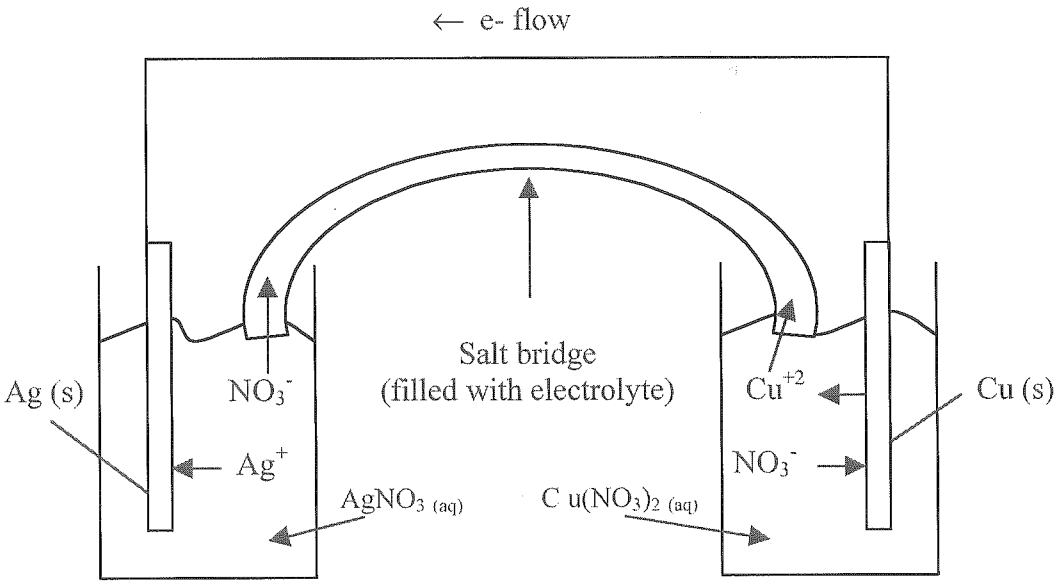
5. Electrochemical Cell – Qualitative (V.3)

Electrons are exchanged between two connected half-reactions.
Movement of electrons is electricity.
Generate electricity thru Chemistry!

a) Example ***How can we harness the electricity from the following redox reaction?***

$$2Ag^{+} + Cu_{(s)} \rightarrow 2Ag_{(s)} + Cu^{+2}$$



Reduction:
$Ag^{+} + e^{-} \rightarrow Ag_{(s)}$

"Cathode"

Oxidation:
$Cu_{(s)} \rightarrow Cu^{+2} + 2e^{-}$

"Anode"

Description:

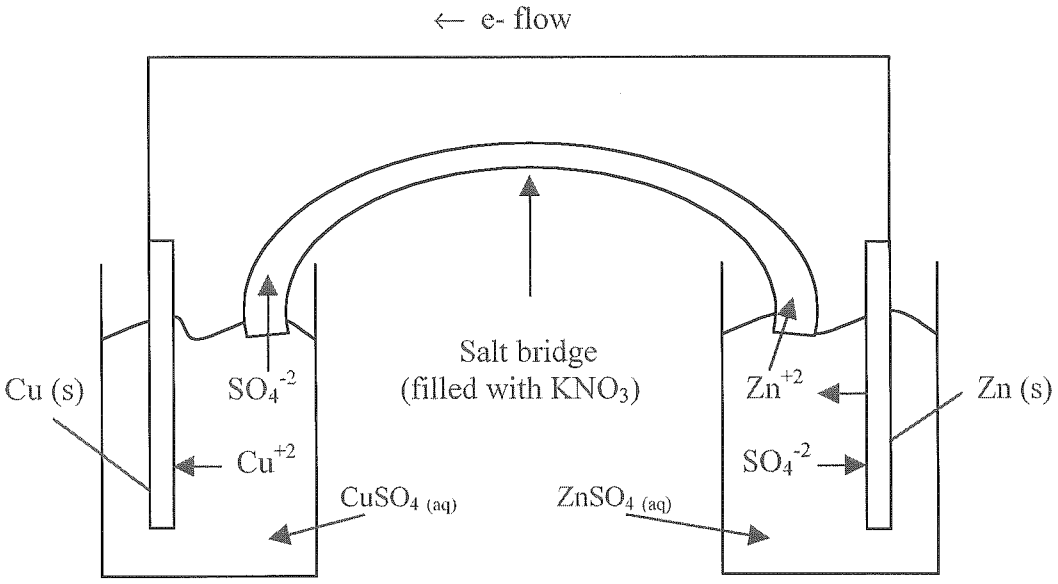
1. $Cu_{(s)}$ will spontaneously oxide to a small extent to start the process.
2. e- left behind by the oxidation of $Cu_{(s)}$ travel though wire as an electrical current to the cathode, where they are picked up by the Ag^+ ions.
3. The Ag^+ ions are then reduced to $Ag_{(s)}$, which is deposited on the cathode.
4. In order for e- to continue flowing, the cell must be overall electrically neutral.
5. To prevent a build up of Cu^{+2} is right half cell and NO_3^- in left half cell, the salt bridge allows them to "escape"

6. Anions (NO_3^-) are attracted to the anode cause after the e- leave and Cu^{+2} is made, there is an excess of positive charge.

