

Seb Academy  
 Topics: Metals Blast Furnace  
 Time allowed: 40 min

Date: \_\_\_\_\_

Name: \_\_\_\_\_

- (2017/O/GCSE/7) A student carried out some experiments to investigate the displacement reactions of metals. She added metals to salt solutions. The table shows her observations.

	Salt solution			
Metal	Copper (II) sulfate	Magnesium sulfate	Cobalt (II) sulfate	Chromium (III) sulfate
Copper		No change. Solution remains colourless	No change, solution remains pink	No change, solution remains green
Magnesium	Brown solid forms in colourless solution		Grey solid forms in colourless solution	Grey solid forms in colourless solution
Cobalt	Brown solid forms in pink solution	No change, solution remains colourless		No change, solution remains green
Chromium	Brown solid forms in green solution	No change, solution remains colourless	Grey solid forms in green solution	

- What is the order of reactivity for the four metals?

Most reactive to Least reactive

- Magnesium sulfate solution is colourless  
 Complete the table to show the colour of the other metal sulfate solutions.

Metal sulfate	Colour
Copper (II) sulfate	
Cobalt (II) sulfate	
Chromium sulfate	

- Write an ionic equation for the reaction when chromium metal is added to a solution of cobalt sulfate.

- The student added calcium to separate samples of each of the salt solution. The student observed fizzing. Explain this observation.

[1]

[Total: 6 Marks]

- Rust is often given the formula  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ . On heating, a sample of rust loses its water of crystallisation which is 18.4% of its mass. Calculate the value of x.

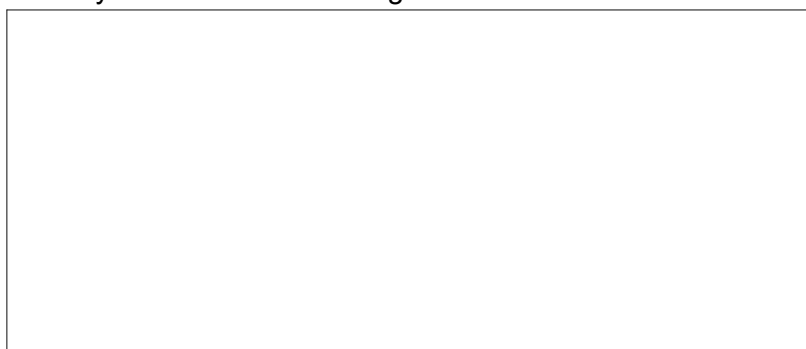
[2]

(2021/SEB/C14) Metals Extraction

- Several metals are listed:

ZnO,  $\text{Fe}_2\text{O}_3$ , CuO, SnO,  $\text{Na}_2\text{O}$ , PbO  $\text{Au}_2\text{O}$

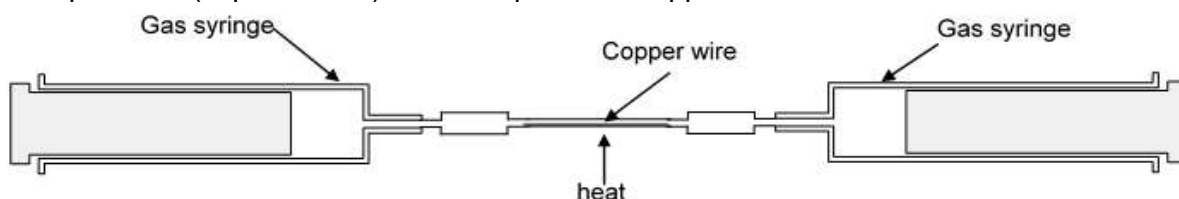
- (a) Classify them in the Venn diagram.



[3]

- (2013/O/GCSE/10) Skill 1

An experiment (experiment 1) was set up to heat copper in air.



At the start of experiment 1, the apparatus contained a total of 200 cm<sup>3</sup> of air.

During heating, the copper reacted with oxygen in the air to form black copper(II) oxide. The copper was heated until the volume of gas, measured at room temperature and pressure remained constant.

- 
- Explain why it was important to continue heating until remained constant.

[1]

The table shows some data about the mass change during the experiment

Mass of copper at start of the experiment	Mass of solid left at the end of the experiment
1.00g	1.07 g

Use the data in the table to show that the solid left at the end of the experiment contains unreacted copper.

- Name the gas that is left in the gas syringes, in the largest amount, at the end of the experiment.

[1]

- Estimate the total volume of gas left in the gas syringes at the end of the experiment. Explain your reasoning.  
Calculation:

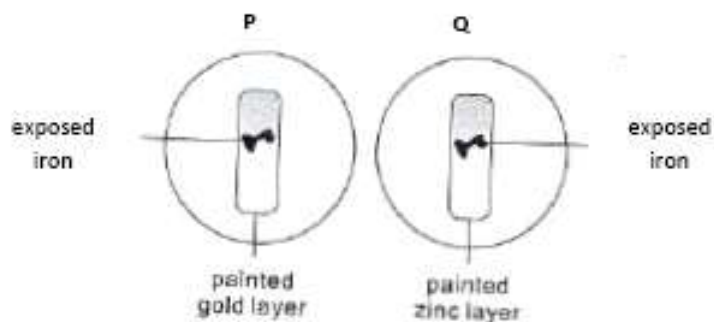
Explanation:

[2]

[Total: 4 Marks]

(2018/SCGS/S4/FE) Rusting simple and sacrificial metal

- Two pieces of iron, P and Q, are painted with gold and zinc respectively. Both pieces have been partly damaged such that the iron is exposed to the environment in both cases. Both pieces are left in the environment for many days.



- (a) After many days, P rusts. Explain this observation.

[2]

- (b) After many days, Q still does not rust. Explain, in terms of electrons, why Q does not rust.

[2]

[Total: 4 marks]

- (2006/O/GCSE/N/P2/10) Magnetite  $\text{Fe}_3\text{O}_4$  is one form of iron oxide In Iron ore.
  - When iron is extracted from haematite,  $\text{Fe}_3\text{O}_4$  in the blast, waste gases and solid waste product are formed.

- Name three main waste products of this process.

[2]

- Write equations to show how two of them are formed.



- The state of liberty in New York is made from an iron frame covered with copper plates. In 2004, work had to be carried out to stop iron frame from rusting away. The iron frame was rusting much faster than normal where it was in contact with the copper.
  - Explain why copper in contact with iron causes the iron to corrode faster than normal?

[2]

- Would you expect the copper in contact with iron to corrode faster or slower than normal? Explain your reasoning.

[1]

[Total: 8 Marks]

(2015/CHS/S4/FE/1) Metal Carbonates Decomposition

- The table below shows the results of some of the chemical reactions of **four** unknown metals.

Metals	Thermal decomposition of metal carbonates	Reaction of metal with cold water
<b>A</b>	Greenish-blue solid turns black. White precipitate formed when gas produced is being passed through limewater	No reaction
<b>B</b>	White solid remains. No gas was produced.	Very vigorous reaction
<b>C</b>	White solid turns yellow, turns back to white after when cooled. White precipitate formed when gas produced is being passed through limewater	No reaction
<b>D</b>	White solid remains white. White precipitate formed when gas produced is being passed through limewater	Little bubbles formed on the surface of the metal.

- (a) Arrange the metals in ascending order of their chemical reactivity.

[1]

- (b) Metal **A** and **D** are placed into two separate beakers of iron(III) sulfate solution. Describe the observations you will see in each beaker.

