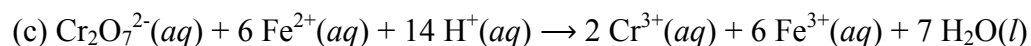
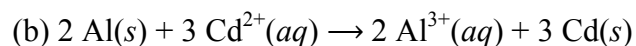
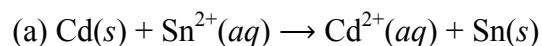


Worksheet 9

Some things to note that are often misunderstood:

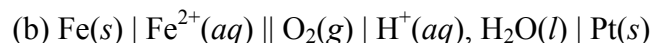
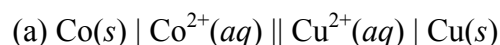
- Anions flow through the salt bridge into the anode compartment while cations flow into the cathode compartment to maintain electroneutrality.
- The anode of a voltaic cell is negative (like an anion), and the cathode is positive (like a cation). Electrons move from the negative anode through an external circuit to the positive cathode.
- When a chemical equation is balanced by the half-reaction method, the number of electrons that occur on both sides of the balanced equation (before canceling) is equal to the value of n .
- For a spontaneous reaction ΔG is negative but E is positive.
- Standard conditions for E° , the standard cell potential, are identical with standard conditions for the ΔG° , ΔH° , and ΔS° .
- Every reduction half-cell reaction has a corresponding standard reduction potential, E°_{red} . If the reaction is reversed, it becomes an oxidation half-cell reaction with a corresponding standard oxidation half-cell potential, E°_{ox} . For any given half-cell reaction, $E^\circ_{\text{ox}} = -E^\circ_{\text{red}}$.
- Half-cell potentials are *never* multiplied by a coefficient when used in the equation $E^\circ_{\text{cell}} = E^\circ_{\text{ox}} + E^\circ_{\text{red}}$.
- The general form of the Nernst equation is used to correct the standard cell potential for concentrations other than 1 M, partial pressures other than 1 atm, or a temperature other than 25°C. This form of the Nernst equation applies only to reactions occurring at 25°C.
- The Nernst equation relates the concentrations of any chemical species, including H^+ , to cell potential.

1. Describe voltaic cells that use the following reactions. In each case, write the anode and cathode half-reactions, and sketch the experiment setup. Label the anode and cathode, identify the sign of each electrode, and indicate the direction of electron and ion flow.



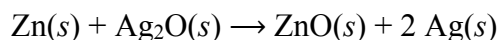
2. Write the shorthand notation for each cell in Problem 1.

3. Write balanced equations for the electrode and overall cell reactions in the following voltaic cells.

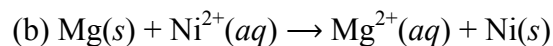
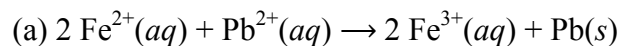


Worksheet 9

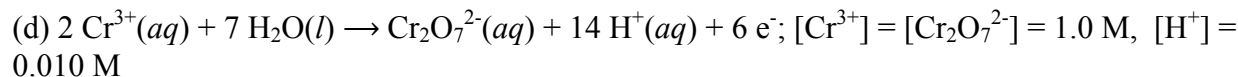
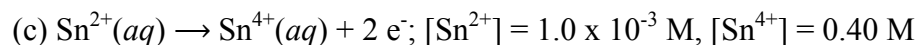
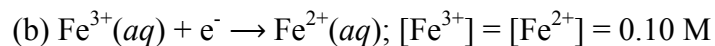
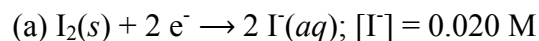
4. The silver oxide-zinc battery used in hearing aids delivers a voltage of 1.60 V. Calculate the free-energy change (in kilojoules) for the cell reaction:



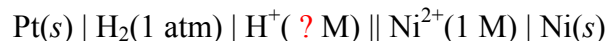
5. Calculate E° for each of the following reactions, and tell which are spontaneous under standard-state conditions.



6. The Nernst equation applies to both cell reactions and half-reactions. For the conditions specified, calculate the potential for the following half-reactions at 25°.



7. The following cell has a potential of 0.27 V at 25°C:



What is the pH of the solution in the anode compartment?

8. Calculate the equilibrium constant at 25°C for the disproportionation of Hg_2^{2+} :

