

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	
Pearson Edexcel Level 1/Level 2 GCSE (9–1)		<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
Thursday 16 May 2019			
Morning (Time: 1 hour 10 minutes)		Paper Reference 1SC0/1CH	
Combined Science Paper 2: Chemistry 1			
Higher 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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- [illegible]

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

- (i) give the letters of the **two** elements that are non-metals (1)
- (ii) give the letters of **two** elements in period 2 (1)
- (iii) give the letter of an element that normally forms an ion with a charge of +1. (1)

- (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)

(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)

(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)

(Total for Question 1 = 10 marks)

- 2 (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)

- (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 2.

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 2

Describe, using the data in Figure 2, what the results show about the volumes of hydrogen and of oxygen produced in this experiment.

(2)

(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)

(d) When molten zinc chloride is electrolysed, zinc ions, Zn^{2+} , form zinc atoms.

Write the half equation for this reaction.

(2)

(Total for Question 2 = 8 marks)

- 3 (a) One way to extract metals from land contaminated with metal compounds is phytoextraction.

When plants grow they absorb metal ions through their roots.

The plants are harvested, dried and burned forming an ash.

The ash contains metal compounds.

Plants were grown in a piece of ground contaminated with nickel compounds.

- (i) 1 kg of the ash from these plants contained 142.0 g of nickel compounds.

Calculate the percentage by mass of nickel compounds in the ash.

(3)

- (ii) Nickel is extracted from nickel compounds.

State an advantage of extracting nickel by phytoextraction rather than from its ore.

(1)

- (b) Some nickel ores contain nickel sulfide.

- (i) In the first stage of extracting nickel from nickel sulfide, the nickel sulfide, NiS , is heated in air to form nickel oxide, NiO , and sulfur dioxide.

Write the balanced equation for this reaction.

(2)

- (ii) In the final stage of the extraction process, a nickel compound is electrolysed to produce pure nickel.

An advantage of producing a metal by electrolysis is that

(1)

- ☐ **A** electrolysis uses a large amount of electricity
- ☐ **B** the metal produced by electrolysis is very pure
- ☐ **C** electrolysis is a very cheap method of extraction
- ☐ **D** electrolysis is the only method of extracting unreactive metals

- (c) In a different method of obtaining nickel, the process produces a mixture of the liquids nickel tetracarbonyl and iron pentacarbonyl.

The boiling point of nickel tetracarbonyl is 43 °C.

The boiling point of iron pentacarbonyl is 103 °C.

These two liquids mix together completely.

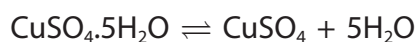
Describe the process used to separate these two liquids.

(3)

(Total for Question 3 = 10 marks)

- 4 (a) Hydrated copper sulfate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, is a blue solid.
Anhydrous copper sulfate, CuSO_4 , is a white solid.

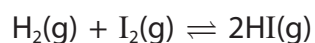
Heat energy is needed to convert hydrated copper sulfate to anhydrous copper sulfate.
This is a reversible reaction.



Devise an experiment to show that this is a reversible reaction.

(4)

- (b) Hydrogen reacts with iodine to form hydrogen iodide.
Iodine gas is purple and hydrogen iodide gas is colourless.



Hydrogen and iodine are placed in a sealed container.
The container is left until equilibrium is reached.

The conditions are changed favouring the forward reaction.

Explain what you would **see**.

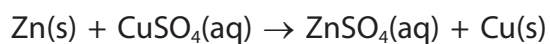
(2)

- (c) Calculate the number of atoms combined in one mole of copper iodide, CuI_2 .
(Avogadro constant = 6.02×10^{23})

(2)

(Total for Question 4 = 8 marks)

- 5 Pieces of zinc react with copper sulfate solution.
Zinc sulfate solution is colourless.



- (a) Describe what you would **see** when an excess of zinc is added to copper sulfate solution and the mixture left until the reaction is complete.

(2)

- (b) This reaction is described as a redox reaction.

Explain, in terms of electrons, which particles have been oxidised and which particles have been reduced in this reaction.

(4)

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- (c) The copper sulfate solution used has a concentration of 15.95 g dm^{-3} .

Calculate the number of moles of copper sulfate, CuSO_4 , in 50.00 cm^3 of this solution.
(relative atomic masses: O = 16, S = 32, Cu = 63.5)

(3)

- (d) In another experiment, 0.043 mol of copper sulfate, CuSO_4 , is used.

Calculate, to one decimal place, the minimum mass of zinc that must be added to react with all the copper sulfate.
(relative atomic mass: Zn = 65)

(2)

(Total for Question 5 = 11 marks)

- 6 (a) **X** and **Y** are solutions of two different acids.
The concentration of acid in each solution, in mol dm^{-3} , is the same.
Solution **X** has a pH of 3.40 and solution **Y** has a pH of 4.40.

(i) State what could be used to measure these pH values of 3.40 and 4.40.

(1)

(ii) What is the concentration of hydrogen ions in solution **X** compared with that in solution **Y**?

(1)

- ☐ **A** ten times lower
- ☐ **B** lower by a factor of 3.30/4.40
- ☐ **C** higher by a factor of 4.40/3.30
- ☐ **D** ten times higher

- (b) An experiment is planned to record the change in pH as a powdered base is added to 50 cm^3 dilute hydrochloric acid.

The method suggested is

- step 1 add dilute hydrochloric acid up to the 50 cm^3 mark on a beaker
 - step 2 add one spatula of the base and stir
 - step 3 measure the pH of the mixture
 - step 4 repeat steps 2 and 3 until the pH stops changing.
- (i) State how you could change the method so that the amounts of dilute hydrochloric acid and of the base can be measured more accurately.

(2)

dilute hydrochloric acid

base

- (ii) During the experiment the pH changes from 2 to 10.
If phenolphthalein indicator is added at the beginning of the experiment, a colour change occurs as the base is added.

State the colour change that occurs.

(1)

colour at start

colour at end

- (iii) Explain, in terms of the particles present, why the pH increases during the experiment.

(2)

*(c) Some properties of four solids, **A**, **B**, **C** and **D**, are shown in Figure 3.

The solids, in no particular order, are copper carbonate, copper oxide, magnesium metal and sodium hydroxide.

	A	B	C	D
colour of solid	black	silver	white	green
observation when solid is added to water	black solid remains	a few bubbles appear on surface of solid	solid dissolves and forms colourless solution	green solid remains
pH of mixture of solid added to water	7	8	13	7
observation when solid is added to dilute sulfuric acid	on warming, solid disappears to form blue solution	effervescence solid disappears to form colourless solution	solid disappears to form colourless solution	effervescence solid disappears to form blue solution

Figure 3

Identify the solids **A**, **B**, **C** and **D**, explaining how the information in Figure 3 supports the identification of each solid.

(6)

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(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	

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.