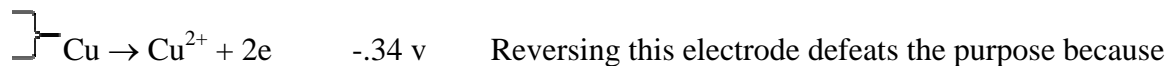
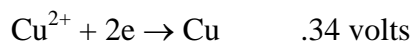
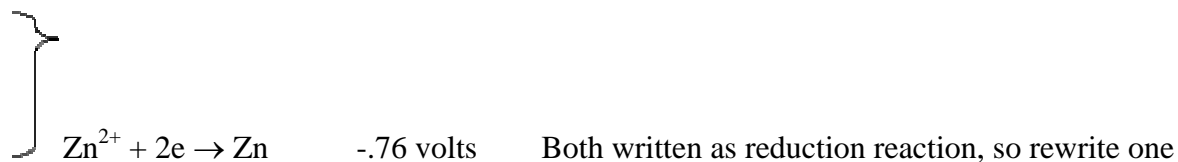
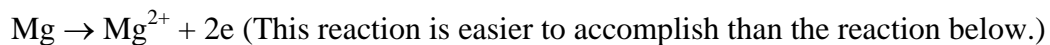
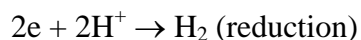
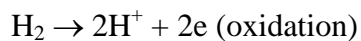


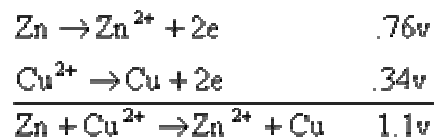
Electrochemistry

Ease of reactions

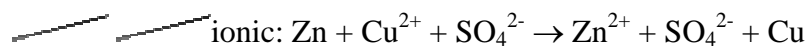
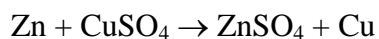


adding algebraically gives a neg. emf, so we reverse the

Zn electrode.



Same as single displacement reaction.



Conventional Cell Reaction

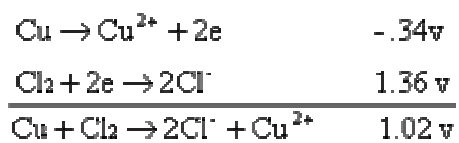
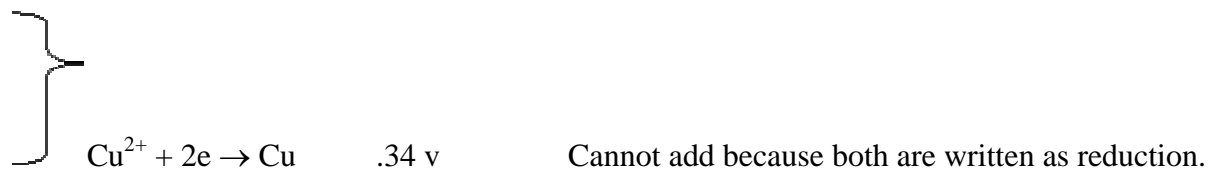
Write anode first, then cathode:

anode || cathode

For anode write electrode first, then electrolyte. For cathode write electrolyte first, then

electrode.



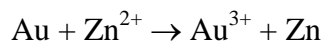


anode || cathode

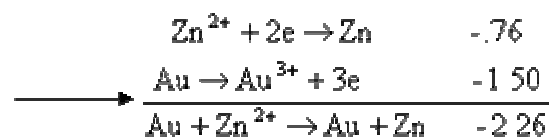
$\text{Cu}; \text{Cu}^{2+} \parallel \text{Cl}^-; \text{Cl}_2; \text{Pt}$ (Note if cathode was anode write: $\text{Pt}; \text{Cl}_2; \text{Cl}^-$. Notice the use of

Pt with gaseous electrodes.)

Given the following reaction, is this a spontaneous reaction?



The emf values for these half cell reactions are taking place:



Gives a neg. emf so cell is not

spontaneous.

