

21.3

ELECTROLYTIC CELLS

Section Review

Objectives

- Distinguish between electrolytic and voltaic cells
- Describe the process of electrolysis of water
- Describe the process of electrolysis of brine
- Explain how electrolysis is used in metal processing

Vocabulary

- electrolysis
- electrolytic cell

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.

The process in which electrical energy is used to make a _____ 1. _____ nonspontaneous redox reaction go forward is called _____ 1 _____. The _____ 2. _____ apparatus in which this process is carried out is called an _____ 2 _____. In this type of cell, as in voltaic cells, _____ 3 _____ flow from the anode _____ 3. _____ to the cathode through an external circuit. In an electrolytic cell, _____ 4. _____ electrons are driven by an outside power source such as a _____ 4 _____. _____ 5. _____ In the electrolysis of water, a small amount of _____ 5 _____ must _____ 6. _____ be added to enable the water to conduct electricity. The products _____ 7. _____ of the electrolysis of water are _____ 6 _____ and _____ 7 _____. During the _____ 8. _____ electrolysis of brine, chloride ions are oxidized to produce chlorine gas at the anode, and water is reduced to produce _____ 8 _____ at the cathode.

Part B True-False

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

- _____ 9. During the electrolysis of brine, sodium metal is produced at the cathode.
- _____ 10. An electrolytic cell drives a nonspontaneous reaction to completion.
- _____ 11. When a current is applied via two electrodes in water, oxygen and hydrogen are produced.
- _____ 12. An object that is to be electroplated needs to be the cathode of the electrolytic cell.

Part C Matching

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

Column A	Column B
_____ 13. electrolysis	a. an electrolytic method for obtaining ultrapure metals
_____ 14. electrolytic cell	b. the process in which electrical energy is used to make a nonspontaneous reaction go forward
_____ 15. brine	c. the deposition of a thin layer of metal on an object in an electrolytic cell
_____ 16. electroplating	d. an electrochemical cell used to cause a chemical change through the application of electrical energy
_____ 17. electrorefining	e. a concentrated solution of sodium chloride

Part D Questions and Problems

Answer the following in the space provided.

18. Distinguish between electrolytic and voltaic cells and list some applications of each.

19. Sketch an electrolytic cell that could be used to silverplate a teaspoon. Label the anode, cathode, and the direction of electron flow. Write the anode and cathode reactions that occur.