

## Chemical Bonding, Electrochemistry, and Environmental Problems

Study Guide: Chapters 14, 15, 17, 18, 24 *Conceptual Physical Science*, 4<sup>th</sup> edition

**Objectives:** Lack of class time may prevent the completion of all objectives. If you finished this entire unit you should be able to:

### Periodic Table, Bonding, and Reactions

Chapter 14 pp. 337-348; Chapter 15 pp. 356-365, Chapter 17 pp. 412-414

- Predict relative sizes of atoms and ions.
- Explain why elements lose or gain electrons in bonding and how many
- Explain the ideas of simple ionic and covalent bonding.
- List general properties of compounds that are bonded ionically and covalently.
- Draw pictures of atom arrangements in simple solids that are ionically and covalently bonded.
- Understand and explain the concept of oxidation number (valence).
- Write simple formulas and name compounds for ionic compounds between metals and nonmetals as well as hydrates, covalently bonded compounds between nonmetals, and acids.
- List and use 4 clues for recognizing a chemical reaction.
- Classify and write simple equations for chemical changes - simple composition (synthesis), simple decomposition, single replacement (displacement), double replacement (displacement), hydrocarbon combustion. This includes balancing.
- Classify chemical changes (reactions) by energy.

### Electrolytes (Acids and Bases) and Batteries

Chapter 18 pp. 437-463

- Define an electrolyte. Explain the reasons for attempting to classify substances as acids, bases, and salts. Explain the models of acid/base behavior from the viewpoint of Arrhenius and Bronsted-Lowry.
- Define the hydronium ion. Define pH and relative values for acids, bases and salts. Be able to calculate the pH if the hydronium ion or hydroxide ion concentration is known and vice versa.
- Define and explain the operation of a buffer solution.
- Define the processes of oxidation and reduction. Identify an oxidation/reduction reaction. Identify oxidizing and reducing agents.
- Give practical examples of oxidation/reduction reactions.
- Explain the parts of a voltaic cell (battery). Identify anode and cathode and write half-cell reactions and polarity of each electrode.

### Environmental Problems

Chapter 18 pp. 448-451, Chapter 24 pp. 645-648

- Explain why natural rainwater is acid and how water can become resistant to a change in pH.
- Explain what we mean by "hard water".
- Explain how ozone protects us in the stratosphere and how CFC's are destroying it.
- Explain what the "Greenhouse Effect" is and how this is related to global warming.
- List the major greenhouse gases.

## Activities and Assignments

- Lecture
- Worksheets on naming compounds and predicting products of reactions
- "Chemical Reactions" Lab
- "Keep your "ion" the reaction" Lab
- "Acid Rain and the Buffering Capacity of Water" Lab
- "Hard Water" Lab
- Global Environmental Problems web activity