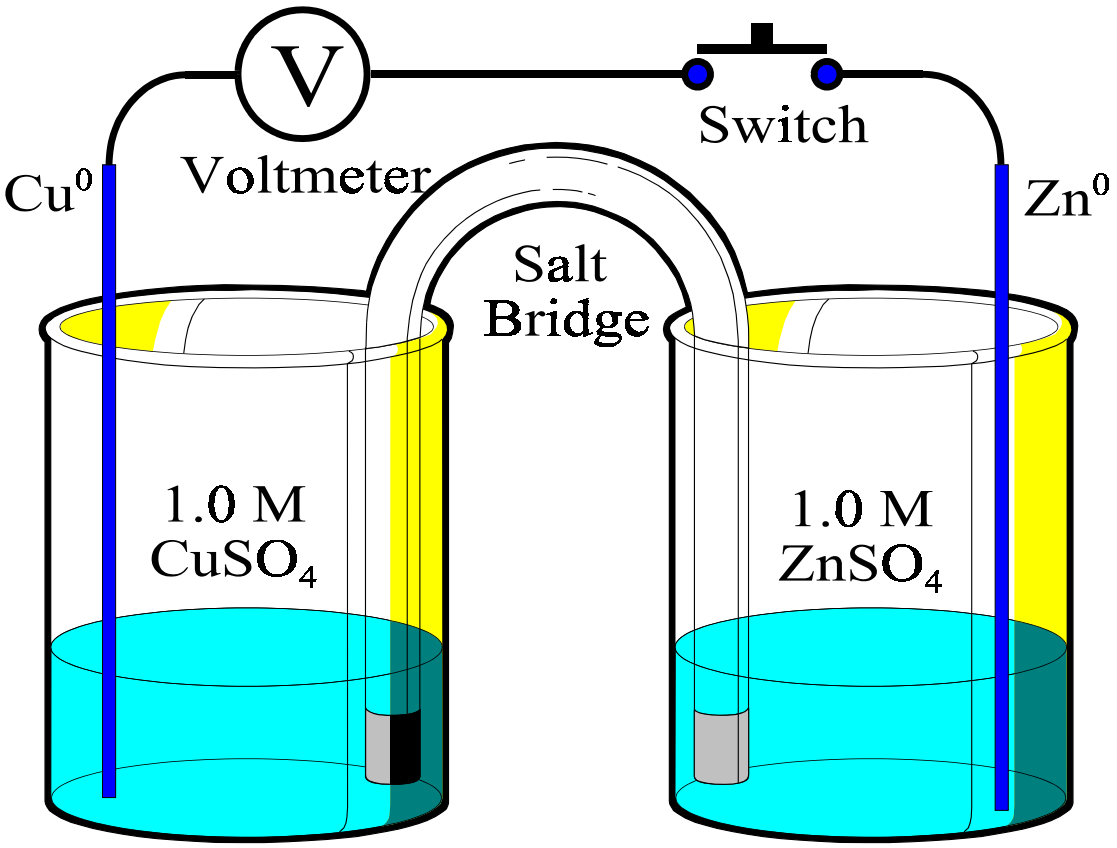


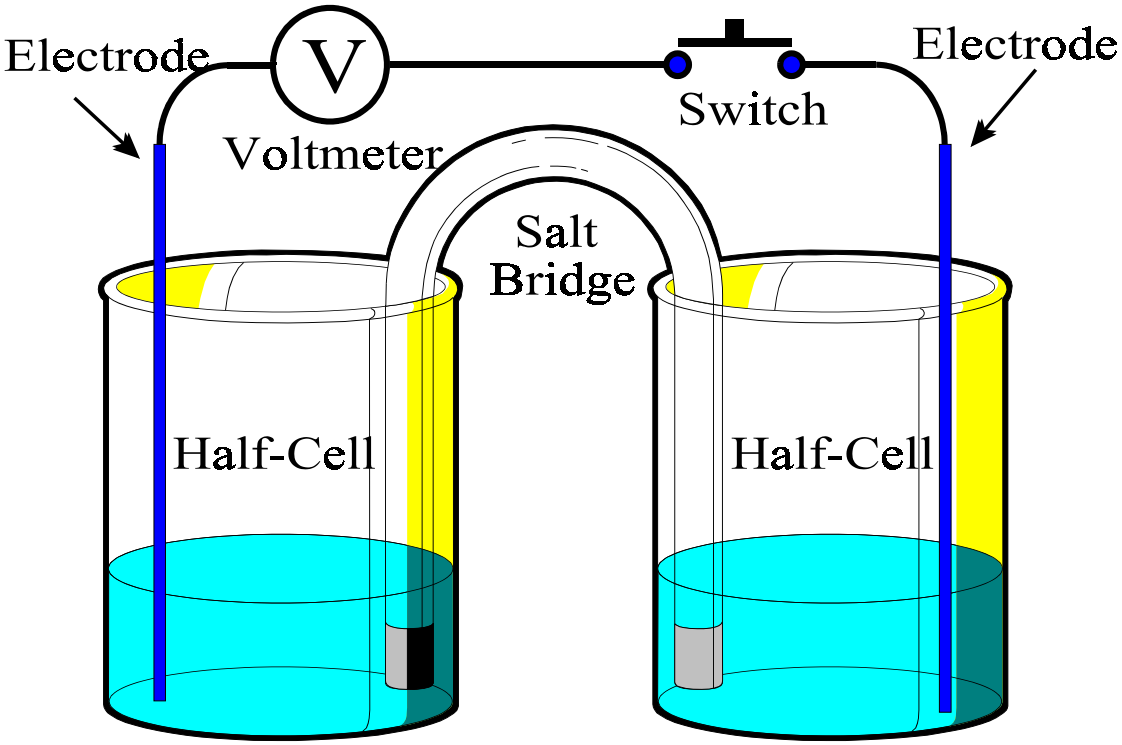
Given the electrochemical cell above:

1. Determine both the spontaneous oxidation half-reaction and the spontaneous reduction half-reaction.

2. Determine the net ionic equation for the reaction which would occur.

3. Calculate the E^0 for the cell.

ELECTROCHEMICAL CELLS
(A BATTERY)



Electrochemical cells (Chemical cells) produce an electric current by means of a chemical reaction. Batteries are examples of electrochemical cells.

