CHAPTER 19 LEARNING OBJECTIVES

To satisfy the minimum requirements for this course, you should be able to:

Recognize a redox reaction and be able to:

- Write the oxidation and reduction half reactions
- Balance the reaction by the half-reaction method
- Identify the oxidizing agent and reducing agent
- Assign oxidation numbers to atoms in molecules and ions

Understand the functions of the various components of simple voltaic and electrolytic cells and:

- Diagram cells, labeling the anode, cathode, directions of ion and electron movement, and the signs of the electrodes.

Understand the definitions of and relationships among the important quantities: electrical work, electrical charge, electrical current, and electrical potential ("emf", potential energy difference) and

- Recognize the correspondence between the standard reduction potentials and the activity series.
- Given appropriate electrode potentials, calculate the cell voltage (standard cell potential, E^{o}_{cell}) generated by a voltaic cell.
- Determine the relative strengths of oxidizing or reducing agents given appropriate electrode potentials.
- Use standard electrode potentials to predict whether a given reaction will be spontaneous.
- Interconvert E^{o}_{cell}, ΔG^{o}, and K for oxidation-reduction reactions.

Use the Nernst equation to calculate the cell potential under nonstandard conditions, or to calculate the concentration of an ion, given E_{cell}, E^{o}_{cell}, and the concentrations of the remaining ions.

Discuss how a spontaneous redox reaction can be used to create a battery and

- Recognize the connection between the components of the cell and the properties of the battery.
- Describe the lead-acid storage battery, the dry cell, the nickel-cadmium or nickel-metal hydride cell, and the lithium ion battery.
- Describe the basic components and processes in fuel cells.

Discuss the difference between galvanic and electrolytic cells and

- Given appropriate electrode potentials, predict the likely electrolysis reactions in aqueous solutions, and calculate the minimum potential required to cause electrolysis in aqueous solutions.
- Interrelate time, current, and the amount of substance produced/consumed in an electrolysis reaction; given two of the three quantities, you should be able to calculate the third.

Describe corrosion in terms of the electrochemistry involved, and explain the principles that underlie cathodic protection. Describe methods for minimizing corrosion, particularly for Naval vessels.

To learn the material in this chapter, you should:

- Review the "In Closing" and "Key Terms" sections of Chapter 19.

- Do the following:
  Exercises: 19.1, 19.5, 19.6, 19.9, 19.13, 19.15, 19.17
  Problem Solving Practice: 19.1, 19.2, 19.3, 19.4, 19.5, 19.6, 19.8, 19.9, 19.10, 19.13

- Test your knowledge by completing the assigned OWL modules.