Chemistry 12

Electrochemistry IV

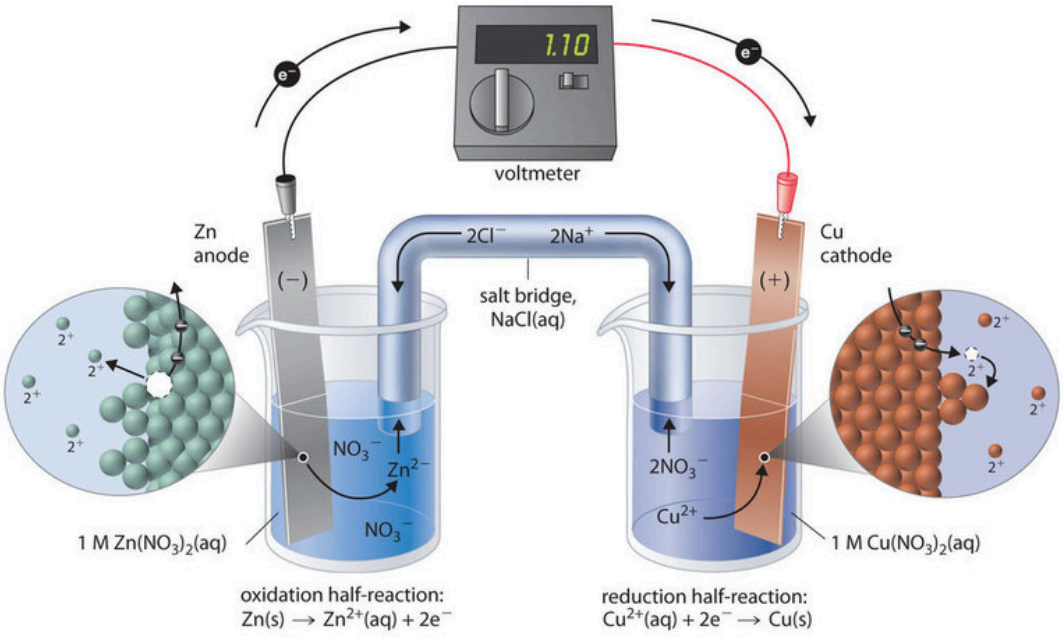
Name:
Date:
Block:

1. **The Electrochemical Cell**
2. **Standard Cell Potentials**

The Electrochemical Cell

- Portable source of electricity in which electricity is produced by a _____ redox reaction within the cell
- Also referred to as a _____ cell or _____ cell.
- Oxidation half-reaction and the reduction half-reaction are separated.
- Electrons can only travel from the reducing agent to the oxidizing agent when the two are connected through an _____.

Basic Components:



Electrons flow from the _____ to the _____

- **Cathode:**
  - The site of _____.
  - The metal _____ mass.
  - If the metal is being coated by a different ion, then we call it _____.

- **Anode:**
  - The site of _____.
  - The metal _____ mass.

- **Salt Bridge:**
  - Consists of _____ _____.
  - Cations flow towards the _____ and anions flow towards the _____.

Standard Cell Potentials

When electrons flow throughout a system, a voltage, or electrical potential is produced. This can be measured by comparing the difference in electrical potential between two half-cells.

- Write the half-reaction the way it occurs and then add the half-cell potentials together.
- A half-cell potential **doesn't change** when its half reaction is multiplied by an integer.

Example:

Determine the voltage of a standard cell consisting of a $Ni \mid Ni^{2+}$ half cell and an $I_2 \mid I^-$ half cell.

- Write the oxidation half-cell reaction and its oxidation potential.

- Write the reduction half reaction and its reduction potential.

- Add the reduction potential to the oxidation potential.

If the standard cell potential (E^o) is positive for a redox reaction, the reaction is expected to be spontaneous.

Draw an electrochemical cell for the above reaction:

Practice:

Determine the standard cell potential of each of the following combinations of half-cells. Show the oxidation and reduction half-reactions as well as the overall redox reaction occurring in each cell. Draw the electrochemical cell and the movement of electrons.

1. Ni | Ni^{2+} and an Sn | Sn^{2+}

2. Cu | Cu^{2+} and an Al | Al^{3+}

3. Design an electrochemical cell for lead-plating.

Calculate the SRP for the following reactions:

a) $Ag + Ni^{2+} \rightarrow Ag^{+} + Ni$

b) $Ag^{+} + Ni \rightarrow Ag + Ni^{2+}$

c) $Sn + Al^{3+} \rightarrow Al + Sn^{2+}$

d) $F_2 + Cu \rightarrow F^{-} + Cu^{2+}$

e) $F_2 + Mg \rightarrow Mg^{2+} + F^{-}$

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