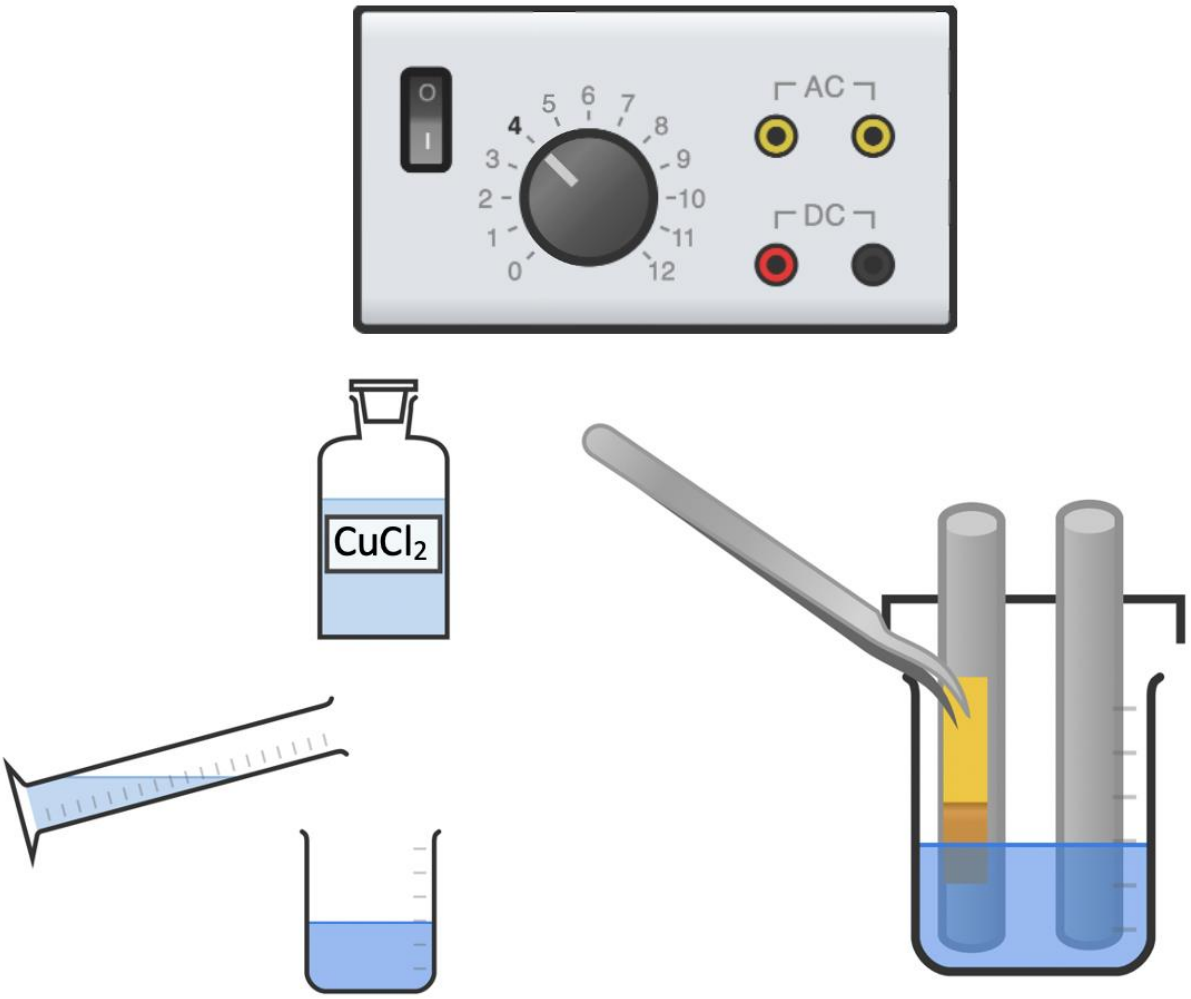
Required Practical Activity:

Electrolysis

Note:
This resource is designed as a review of the required practical activity, covering all possible skills that could be developed through the investigation. This resource can be adapted to suit the needs of your class, depending on which skills your class need support with.

In this investigation we will use a low voltage power supply to pass a current through two different salt solutions.



Required equipment diagram

1. Electrolysis	
a. What is electrolysis?	**Electrolysis is a technique which uses a direct electric current to drive a chemical reaction.**

2. Hazards:	
a. What are the chemical hazards present in this practical?	**Copper sulfate solution is currently classed as corrosive and irritant hazard. Ensure eye protection is worn at all times. Copper sulfate solution must be left in a secure location to crystallise.**
b. What other hazards are present in this experiment?	**Sulfur and chlorine fumes can be toxic and care should be taken to not inhale them. Ensure the area is well ventilated and use as little of the chemicals as possible.** **Ensure liquids and electrical power supplies are kept separate. Clean up any liquid spills as quickly as possible.** **Do not exceed 4 V on the powerpack.**
3. Equipment:	
a. What is the name given to the positive electrode?	**Anode**
b. What is the name given to the negative electrode?	**Cathode**
c. Why is it important to ensure the two electrodes do not touch one another?	**This would create a short circuit and no electricity would pass through the aqueous solution.**
d. Why is it important to rinse the equipment before repeating the experiment with sodium chloride solution?	**To ensure there is no contamination of the pure sodium chloride solution with copper chloride solution.**
e. Why is it important to keep the voltage below 4 V?	**Higher voltages can result in sparks and shocks. There is also the risk of electrolysising the solution too quickly, resulting in a dangerous release of gas.**
f. List the following steps of the method in the correct order: • Hold a small piece of blue litmus paper in	• **Pour 50 ml of copper (II) chloride solution into the 100 ml beaker.**

the forceps and position this in the solution next to the positive electrode (anode). Use any change in its appearance to identify the element formed and record this in your table. • Pour 50 ml of copper (II) chloride solution into the 100 ml beaker. • Set the power supply to 4V and switch it on. • Connect the two graphite rods to the power supply using the crocodile clips and 4mm leads.	• **Connect the two graphite rods to the power supply using the crocodile clips and 4mm leads.** • **Set the power supply to 4V and switch it on.** • **Hold a small piece of blue litmus paper in the forceps and position this in the solution next to the positive electrode (anode). Use any change in its appearance to identify the element formed and record this in your table.**

4. Results						
Solution	**Positive electrode (anode)**			**Negative electrode (cathode)**		
	Observations	**Element formed**	**State**	**Observations**	**Element formed**	**State**
Copper (II) chloride	Bubbles of gas Bleaches blue litmus paper white	**Chlorine**	**gas**	Brown/red solid coating on rod	**Copper**	**solid**
Sodium chloride	Bubbles of gas Bleaches blue litmus paper white	**Chlorine**	**gas**	Bubbles of gas (more rapid production)	**Hydrogen**	**gas**

4. Analysis:	
g. Complete the above results table.	**See above.**

h. Write out the chemical equation for what is happening at the cathode during electrolysis of copper sulfate.	$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$
i. Write out the chemical equation for what is happening at the anode during electrolysis of copper sulfate.	$2H_2O(l) \rightarrow O_2(g) + 4H^+(aq) + 4e^-$
j. During the electrolysis of sodium chloride, why is hydrogen formed at the cathode instead of sodium?	**The position of the salt's metal in the reactivity series determines what is produced at the cathode. When the metal is more reactive than hydrogen, hydrogen is formed at the cathode.**