[Electrochemistry](http://session.masteringchemistry.com/myct/assignment?assignmentID=2386283) Part III

1. Balance each redox reaction occurring in acidic aqueous solution. Express your answer as a chemical equation. Identify all of the phases in your answer.

Ni(s)+Cd 2+ (aq)→Ni 2+ (aq)+Cd(s)

Ni(s)+Cd 2+ (aq)→Ni 2+ (aq)+Cd(s)

MnO 4 − (aq)+Al(s)→Mn 2+ (aq)+Al 3+ (aq) {\rm MnO_4}^-(aq)+{\rm Al}(s)\rightarrow {\rm Mn}^{2+}(aq)+{\rm Al}^{3+}(aq)

{\rm Ni} (s) +{\rm Cd}^{2+}(aq)\rightarrow {\rm Ni}^{2+}(aq)+{\rm Cd}(s){\rm Ni} (s) +{\rm Cd}^{2+}(aq)\rightarrow {\rm Ni}^{2+}(aq)+{\rm Cd}(s)

1. Balance each redox reaction occurring in basic aqueous solution.

MnO − 4 (aq)+Br − (aq)→MnO 2 (s)+BrO − 3 (aq)

Ag(s)+CN − (aq)+O 2 (g)→Ag(CN) − 2 (aq)

O − 2 (aq)+Al(s)→NH 3 (g)+AlO − 2 (aq)

1. Calculate the standard cell potential (E ∘ E^\circ) for the reaction X(s)+Y + (aq)→X + (aq)+Y(s) if K = 5.82×10−3.Express your answer to three significant figures and include the appropriate units.
2. Calculate the standard free-energy change at 25 ∘ C ^ \circ \rm Cfor the following reaction: Mg(s)+Fe 2+ (aq)→Mg 2+ (aq)+Fe(s) Express your answer to three significant figures and include the appropriate units.
3. Calculate the standard cell potential at 25 ∘ C ^ \circ \rm Cfor the reactionX(s)+2Y + (aq)→X 2+ (aq)+2Y(s) where ΔH ∘ = -633kJ and ΔS ∘ = -391J/K.Express your answer to three significant figures and include the appropriate units.
4. Consider the reaction Mg(s)+Fe 2+ (aq)→Mg 2+ (aq)+Fe(s) at 67 ∘ C, where [Fe 2+ ]= 3.80M and [Mg 2+ ]= 0.310M.

What is the value for the reaction quotient, Q Q, for the cell? Express your answer numerically.

What is the value for the temperature, T T, in kelvins?Express your answer to three significant figures and include the appropriate units.

What is the value for n n?Express your answer as an integer and include the appropriate units (i.e. enter mol for moles).

Calculate the standard cell potential for Mg(s)+Fe 2+ (aq)→Mg 2+ (aq)+Fe(s) \rm Mg {(s)}+ \rm Fe^{2+}{(aq)} \rightarrow \rm Mg^{2+}{(aq)}+ \rm Fe {(s)}Express your answer to three significant figures and include the appropriate units.

1. A voltaic cell employs the redox reaction:2Fe 3+ (aq)+3Mg(s)→2Fe(s)+3Mg 2+ (aq) Calculate the cell potential at 25 ∘ C ^\circ {\rm{C}}under each set of conditions:

standard conditions, Express your answer using two decimal places.

[Fe 3+ ]= \left[ {{\rm{Fe}}^{3 + } } \right] = 2.2×10−3M {\rm M}; [Mg 2+ ]= \left[ {{\rm{Mg}}^{2 + } } \right] = 2.60M {\rm M}Express your answer using two decimal places.

[Fe 3+ ]= \left[ {{\rm{Fe}}^{3 + } } \right] = 2.60M {\rm M}; [Mg 2+ ]= \left[ {{\rm{Mg}}^{2 + } } \right] = 2.2×10−3M {\rm M}Express your answer using two decimal places.

1. A Cu/Cu 2+ {\rm{Cu}}/ {\rm{Cu}}^{2 + }concentration cell has a voltage of 0.22V Vat 25 ∘ C ^\circ {\rm{C}}. The concentration of Cu 2+ {\rm{Cu}}^{2 + }in one of the half-cells is 1.4×10−3MM.What is the concentration of Cu 2+ {\rm{Cu}}^{2 + }in the other half-cell? Express your answer using two significant figures.
2. Galvanized nails are iron nails that have been plated with zinc to prevent rusting. The relevant reaction is Zn 2+ (aq)+2e − →Zn(s) {\rm Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)}For a large batch of nails, a manufacturer needs to plate a total zinc mass of 3.30kg kgon the surface to get adequate coverage. How many moles of zinc are in 3.30kg kgof zinc? Express your answer to three significant figures and include the appropriate units.