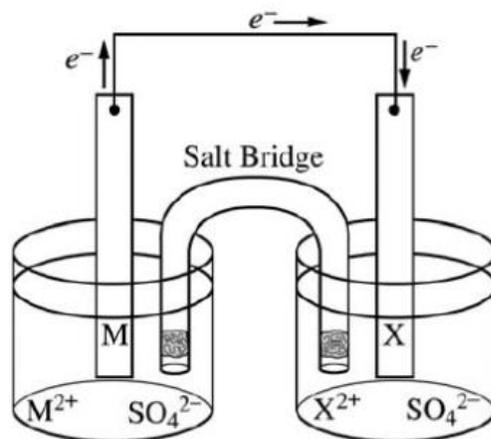


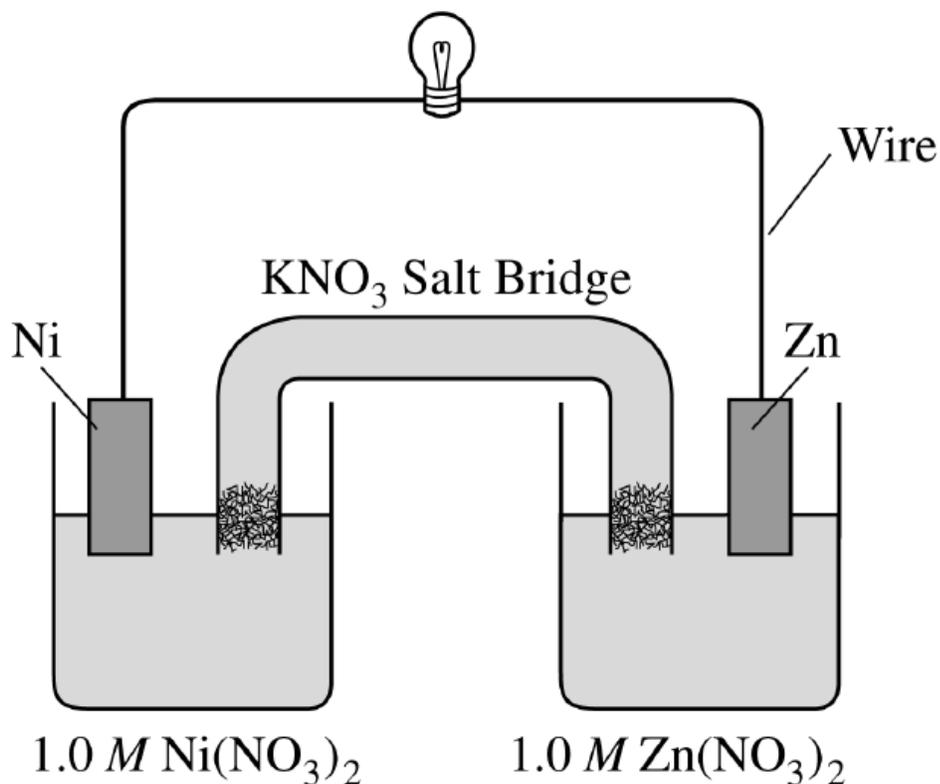
Electro FRQs

1. (2002 B #7) The diagram below shows the experimental setup for a typical electrochemical cell that contains two standard half-cells. The cell operates according to the reaction represented by the following equation.



- Identify M and M^{2+} in the diagram and specify the initial concentration for M^{2+} in solution.
- Indicate which of the metal electrodes is the cathode. Write the balanced equation for the reaction that occurs in the half-cell containing the cathode.
- What would be the effect on the cell voltage if the concentration of Zn^{2+} was reduced to 0.100 M in the half-cell containing the Zn electrode?
- Describe what would happen to the cell voltage if the salt bridge was removed. Explain.