It will be a spontaneous cell if Zn is the anode and Au is the cathode.

$$1 \text{ F} = 96,500 \text{ coul} = 6.02 \times 10^{23} \text{ e}^{-}\text{s} \quad \text{coul} = (\text{amps})(\text{sec})$$

$$1 \text{ F} = 1 \text{ g H} \quad \text{Eq. wt of hydrogen}$$

$$1 \text{ F} = 35.5 \text{ g Cl} \quad \text{Eq. wt of chlorine}$$

$$1 \text{ F} = 8 \text{ g ox.} \quad \text{Eq. wt of oxygen}$$

$$1 \text{ F} \rightarrow 11.2 \text{ L of H}_2 \text{ at STP}$$

$$11.2 \text{ L of Cl}_2 \text{ at STP}$$

5.6 L of ox. at STP

1 mol of ox. = 32 g ox. = 22.4 L of ox. at STP

1 F = 8 g ox. = 5.6 L of ox. at STP

Calculate the weight of gold ion Au^{3+} deposited by a 2 amp current that passes through the Au^{3+} cell for 1 hr 20 min 4 sec (4804 sec).

96,500 coul = Eq. wt of anything

$$\left. \begin{array}{l} \text{coul} = \text{amp} \times \text{sec} \\ \text{coul} = 2 \times 4804 \end{array} \right\} \quad \begin{array}{l} 96,500 \text{ coul} = 65.7 \text{ g Au} \\ 2 \times 4804 \text{ coul} = x \end{array} \quad \frac{(2 \times 4804) \text{ coul} \times 65.7 \text{ g Au}}{96,500 \text{ coul}} = 6.54 \text{ g Au}$$

Calculate the weight of gold and weight of silver deposited by a 2 amp current that passes through the cell for 1 hr 20 min 4 sec.

2 amp	1 hr 20 min 4 sec	Au^{3+}	6.54 g Au
	2 x 4804	Ag^+	10.75

$$\left. \begin{array}{l} 96,500 \text{ coul} = \frac{197}{3} \text{ g Au} \\ 2 \times 4804 \text{ coul} = x \end{array} \right\} \quad \frac{2 \times 4804 \times 197}{96,500 \times 3} = 6.5 \text{ g Au}$$

The different masses of elements deposited at the cathode is in ratio of their equivalent weights.

Eq. wt of Au

$$\left. \begin{array}{l} 65.7 \text{ g} \approx 6.54 \text{ g Au deposited} \\ 108 \text{ eq. wt of Ag} \approx x \end{array} \right\} \quad \frac{108 \times 6.54}{65.7} = 10.75 \text{ g Au deposited}$$

$$\left. \begin{array}{l} 65.7 \text{ g} \approx 6.54 \text{ g Au} \\ 1 \approx x \end{array} \right\} \quad \frac{1 \times 6.54}{65.7} = .09 \text{ g H}$$

$$\left. \begin{array}{l} 2 \text{ g H}_2 = 22.4 \text{ L} \\ .09 = x \end{array} \right\} \quad \frac{.09 \times 22.4}{2}$$

A 2.5 amp current that passed through an unknown element for 30 min deposited .65 g of the element. Calculate the eq. wt of the unknown element.

$$\left. \begin{array}{l} 2.5 \times 30 \times 60 \text{ coul} = .65 \text{ g} \\ 96,500 \text{ coul} = x \end{array} \right\} \quad \frac{96,500 \times .65}{2.5 \times 30 \times 60} = 14.5 \text{ eq. wt}$$

Calculate the time it takes to deposit 3 g Ag by a 5 amp current that passes through a Ag ion solution.

$$\left. \begin{array}{l} 96,500 \text{ coul} = 108 \text{ g Ag} \\ x = 3 \text{ g Ag} \end{array} \right\} \quad \frac{96,500 \text{ coul} \times 3 \text{ g Ag}}{108 \text{ g Ag}} = 2680.6 \text{ coul}$$

$$\text{coul} = \text{amp} \times \text{sec}$$

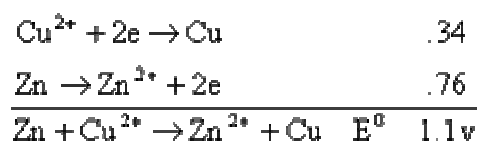
$$2680.6 = (5)(\text{sec})$$

$$\frac{2680.6}{5} = \text{sec}$$

Nernst Equation

$$E = E^0 - \frac{.06}{n} \log Q$$

Calculate the emf of a cell if the concentration of the Zn^{2+} is .003 M and Cu^{2+} is .1M.



$$\begin{aligned}
 E &= 1.1 - \frac{.06}{2} \log \left[\frac{5 \times 10^{-3}}{.1} \right] \\
 &= 1.1 + .04 \\
 &= 1.14
 \end{aligned}$$

$$\Delta G = -nEF$$

Balancing Reactions

