

## Lesson 31: Electrochemistry I

text: 504-518

what to know:

- electrochemical cell terminology (electrodes, salt bridge, half-cells, current, voltage, coulomb, galvanic cell, electrolytic cell, anode, cathode), §12-3
- how to write abbreviated cells, anode to the left and anode to the right, e flowing L to R, p-508
- Faraday=s laws and their application, §12-4
- electrometallurgy, metallurgy of aluminum and magnesium, §12-5

questions:

1. Describe the basic features of a galvanic (voltaic) cell including what happens at the anode and cathode. Why are the two components separated from each other? What is the function of the salt bridge? Which direction do anions flow in the salt bridge on a operating voltaic cell?
2. An automobile battery delivers a current of 50 A for 1.5 sec to start an engine. Calculate the quantity of charge (in coulombs) passing through the battery. How many moles of electrons are passing per minute?
3. How many minutes would it take to deposit 1.00 oz (28.4 g) of gold from a  $\text{AuCl}_3$  solution with a current of 2.00 amperes?
4. A current of 0.600 A deposits 2.42 g of a certain metal, M, in one hour from a  $\text{M}^+$  solution. What is the atomic mass of the metal?
5. A constant electric current flows for 3.75 h through two electrolytic cells connected in series. One contains a solution of  $\text{AgNO}_3$  and the second a solution of  $\text{CuCl}_2$ . During this time 2.00 g of Ag are deposited in the first cell.
  - a. How many grams of copper are deposited in the second cell?
  - b. What is the current expressed in amperes?
6. Galvanized steel consists of steel with a thin coating of zinc to slow corrosion. The zinc can be deposited electrolytically by making the steel object the cathode and a block of zinc the anode in an electrochemical cell containing a dissolved zinc salt. Suppose a steel garbage can is to be galvanized and requires a total mass of 7.32 g of zinc to be coated to the required thickness. How long should a current of 8.50 A be passed through the cell to achieve this?
7. Describe the metallurgy of aluminum. Why is it economically advantageous to recycle aluminum? (Each recycled aluminum can saves the equivalent of one cup of gasoline, every recycled aluminum can saves enough electricity to burn a 100 watt bulb for 3.5 years, two aluminum cans thrown away is a waste of more energy than is used daily by each of a billion people in poorer lands, every year Americans throw away enough aluminum to rebuild the entire American Airline fleet 71 times.)
8. Aluminum is not as good as copper in electrical conductance and yet it is often used instead of copper for that purpose. Why?
9. How is copper refined?