7. Cations (Ag^+) are attracted to the cathode, cause the arrival of electrons and depletion of surrounding Ag^+ produce an excess of negative change.

b) Example ***Describe an electrochemical cell that could take advantage of the following reaction. Sketch cell and label.***

$$Cu^{+2} + Zn_{(s)} \rightarrow Cu_{(s)} + Zn^{+2}$$



Reduction:
$Cu^{+2} + 2e^- \rightarrow Cu_{(s)}$

"Cathode"

Oxidation:
$Zn_{(s)} \rightarrow Zn^{+2} + 2e^-$

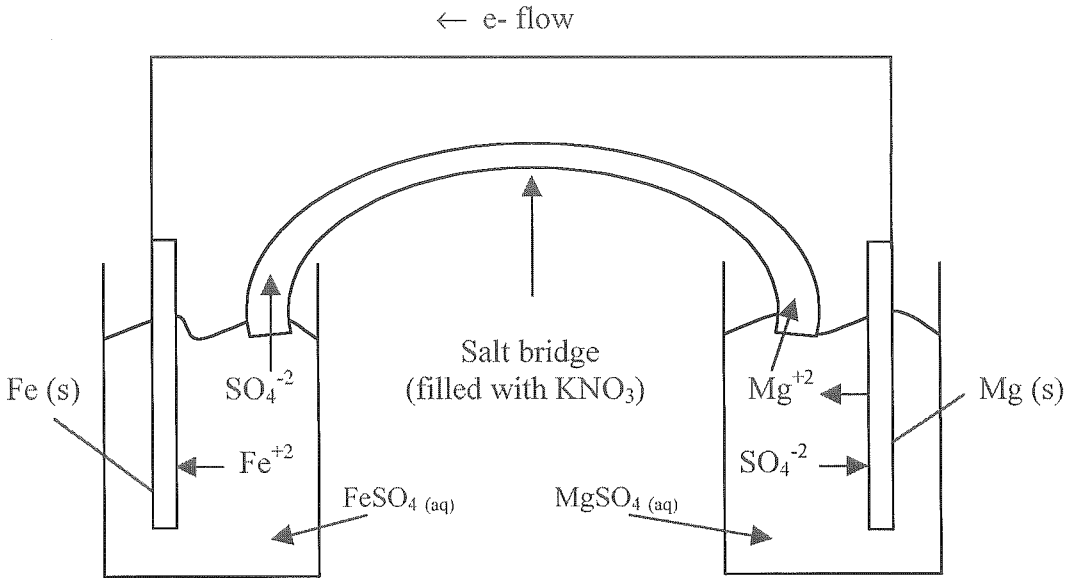
"Anode"

Procedure:

1. One half cell must contain a Cu electrode dipped into a solution containing Cu^{+2}
2. One half cell must contain a Zn electrode dipped into a solution containing Zn^{+2}
3. Since $Zn_{(s)}$ is being oxidized, it is at anode
4. Since Cu^{+2} is being reduced is it the cathode reaction
5. Anions move toward the anode, Cations move toward the cathode
6. e- travel from anode to the cathode

c) Example ***Describe an electrochemical cell that could take advantage of the following reaction. Sketch cell and label.***

$$Fe^{+2} + Mg_{(s)} \rightarrow Fe_{(s)} + Mg^{+2}$$



Reduction:
$Fe^{+2} + 2e^- \rightarrow Fe_{(s)}$

"Cathode"

Oxidation:
$Mg_{(s)} \rightarrow Mg^{+2} + 2e^-$

"Anode"

Procedure:

1. One half cell must contain a Fe electrode dipped into a solution containing Fe^{+2}
2. One half cell must contain a Mg electrode dipped into a solution containing Mg^{+2}
3. Since $Mg_{(s)}$ is being oxidized, it is at anode
4. Since Fe^{+2} is being reduced is it the cathode reaction
5. Anions move toward the anode, Cations move toward the cathode
6. e- travel from anode to the cathode

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