

# Electrochemistry

## Section 20.2 Batteries

**Main Idea** \_\_\_\_\_

**Details** \_\_\_\_\_

**Skim** Section 2 of your text. Write three questions that come to mind after reading the headings and the illustration captions.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**New Vocabulary**

Use your text to define each term.

*battery*

\_\_\_\_\_  
\_\_\_\_\_

*dry cell*

\_\_\_\_\_

*primary battery*

\_\_\_\_\_  
\_\_\_\_\_

*secondary battery*

\_\_\_\_\_

*fuel cell*

\_\_\_\_\_  
\_\_\_\_\_

*corrosion*

\_\_\_\_\_  
\_\_\_\_\_

*galvanization*

\_\_\_\_\_  
\_\_\_\_\_

## Section 20.2 Batteries

In your textbook, read about dry cells, the lead–acid storage battery, and lithium batteries.

Complete the table below by writing the type of battery described on the right. Choose your answers from the following types: *lead–acid battery*, *lithium battery*, *nickel–cadmium battery*, *zinc–carbon dry cell*.

Type of Battery	Description
1.	The standard, rechargeable automobile battery
2.	Often used in cordless drills, screwdrivers, and shavers because it is compact and rechargeable
3.	The most commonly used voltaic cell from the 1880s until recently
4.	Lightweight, long-lasting battery often used in watches and computers to maintain time and date settings

In the space at the left, write *true* if the statement is true; if the statement is false, change the italicized word or phrase to make it true.

- \_\_\_\_\_ 5. In a zinc–carbon dry cell, a carbon rod serves as the *cathode*.
- \_\_\_\_\_ 6. *Secondary* batteries produce electric energy by means of redox reactions that are not easily reversed.
- \_\_\_\_\_ 7. One advantage of alkaline cells is that they are *larger* than dry cells.
- \_\_\_\_\_ 8. When a lead–acid battery is generating electric current, *sulfuric acid* is consumed and lead(II) sulfate is produced.
- \_\_\_\_\_ 9. Dry cells and alkaline cells are examples of *primary* batteries.
- \_\_\_\_\_ 10. Compared to most other batteries, lithium batteries store a *small* amount of energy for their size.
- \_\_\_\_\_ 11. *Secondary* batteries are rechargeable.
- \_\_\_\_\_ 12. Each cell in a lead–acid battery generates about *12 volts*.
- \_\_\_\_\_ 13. Lead–acid batteries and nickel–cadmium batteries are examples of *secondary* batteries.

**Section 20.2** *continued*

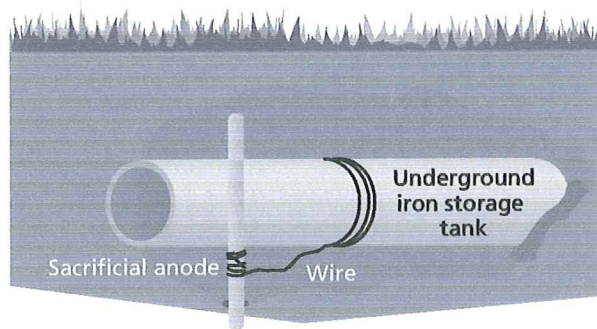
*In your textbook, read about fuel cells.*

**Circle the letter of the choice that best completes the statement or answers the question.**

14. The main purpose of a fuel cell is to produce
  - a. fuel.
  - b. electric energy.
  - c. chemical energy.
  - d. heat.
  
15. In the hydrogen–oxygen fuel cell,
  - a. hydrogen is oxidized and oxygen is reduced.
  - b. oxygen is oxidized and hydrogen is reduced.
  - c. both oxygen and hydrogen are oxidized.
  - d. both oxygen and hydrogen are reduced.
  
16. What is the main difference between the reaction in a hydrogen–oxygen fuel cell and the burning of hydrogen in air?
  - a. When hydrogen burns in air, the oxidation and reduction reactions are separated.
  - b. The burning of hydrogen in air does not produce water.
  - c. The reaction in a fuel cell does not produce water.
  - d. The reaction in a fuel cell is very controlled.

