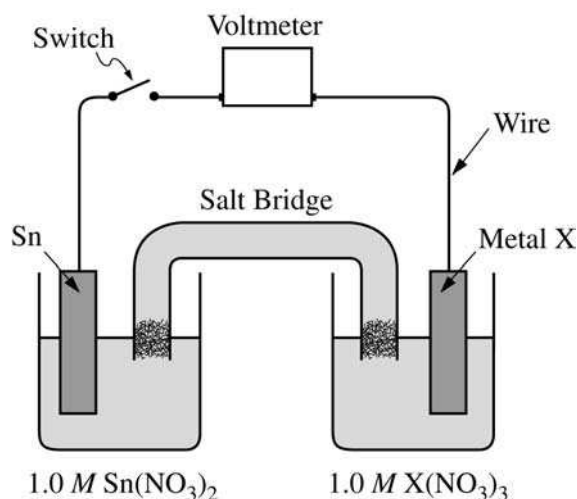
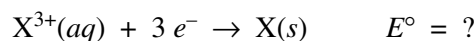
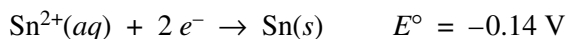


2004 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS



6. An electrochemical cell is constructed with an open switch, as shown in the diagram above. A strip of Sn and a strip of an unknown metal, X, are used as electrodes. When the switch is closed, the mass of the Sn electrode increases. The half-reactions are shown below.



- In the diagram above, label the electrode that is the cathode. Justify your answer.
- In the diagram above, draw an arrow indicating the direction of the electron flow in the external circuit when the switch is closed.
- If the standard cell potential, E_{cell}° , is +0.60 V, what is the standard reduction potential, in volts, for the X^{3+}/X electrode?
- Identify metal X.
- Write a balanced net-ionic equation for the overall chemical reaction occurring in the cell.
- In the cell, the concentration of Sn^{2+} is changed from 1.0 M to 0.50 M, and the concentration of X^{3+} is changed from 1.0 M to 0.10 M.
 - Substitute all the appropriate values for determining the cell potential, E_{cell} , into the Nernst equation. (Do not do any calculations.)
 - On the basis of your response in part (f) (i), will the cell potential, E_{cell} , be greater than, less than, or equal to the original E_{cell}° ? Justify your answer.