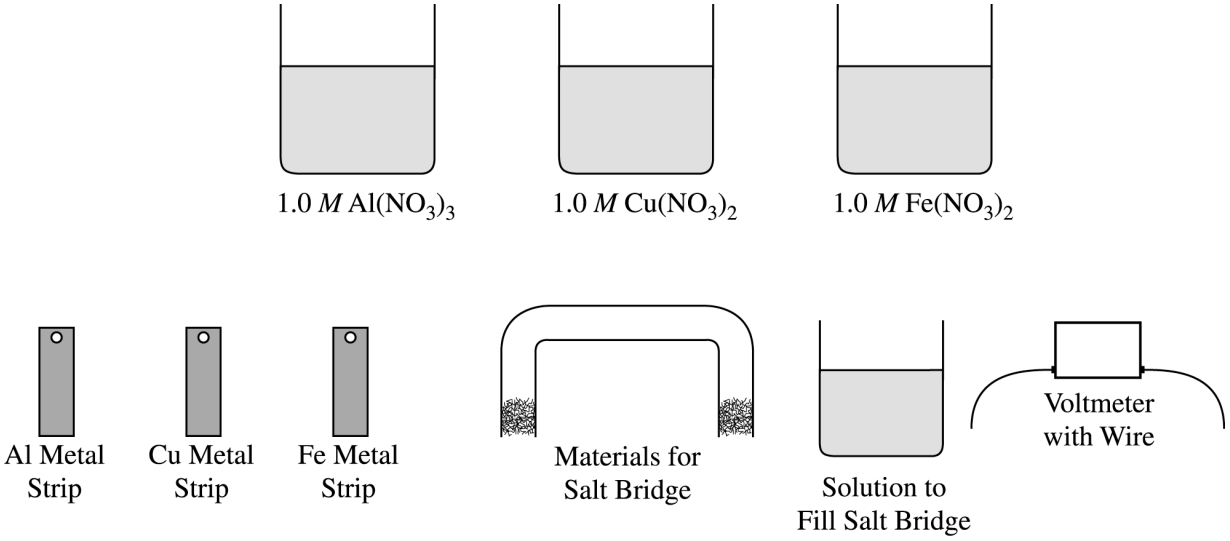
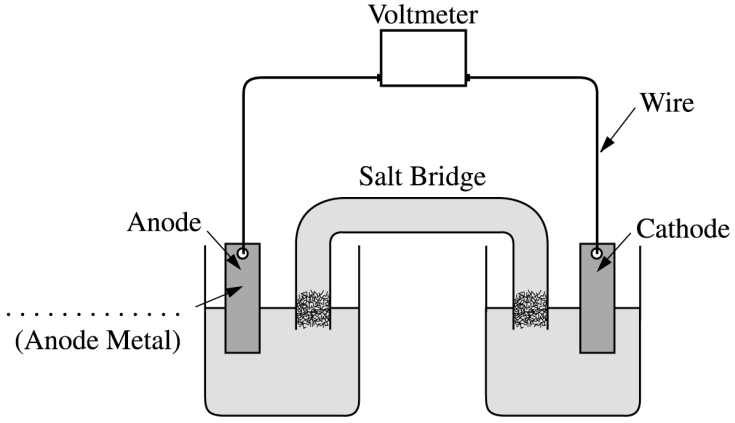
6. Answer the following questions about electrochemistry.

(a) Several different electrochemical cells can be constructed using the materials shown below. Write the balanced net-ionic equation for the reaction that occurs in the cell that would have the greatest positive value of E°_{cell}.



(b) Calculate the standard cell potential, E°_{cell}, for the reaction written in part (a).

(c) A cell is constructed based on the reaction in part (a) above. Label the metal used for the anode on the cell shown in the figure below.



(d) Of the compounds $NaOH$, CuS, and $NaNO_3$, which one is appropriate to use in a salt bridge? Briefly explain your answer, and for each of the other compounds, include a reason why it is not appropriate.

(e) Another standard cell is based on the following reaction.

$$Zn + Pb^{2+} \rightarrow Zn^{2+} + Pb$$

If the concentration of Zn^{2+} is decreased from 1.0 *M* to 0.25 *M,* what effect does this have on the cell potential? Justify your answer.

Answer EITHER Question 7 below OR Question 8 printed on page 14. Only one of these two questions will be graded. If you start both questions, be sure to cross out the question you do not want graded. The Section II score weighting for the question you choose is 15 percent.

7. Account for the following observations using principles of atomic structure and/or chemical bonding. In each part, your answer must include specific information about both substances.

(a) The Ca^{2+} and Cl^- ions are isoelectronic, but their radii are not the same. Which ion has the larger radius? Explain.

(b) Carbon and lead are in the same group of elements, but carbon is classified as a nonmetal and lead is classified as a metal.

(c) Compounds containing Kr have been synthesized, but there are no known compounds that contain He.

(d) The first ionization energy of Be is 900 kJ mol^{-1}, but the first ionization energy of B is 800 kJ mol^{-1}.