}/ (calcium) carbonate {is insoluble/ does not dissolve} (1)
• so ions {free to move in solution / not free in solid} (1)

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*(d) Impure copper can be purified using electrolysis.

In this electrolysis
- the anode is made of impure copper
- the cathode is made from pure copper
- the electrolyte is copper sulfate solution.

The apparatus at the start of the experiment is shown in Figure 7.

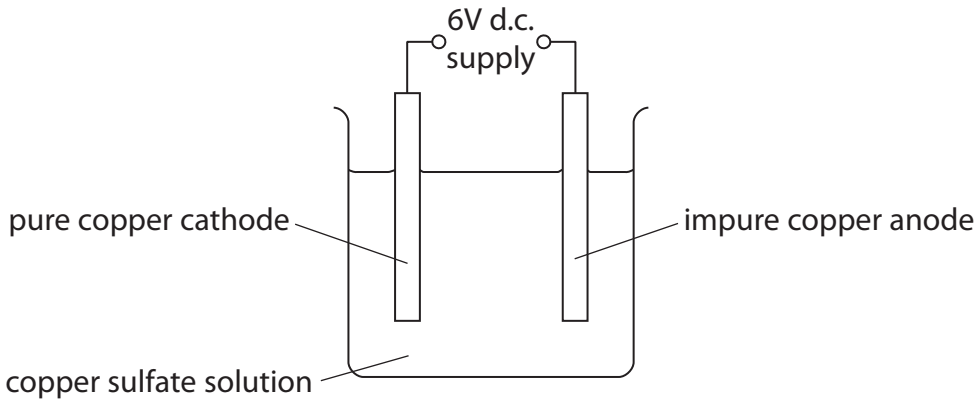

Figure 7

During the electrolysis three observations are made
- the sizes of both the anode and the cathode change
- a solid appears directly beneath the anode
- the colour of the copper sulfate solution does not change.

Explain all three observations.

(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

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.