

## Name \_\_\_\_\_ Electrolytic Problems

20.60 =

1. (Brady853) Copper (II) ions are being exposed to an electric current producing a solid. This process occurs with an electric current of 2.00 A is run through a solution of  $\text{CuSO}_4$  for a period of 20.0 min

Write out the half reaction taking place at the copper electrode.

Is this oxidation or reduction?

Will this take place at the cathode or the anode?

How many grams of copper are deposited?

Reduction



$I = \frac{q}{t}$      $2 = \frac{q}{1200 \text{ sec}}$      $q = 2400 \text{ C}$      $\frac{1 \text{ mole } e^-}{96500 \text{ C}} = 0.0248 \text{ mole } e^-$      $\frac{1 \text{ Cu}}{2 e^-} \cdot \frac{63.5 \text{ g}}{1 \text{ Cu}} = 0.789 \text{ g}$

2. (brady854) Electrolysis provides a useful way to deposit a thin metallic coating on an electrically conducting surface. The technique is called electroplating. How much time would it take in minutes to deposit 0.500 g of metallic nickel on a metal object using a current of 3.00 A? The nickel is reduced from the +2 oxidation state

$0.5 \text{ g} \cdot \frac{1 \text{ mol}}{58.6 \text{ g}} = 0.00853 \text{ mol}$      $\frac{2 \text{ mole } e^-}{1 \text{ mol}} = 0.017 \text{ mole } e^-$      $\frac{96500 \text{ C}}{1 \text{ mole } e^-} = 16406 \text{ C}$

$\text{Ni}^{+2} + 2e^- = \text{Ni}^0$      $3 = \frac{16406}{t}$      $I = \frac{q}{t}$      $t = 5485 \text{ sec} \leftarrow 9 \text{ min } 8 \text{ sec}$

3. \_\_\_\_\_

moles of metal    Nickel > Chromium  
 mole  $e^-$     =  
 mass    Nickel > Chromium

4. If 3 metals were all oxidized ( $\text{Ag}^+$ ,  $\text{Mg}^{2+}$  and  $\text{Pb}^{2+}$ ) with the same current for the same period of time, which will create the largest mass of metal? (this calculation is a series of linear proportions, is a calculator needed?)

$\text{Ag}$      $\text{Pb}$      $\text{Mg} < \text{Pb} < \text{Ag}$   
 107    207    Lowest

$\frac{1}{2}$  the lead, but Not 2x heavier.

5. What are the two equations for the oxidation and reduction of water?



6. If two electrodes are placed in a solution of aqueous  $\text{Sn}^{2+}$ , on one electrode a solid is produced, on the other bubbles occur.

a. At what post is the solid occurring? (anode or cathode)

b. What are the bubbles?  $\text{O}_2$

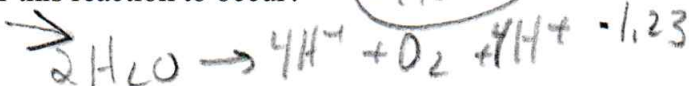
c. What is the minimum voltage is needed for this reaction to occur?

$-1.23$   
 $+ .14$   
 $-1.37$     Need +vult

Ox

Red

↓ solid = Sn



need to oxidize water?