Electrochemical cells consist of two discrete half-cells which are separated by a salt bridge or porous partition and connected by an external conductor.

Characteristics of Electrochemical Cells

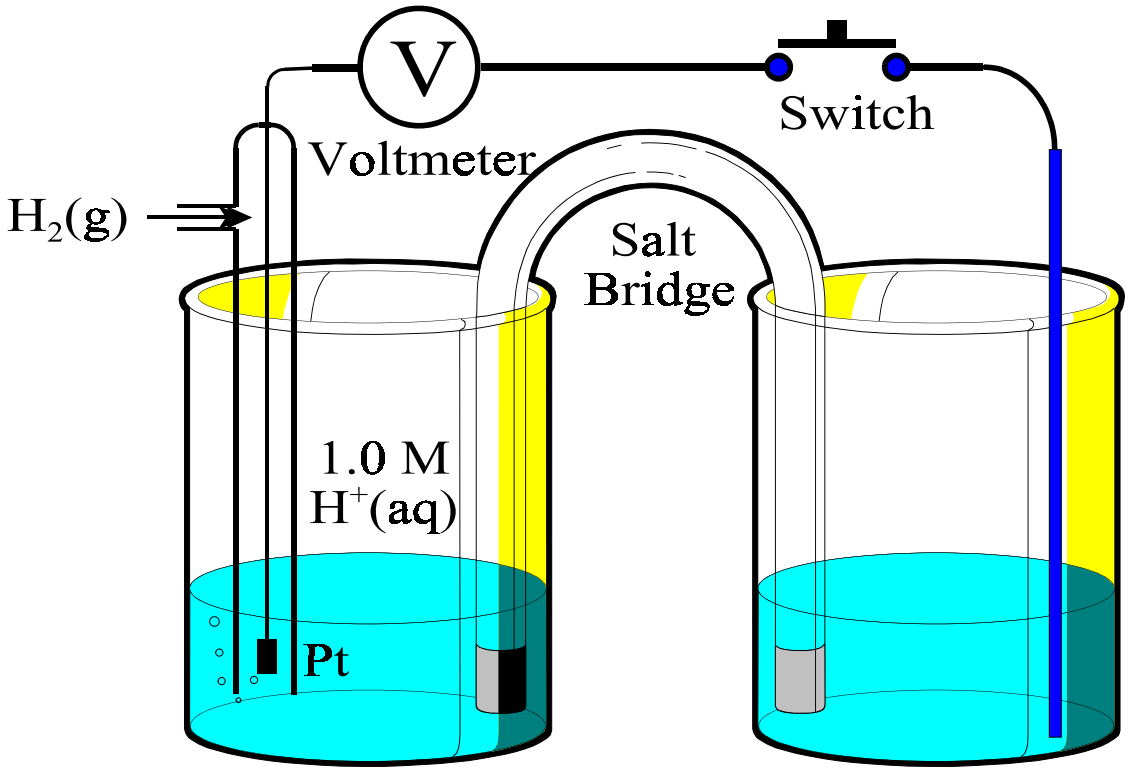
Half-cells - The redox reaction is separated into two half-cells by means of the salt bridge. One cell contains the oxidation half-reaction and the other the reduction half reaction.

