



Electrochemistry

Name Key
Date _____

1. How much silver metal will be plated out in an electrolytic cell containing Ag^+ when 0.50 mol of electrons passes through the cell?

$$\frac{0.50 \text{ mole } e^-}{1 \text{ mole } e^-} \times \frac{1 \text{ mol Ag}}{1 \text{ mol Ag}} \times \frac{107.87 \text{ g Ag}}{1 \text{ mol Ag}} = 53.935 \text{ g Ag}$$

2. How much zinc metal will 2.5 mol of electrons plate out of a zinc chloride solution?

$$\frac{2.5 \text{ mole } e^-}{2 \text{ mole } e^-} \times \frac{1 \text{ mol Zn}}{1 \text{ mol Zn}} \times \frac{65.39 \text{ g Zn}}{1 \text{ mol Zn}} = 81.7375 \text{ g Zn}$$

3. A current of 5.0 A is passed through a solution of aluminum chloride for 15 minutes. How much aluminum metal is plated out during this period of time?

$$\frac{5 \text{ C}}{1 \text{ s}} \times \frac{900 \text{ s}}{1 \text{ s}} \times \frac{1 \text{ mole } e^-}{96485 \text{ C}} \times \frac{1 \text{ mol Al}}{3 \text{ mole } e^-} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = 0.419 \text{ g Al}$$

4. How many amperes of current are needed to plate out 10.0 g of silver per hour from a solution of silver nitrate?

$$\frac{10 \text{ g}}{107.87 \text{ g Ag}} \times \frac{1 \text{ mol Ag}}{1 \text{ mol Ag}} \times \frac{1 \text{ mole } e^-}{1 \text{ mole } e^-} \times \frac{96485 \text{ C}}{3600 \text{ s}} = 2.4846 \text{ A}$$

5. Determine the standard potential for each of the following cells and tell which half cell is the cathode in each case.

(a) $\text{Fe}^{3+}(\text{aq}) \mid \text{Fe}^{2+}(\text{aq}); \text{Ni}^{2+}(\text{aq}) \mid \text{Ni}(\text{s})$	-0.77 -0.23	1.06 V	Fe is cathode
(b) $\text{Cu}^{2+}(\text{aq}) \mid \text{Cu}(\text{s}); \text{Ag}^+(\text{aq}) \mid \text{Ag}(\text{s})$	-0.34 $+0.80$	0.46 V	Ag is cathode
(c) $\text{Zn}^{2+}(\text{aq}) \mid \text{Zn}(\text{s}); \text{Ag}^+(\text{aq}) \mid \text{Ag}(\text{s})$	-0.76 $+0.80$	1.56 V	Ag is cathode
(d) $\text{Cu}^{2+}(\text{aq}) \mid \text{Cu}(\text{s}); \text{Cd}^{2+}(\text{aq}) \mid \text{Cd}(\text{s})$	-0.34 -0.40	0.74 V	Cu is cathode
(e) $\text{Sn}^{2+}(\text{aq}) \mid \text{Sn}(\text{s}); \text{Br}_2^0(\text{l}) \mid \text{Br}(\text{aq})$	-0.14 $+1.09$	1.23 V	Br is cathode
(f) $\text{Al}^{3+}(\text{aq}) \mid \text{Al}(\text{s}); \text{Cu}^{2+}(\text{aq}) \mid \text{Cu}(\text{s})$	-1.66 $+0.34$	2.00 V	Cu is cathode
(g) $\text{Ni}^{2+}(\text{aq}) \mid \text{Ni}(\text{s}); \text{Cr}^{3+}(\text{aq}) \mid \text{Cr}(\text{s})$	-0.23 -0.73	0.50 V	Ni is cathode
(h) $\text{Cd}^{2+}(\text{aq}) \mid \text{Cd}(\text{s}); \text{Co}^{2+}(\text{aq}) \mid \text{Co}(\text{s})$	-0.40 -0.28	0.12 V	Co is cathode

