

Lesson 33: Electrochemistry III

text: 907-909, 544-558

what to know:

- electrolysis of various substances in the molten or aqueous states, webout, §23-2
- batteries and fuel cells, chemistry of the lead storage battery, §13-6
- the chemistry of corrosion and its prevention, §13-7

questions:

1. Write the balanced half-equations for the anode and cathode reactions occurring when:
 - a. molten KBr is electrolyzed.
 - b. aqueous KI is electrolyzed.
 - c. aqueous HI is electrolyzed.
 - d. aqueous CuSO_4 is electrolyzed.
 - e. water is electrolyzed.
2. How does the ordinary dry cell work?
3. The fact that the lead storage battery is rechargeable is one reason why it is so useful. What reactions occur at the anode and the cathode during a recharge? Why can the status of the battery's "charge" be determined by measuring the density of the battery acid?
4. In a hydrogen-oxygen fuel cell, the reaction is very similar to the combustion of hydrogen, except that the anode and cathode reactions are carried out separately. The electrode reactions are $2\text{H}_2(\text{g}) + 4\text{OH}^-(\text{aq}) \rightleftharpoons 4\text{H}_2\text{O}(\text{l}) + 4\text{e}^-$ and $\text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}) + 4\text{e}^- \rightleftharpoons 4\text{OH}^-(\text{aq})$
 - a. What is the overall balanced equation?
 - b. What is the standard voltage of the cell?
5. Explain why aluminum cookware does not disintegrate in air but is not very useful for cooking acid foods.
6. The corrosion of iron can be prevented or retarded by a variety of means. Explain how each of the following work.
 - a. Keep the iron dry.
 - b. Galvanize it.
 - c. Plate it with tin (as in tin cans).
 - d. Paint it.
 - e. Connect it to a sacrificial active metal like magnesium.
 - f. Control the pH.