

**CHM 111**  
**Chapter 8 study guide / learning objectives**

Chapter 8 in the OpenStax text discusses theories of covalent bonding. We will not cover molecular orbital theory in this course (section 8.4), but if you are planning to continue your study of chemistry by taking an organic chemistry course, you should read up on molecular orbital theory.

This chapter covers how the valence bond theory explains both the shape of molecules and the nature of double and triple covalent bonds.

**At the end of chapter 8, you should be able to:**

*[Definitions / Terminology]*

- Define terms related to valence bond theory: **orbital, hybrid orbital, sigma (  $\sigma$  ) bond, pi (  $\pi$  ) bond, bond energy, isomer.**

*[Valence bond theory]*

- Describe **how a bond is formed** in valence bond theory (half-full orbitals overlap and electrons are shared).
- **Draw** an orbital diagram showing the valence orbitals (and hybrid orbitals) of a bonded atom in a simple molecule.
- Given a molecule, **describe what type of bonds** (sigma, pi) are present and what type of orbitals (s, p,  $sp^3$  hybrids, etc.) form those bonds. To do this, you will need to be able to draw the Lewis structure and find the shape of the molecule.
- Describe how pi bonds fix the structure of molecules and cause compounds like  $C_2H_2Cl_2$  to have multiple isomers with different physical and chemical properties.

*[Practice exercises from the OpenStax text]*

- 1, 5, 7, 9, 11, 21, 23