

## SC151 - CHAPTER 11 LEARNING OBJECTIVES

**To satisfy the minimum requirements for this course, you should master the following learning objectives.**

Recognize a redox reaction and be able to:

- assign oxidation numbers to atoms in molecules and ions.
- write the oxidation and reduction half reactions.
- identify the oxidizing agent and reducing agent.

Describe the functions of the various components of simple galvanic (voltaic) and electrolytic cells.

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

Recognize the use of the standard hydrogen electrode as a standard in the development of the table of standard reduction potentials.

Given appropriate reduction potentials,

- calculate the cell voltage (standard cell potential,  $E^{\circ}_{\text{cell}}$ ) generated by a galvanic cell.
- determine the relative strengths of oxidizing or reducing agents.
- predict whether a given reaction will be spontaneous or nonspontaneous.

Define and describe the relationships among these important quantities: electrical work, electrical charge, electrical current, and electrical potential (“emf”, potential energy difference), free energy.

Interconvert  $E^{\circ}_{\text{cell}}$ ,  $\Delta G^{\circ}$ , and  $K$  for oxidation-reduction reactions.

Use the Nernst equation to calculate the cell potential or the concentration of an ion, under nonstandard conditions.

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.

Describe corrosion in terms of the electrochemistry involved, and explain the principles that underlie cathodic protection.

Describe methods for minimizing corrosion for Naval vessels.