Metal Electrodes - Metal electrodes allow electrons to flow into and out of the cell. There are two electrodes, an anode and a cathode. Oxidation always occurs at the anode and reduction always occurs at the cathode.

Salt Bridge - The salt bridge is used to isolate each half-cell but allow the migration of ions into each solution maintaining the solution's electrical neutrality.

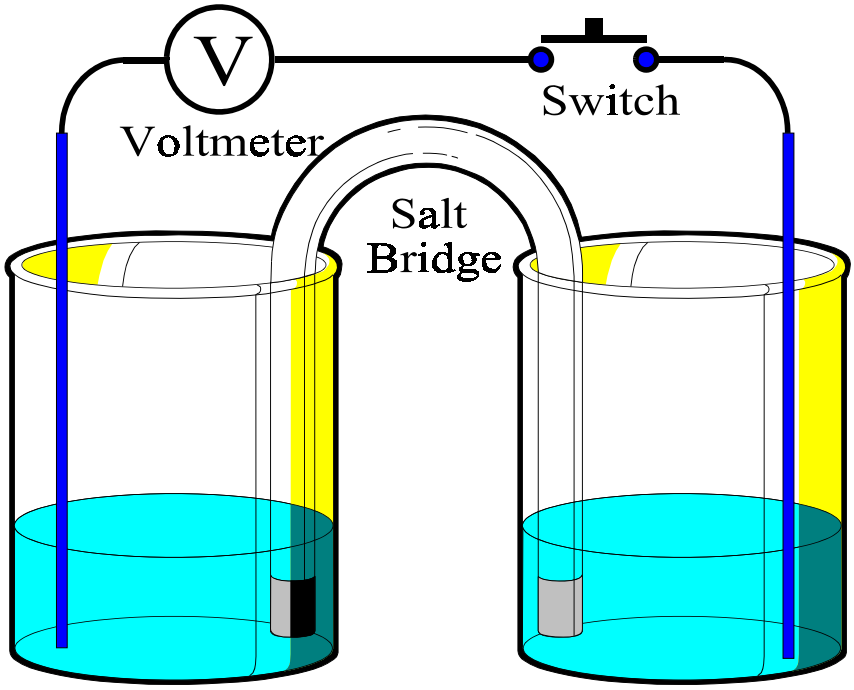
Voltmeter - The voltmeter measures the potential difference between the two half-cells. The theoretical voltmeter value is called the Standard Cell Potential, E^0.

STANDARD HYDROGEN ELECTRODE



The standard half-cell reaction against which all others are measured is the standard hydrogen electrode (SHE), and has a cell potential of 0.00 volts.

The standard hydrogen electrode consists of hydrogen gas at 25°C and 1.0 atm. bubbled into an exact 1.00 M $H^+(aq)$ solution with an inert platinum metal electrode.



1. Determine both the spontaneous oxidation and the spontaneous reduction half-reactions.

2. The net ionic equation for the overall reaction.

3. The standard cell potential, E^0.

4. The anode and cathode.

5. The current flows from _____ to _____.

6. The species oxidized and the species reduced.

7. The [ ] increases, decreases, the same

The Standard Cell Potential, E^0

The Standard Cell Potential, E^0, is a measure of the electrical potential difference between the two half cells. The standard state for electrochemical cells is a 1.0 M solution at 25°C (298 K) and 1 atmosphere pressure.

