1. (Step 3: Practice with standard cell potentials) Use the simulation to determine the half-cell potential for the metal "X".
   a. What is the balanced half-cell reaction corresponding to the reduction of metal X?

   b. What cell potentials did you measure, to help determine the half-cell reduction potential for metal X, and what values did you obtain (list two different cells, and the measured potential)?

   c. What value did you obtain for the half cell reduction potential of metal X?

   d. As a check on your answer, use your above value for the half-cell reduction potential of X to calculate the potential of the two cells you measured in part b. Your predicted values should agree with what you measured in part b.
2. (Step 4: Practice with Non-standard conditions)

**Dilute the Sn2+ solution in the following two galvanic cells. What happens to the voltage in each? Explain your results.**

a. Reaction 1

\[ \text{Sn}(s) + \text{Cu}^{2+}(aq) \rightarrow \text{Sn}^{2+}(aq) + \text{Cu}(s) \quad E^0_{\text{cell}}=0.48V \]

b. Reaction 2

\[ \text{Zn}(s) + \text{Sn}^{2+}(aq) \rightarrow \text{Zn}^{2+}(aq) + \text{Sn}(s) \quad E^0_{\text{cell}}=0.62V \]

3. **Consider a cell:** \( \text{Zn}(s) + \text{Cu}^{2+}(aq) \rightarrow \text{Zn}^{2+}(aq) + \text{Cu}(s) \) in which the concentration of \([\text{Cu}^{2+}]\) and \([\text{Zn}^{2+}]\) are both 2M. [Note that the simulation does not provide solutions above 1M. Please make predictions about cells with 2M concentrations based upon experiments you perform with the concentrations provided.]

a) Will the cell potential be greater than, equal to or less than the standard cell potential?

b) Will the cell be able to run the stopwatch for a longer time, equal time, or shorter time than the standard cell.