*In your textbook, read about corrosion.*

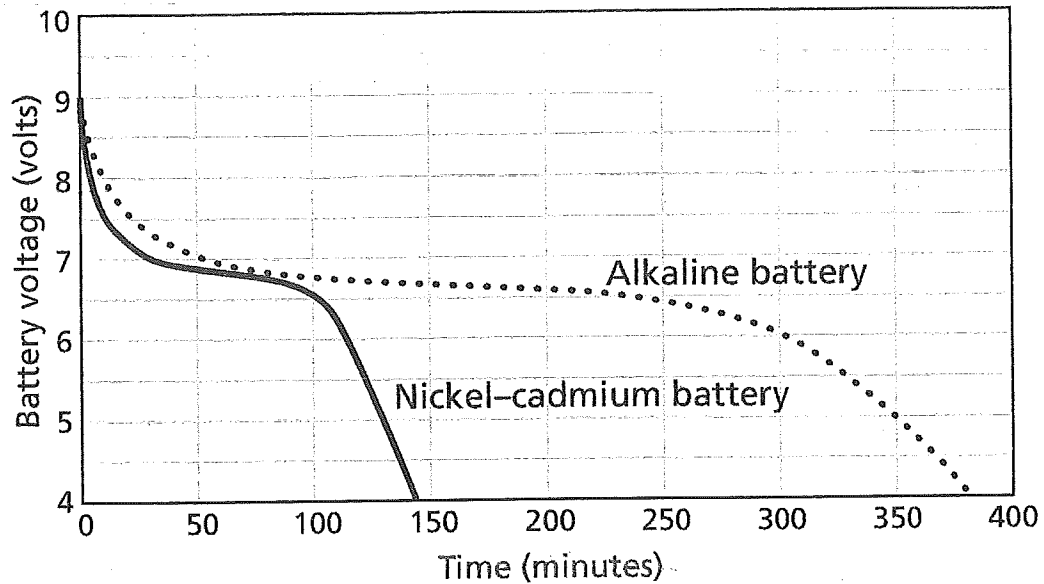
**Use the diagram below to answer the following questions.**



17. What is the function of the sacrificial anode?  
\_\_\_\_\_
  
18. Name one metal that is commonly used as a sacrificial anode.  
\_\_\_\_\_
  
19. Galvanizing the iron tank (or pipe) would serve the same function as a sacrificial anode. What is galvanizing?  
\_\_\_\_\_
  
20. In what two ways does galvanizing protect iron?  
\_\_\_\_\_  
\_\_\_\_\_

# Comparing the Performance of Batteries

Use with Chapter 20,  
Section 20.2



The transparency shows how the voltage of two batteries changes when they are used to power the same kind of electrical device.

1. What is the starting voltage of each battery?  
\_\_\_\_\_
2. What is the remaining voltage of each battery after 100 minutes?  
\_\_\_\_\_
3. If the device requires a voltage of at least 6 V to work properly, how long will it work with each battery?  
\_\_\_\_\_  
\_\_\_\_\_
4. How many of each battery would you need to keep the device working for 5 days if you replaced each battery when its voltage dropped to 6 V?  
\_\_\_\_\_  
\_\_\_\_\_
5. Alkaline batteries are not rechargeable. Suppose each alkaline battery costs \$1.25. How much would it cost to run the device for 5 days with alkaline batteries if you replaced each worn-out battery with a new one?  
\_\_\_\_\_
6. Nickel-cadmium batteries are rechargeable. Suppose each nickel-cadmium battery costs \$10.00, and a battery charger costs \$20.00. How much would it cost to run the device for 5 days with nickel-cadmium batteries if you recharged them? (Assume you use two nickel-cadmium batteries, and that one battery can be fully recharged while the other keeps the device running. Include the cost of the charger, but ignore the cost of electricity to recharge the batteries.)  
\_\_\_\_\_
7. How long would you have to run the device before the cost of replacing alkaline batteries exceeded the cost of two nickel-cadmium batteries and a charger?  
\_\_\_\_\_