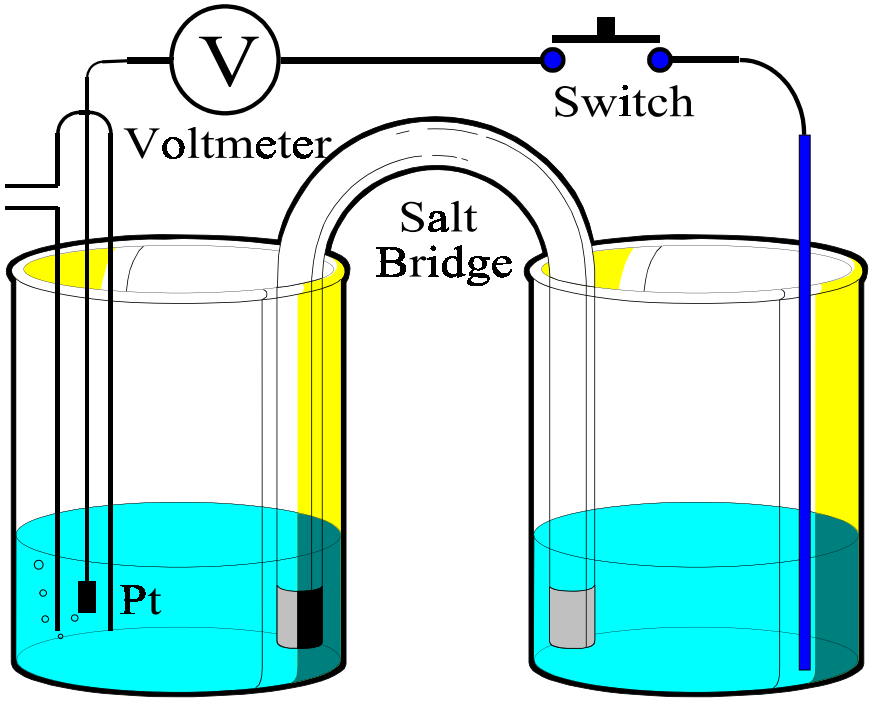
As the concentration decreases, the voltmeter reading decreases. At equilibrium, E^0 is zero. (Dead Battery)

To calculate E^0, determine the electrode potential for each half-cell on *Chart N* and find their difference. (Subtract the *more* negative value from the *more* positive value)

$$E^0 = \text{Cell voltage for the Reduction reaction} - \text{Cell voltage for the Oxidation reaction}$$

For a Fe/Fe^{2+} and Mg/Mg^{2+} reaction

$E^0 = -0.45$ v. - (-2.37 v.) = 1.92 volts



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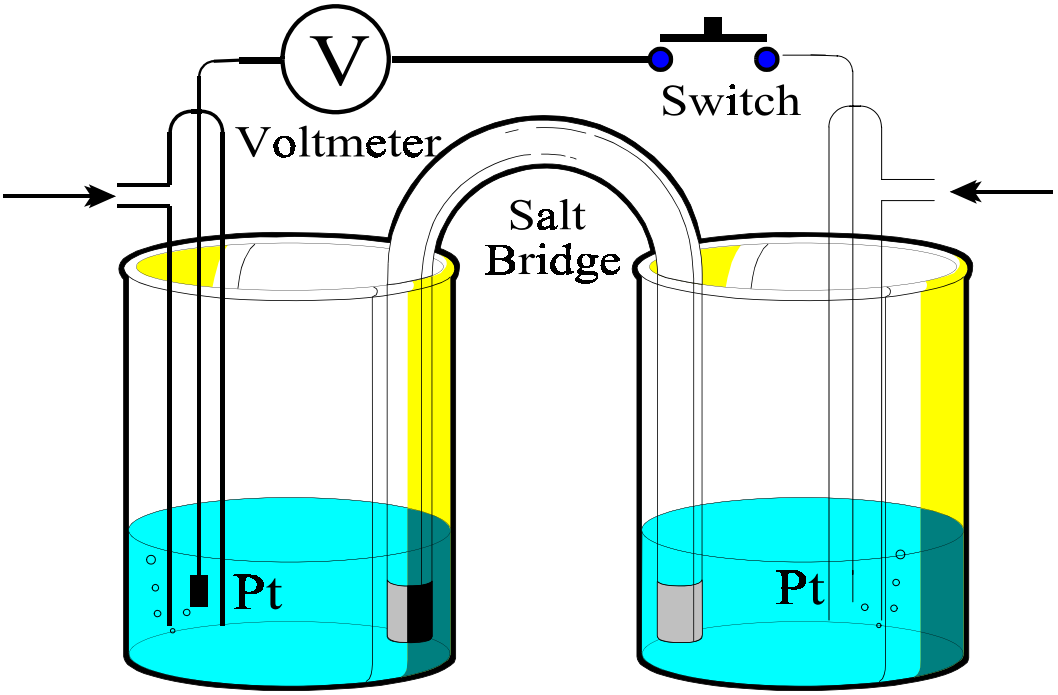

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