Practice Problems: Electrochemical Cells (Drawings)

For questions 1 to 3, two half-cells are connected under standard conditions to make an electrochemical cell. Use the Table of Standard Reduction Potentials included with these questions to obtain the half-reactions involved. For each:

a. write the equation for each half-reaction that will occur

b. label each half-reaction as oxidation or reduction

c. calculate the voltage of the electrochemical cell

d. the net overall **balanced** redox equation.

e. diagram the cell, clearly indicating the following

- the electrodes in appropriate electrolytic solutions
- label each electrode as anode or cathode
- label each electrode as positive post or negative post
- diagram the flow of electrons through the external circuit
- a salt bridge with appropriate electrolytic solution
- flow of ions from the salt bridge to the two half-cells

1. iron-iron(II) ion ($Fe|Fe^{2+}$) and lead-lead(II) ion ($Pb|Pb^{2+}$)
2. chromium-chromium(III) ion ($Cr|Cr^{3+}$) and rubidium-rubidium ion ($Rb|Rb^{+}$)
3. copper-copper(I) ion ($Cu|Cu^{+}$) and aluminum-aluminum ion ($Al|Al^{3+}$)

   (NOTE: Be sure to use the Cu^{1+} half-reaction, not Cu^{2+})
4. An electrochemical cell is created using gold and magnesium half-cells.
   a. Determine which half-cell will undergo oxidation and which will undergo reduction, identify anode and cathode, and calculate the voltage for the cell. You do not need to diagram the cell.
   b. If the mass of the magnesium electrode changes by 5.0 g, what will be the change in mass of the gold electrode, and will its mass increase or decrease?