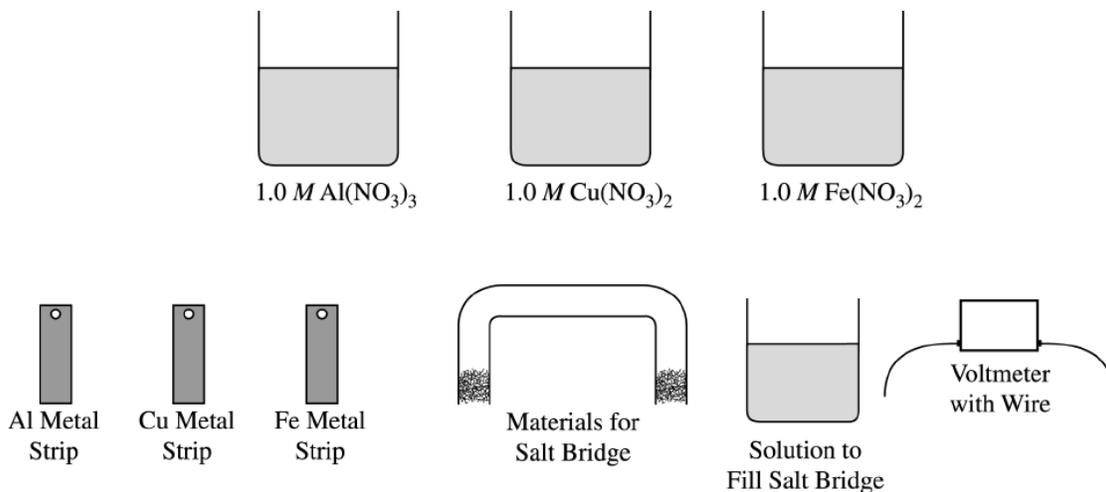
2. (2001 #7)



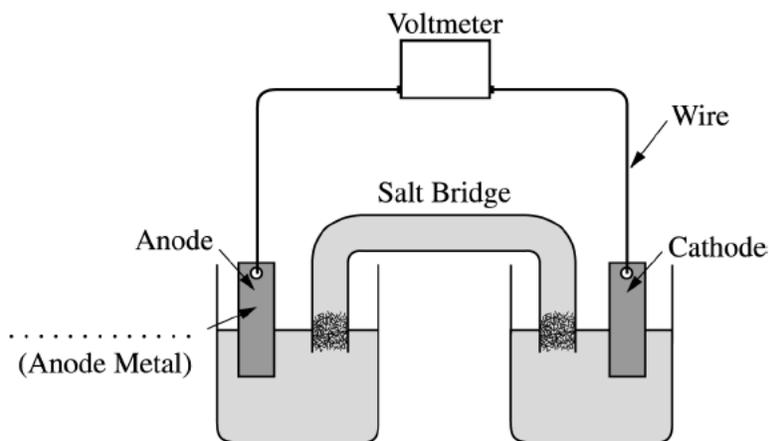
Answer the following questions that refer to the galvanic cell shown in the diagram above.

- Identify the anode of the cell and write the half-reaction that occurs there.
- Write the net ionic equation for the overall reaction that occurs as the cell operates and calculate the value of the standard cell potential, E°_{cell} .
- Indicate how the value of E_{cell} would be affected if the concentration of Ni(NO₃)₂(aq) was changed from 1.0 M to 0.10 M and the concentration of Zn(NO₃)₂(aq) remained at 1.0 M. Justify your answer.
- Specify whether the value of K_{eq} for the cell reaction is less than 1, greater than 1, or equal to 1. Justify your answer.

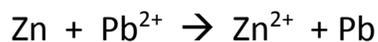
3. (2003 B #6) Answer the following questions about electrochemistry.
- a. Several different electrochemical cells can be constructed using the materials shown below. Write the balanced net-ionic equation for the reaction that occurs in the cell that would have the greatest positive value of E°_{cell} .



- 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.



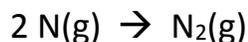
- d. Of the compounds NaOH , CuS , and NaNO_3 , which one is appropriate to use in a salt bridge? Briefly explain your answer, and for each of the other compounds, include a reason why it is not appropriate.
- e. Another standard cell is based on the following reaction.



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.

4. (2003 #7) Answer the following questions that relate to the chemistry of nitrogen.

a. Two nitrogen atoms combine to form a nitrogen molecule, as represented by the following equation.



Using the table of average bond energies below, determine the enthalpy change, ΔH° , for the reaction.

Bond	Average Bond Energy (kJ mol ⁻¹)
N — N	160
N = N	420
N ≡ N	950

b. The reaction between nitrogen and hydrogen to form ammonia is represented below.



Predict the sign of the standard entropy change, ΔS° , for the reaction.

Justify your answer.

c. The value of ΔG° for the reaction represented in part (b) is negative at low temperatures but positive at high temperatures. Explain.

d. When $\text{N}_2(\text{g})$ and $\text{H}_2(\text{g})$ are placed in a sealed container at a low temperature, no measurable amount of $\text{NH}_3(\text{g})$ is produced. Explain.