1. Silver is electroplated onto a spoon by suspending the spoon in a 1.00 M solution of AgNO3 and passing a 2.00 amp current through it for 15.0 min. What mass of silver is deposited on the spoon?

The half-cell reaction for the reduction of silver is given by

The mass of silver deposited is given by

1. Calculate the standard cell potential for the reaction

Given the standard reduction potentials,

MnO4+ + 8 H+ + 5 e 🡪 Mn2++ 4 H2O 1.51 V

Fe2+ 🡪 Fe3+ + e -0.136 V

The standard cell potential is given by

1. The following data can be found in a table of standard reduction potentials at 25 oC:

Sn4+ + 2 e 🡪 Sn2+ 0.15 V

Sn2+ + 2 e 🡪 Sn -0.136 V

From these data, Calculate the standard reduction potential for the half-cell

Sn4+ + 4 e 🡪 Sn ? V

The target reaction can be generated by simply adding the two data reactions

Sn4+ + 2 e 🡪 Sn2+ 0.15 V

Sn2+ + 2 e 🡪 Sn -0.136 V

Sn4+ + 4 e 🡪 Sn 0.014 V

1. From a table of standard reduction potentials at 25 oC, the following is found:

Cu2+ + 2 e 🡪 Cu 0.337 V

Zn2+ + 2 e 🡪 Zn -0.763 V

From these data, calculate the cell potential for the cell constructed as

The standard cell potential is given by

The cell potential can then be calculated using the Nernst equation:

So

1. A Daniel cell is constructed

and the cell potential is measured to be 1.05 V. Calculate the concentration of Cu2+ ions in the cathode half-cell.

As in the previous problem, the cell potential is given by the Nernst equation.

So

1. Given the following standard reduction potentials, calculate the value of Ksp for AgI.

AgI + e- 🡪 Ag + I- -0.152 V

Ag+ + e 🡪 Ag 0.799 V

The dissociation reaction can be generated by flipping the second half-cell and adding the half reactions.

AgI + e- 🡪 Ag + I- -0.152 V

Ag 🡪 Ag+ + e- -0.799 V

AgI 🡪 Ag+ + I- -0.951 V

The equilibrium constant is then obtained from

So

1. Ksp for PbCl2(s) is 1.8 x 10-4 M3. Based on this, and the standard reduction potential

Pb2+ + 2 e 🡪 Pb -0.126 V

calculate the standard reduction potential for

PbCl2 + 2 e 🡪 Pb + 2 Cl- ?

The target reaction can be generated for the data reactions indicated in the problem from

Pb2+ + 2 e 🡪 Pb -0.126 V

PbCl2 🡪 Pb2+ + 2 Cl- Espo from Ksp

PbCl2 + 2 e 🡪 Pb + 2 Cl- Eo = -0.126 V + Espo

Using the equilibrium constant, the standard cell potential for the dissociation (Espo) is found from

So

So, Eo for the target half-reaction is given by

1. At 25 oC, Kf = 8.9 x 102 M-1 for the complexation reaction

Given that the standard reduction potential at 25 oC

Fe3+ + 3 e 🡪 Fe 0.771 V

determine the standard reduction potential for the half-reaction

FeSCN2+ + 3 e 🡪 Fe + SCN- ? V

The target reaction can be generated from the data reactions by

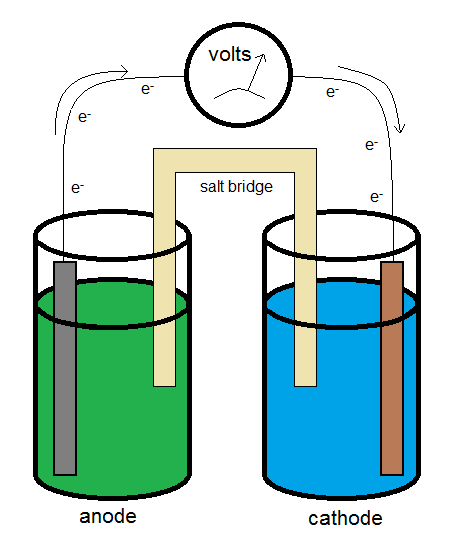
Fe3+ + 3 e 🡪 Fe Eo = 0.771 V

FeSCN2+ ↔ Fe3+ + SCN- Eo =

FeSCN2+ + 3 e 🡪 Fe + SCN- Eo = ?

So

1. Ni2+ Ions complex with EDTA by the reaction

Kf for this complex formation equilibrium is 3.6 x 1018 M-1. A half-cell is prepared to be 0.100 M in Ni2+ and 1.00 M in EDTA. Its standard reduction potential is measured relative to a copper half-cell, in which [Cu2+] = 1.00 M. The standard reduction potentials for the bare-ion reductions are

Cu2+ + 2 e 🡪 Cu 0.337 V

Ni2+ + 2 e 🡪 Ni -0.250 V

From these data, calculate the cell potential once the complexation reaction of N2+ with EDTA has reached equilibrium.

First, find the concentration of Ni2+.

Kf = 3.6 x 1018 M-1

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Ni2+** | **EDTA4-** | **NiEDTA2-** |
| **Initial** | 0.100 M | 1.00 M | 0 |
| **Change** | -0.100 M | -0.100 M | +0.100 M |
| **End** | y | 0.90 M | 0.100 M |

Now, use the concentration in the Nernst equation to find the cell potential. The reaction is

For this reaction, Eo is given by

Also, n = 2 for the reaction as two electrons are transferred per reaction equivalent. So, the Nernst equation is given by

Using values from the problem,

1. Consider the redox reaction

Given the following data

Mg2+ + 2 e 🡪 Mg -2.37 V

Li+ + e 🡪 Li -3.045 V

|  |  |
| --- | --- |
| Species | Sfo (J mol-1 K-1) |
| Mg2+(aq) | -138.1 |
| Mg(s) | 32.68 |
| Li+(aq) | 13.4 |
| Li(s) | 29.12 |

1. Calculate the standard cell potential (Eo) at 25 oC,

The target reaction can be generated by adding the data reactions (with the lithium half-reaction flipped and doubled):

Mg2+ + 2 e 🡪 Mg -2.37 V

2(Li 🡪 Li+ + e) 3.045 V

Mg2+ + 2 Li 🡪 Mg + 2 Li+ 0.675 V

1. the standard reaction entropy (Srxno) at 25 oC,

The reaction entropy is found in the usual way of adding up the total entropy for the products and subtracting that for the reactants:

1. and the standard cell potential at 37 oC.

The temperature dependence of the standard cell potential is given by

and

So, so long as the reaction entropy change is constant across the temperature range: