8: Basic Concepts of Chemical Bonding

OVERVIEW OF THE CHAPTER

8.1 Lewis Symbols: Octet Rule

Review: Concept of outermost electron shell (6.7, 6.8, 6.9); electron configurations (6.8).

Learning Goals: You should be able to:

1. Determine the number of valence electrons for an atom and write its Lewis symbol.
2. State the octet rule and how it is applied to the valence shell of atoms in a molecule.

8.2 Ionic Bonding: Lattice Energy

Review: Atomic radii (7.3); electron configurations (6.8, 6.9); ions (2.7); periodic table (2.5, 6.9).

Learning Goals: You should be able to:

1. Explain the factors that affect the value of lattice energy for a solid ionic substance.
2. Write the valence electron configurations for metal ions, including transition elements, and anions.

8.3 The Lewis Model for Covalent Bonding

Learning Goals: You should be able to:

1. Describe the basis of the Lewis theory for describing bonding between atoms in a molecular substance.
2. Describe a covalent bond.
3. Be able to look at a Lewis structure and determine if it properly fits the Lewis model.
4. Describe single, double, and triple covalent bonds and their relative bond lengths.

8.4 Bond Polarity and Electronegativity

Review: Oxidation numbers (2.8)

Learning Goals: You should be able to:

1. Explain the significance of electronegativity and in a general way relate the electronegativity of an element of its position in the periodic table.
2. Predict the relative polarities of bonds using either the periodic table or electronegativity values.

8.5, 8.6 Drawing Lewis Structures

Review: Electron configurations (6.8); periodic table (2.5, 6.9).

Learning Goals: You should be able to:

1. Using the periodic table, write the Lewis structures for molecules and ions containing covalent bonds.
2. Write resonance forms for molecules or polyatomic ions that are not adequately described by a single Lewis structure.

8.7 Exceptions to the Octet Rule

Learning Goals: You should be able to write the Lewis structures for molecules and ions containing covalent bonds that have an odd number of electrons, a deficiency of electrons, or an expanded octet.

8.8 Strengths of Covalent Bonds

Review: Energy changes in chemical reactions (5.2, 5.4) enthalpy (5.3, 5.4); Hess's law (5.6).

Learning Goals: You should be able to relate bond enthalpies to bond strengths and use bond enthalpies to estimate **Δ** H for reactions.