

23.1

ELECTROCHEMICAL CELLS

SECTION REVIEW

Objectives

- Describe how redox reactions interconvert electrical energy and chemical energy
- Explain the structure of a dry cell and identify the substances that are oxidized and reduced

Key Terms

- electrochemical process
- half-cell
- cathode
- salt bridge
- electrochemical cell
- electrode
- battery
- dry cell
- voltaic cells
- anode
- fuel cells

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

Chemical processes can release or absorb energy. Any conversion between chemical energy and electrical is known as an 1. These processes always involve spontaneous redox reactions in which a transfer of 2 occur. Electrochemical cells that generate electrical energy are known as 3.

The half-reactions associated with redox reactions take place in half-cells. The half-cells are separated by a porous plate or 4. This barrier prevents the contents of the two half-cells from mixing, but permits the passage of 5 between the half-cells. Electrons are transferred through an external circuit from the 6, the electrode where oxidation occurs, to the 7, the electrode where reduction occurs.

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- _____ 8. Nickel is below mercury in the activity series of metals.
- _____ 9. The reduction half-reaction in a voltaic cell occurs at the cathode.
- _____ 10. In a flashlight battery, the anode is the graphite rod.
- _____ 11. A salt bridge is part of a voltaic cell.

Part C Matching

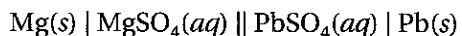
Match each description in Column B to the correct term in Column A.

- | Column A | Column B |
|--------------------------------|--|
| _____ 12. dry cell | a. the electrode at which oxidation occurs |
| _____ 13. voltaic cells | b. a group of voltaic cells that are connected together |
| _____ 14. cathode | c. a voltaic cell in which a fuel substance undergoes oxidation to produce electrical energy |
| _____ 15. battery | d. the electrode at which reduction occurs |
| _____ 16. fuel cell | e. any device that converts chemical energy into electrical energy or electrical energy into chemical energy |
| _____ 17. electrochemical cell | f. electrochemical cells used to convert chemical energy into electrical energy |
| _____ 18. anode | g. a commercial voltaic cell in which the electrolyte is a moist paste |

Part D Questions and Problems

Answer the following in the space provided.

19. Describe the voltaic cell represented as:



Sketch a diagram of the cell similar to the one shown in Figure 23.3 of your textbook. Label the cathode and anode, and indicate the direction of electron flow.