

After this chapter, you should be able to...

- Explain what valence electrons are
 - Determine the number of valence electrons an atom has
 - Write a Lewis dot-symbol for any main-group atom
 - Recall the number of bonds that atoms of C, H, N, O, and the halogens form in most organic compounds
- Define the term: covalent bond
- Write equations for covalent bond formation between two atoms using Lewis structures
 - Identify lone-pairs and bonding-pairs of electrons in a Lewis structure
 - Explain what is meant by the Octet and Duet rules
- Explain the difference between a single, double, and triple bond in terms of numbers of electrons shared
 - Describe the relationship between bond strength, bond length, and the type of covalent bond formed (single/double/triple)
- Define the term: electronegativity
 - Explain what happens when two atoms of form a covalent bond by examining the atoms' electronegativities
 - Explain the difference between a pure/non-polar covalent bond, a polar-covalent bond, and an ionic bond in terms of electronegativity differences
 - Describe and recognize how an atom's electronegativity is dictated by its position in the periodic table
- Write a valid Lewis structure given the formula of an ionic compound, molecule, or a polyatomic ion
 - Explain why resonance gives a better description of the bonding in certain molecules
- Calculate the formal charge and/or the oxidation number of each atom in a Lewis structure
 - Use formal charges to decide between a set of valid Lewis structures
- Recognize the general classes of exceptions to the Octet rule
 - Electron deficient (boron and beryllium compounds)
 - Odd-electron molecules (free radicals)

- Expanded octet
 - Explain why atoms in the 3rd period and beyond can form an expanded octet, but 2nd period atoms can not
- Define what is meant by "Bond Energy"
 - Recognize that bond-breaking is an endothermic (+) process, and bond-forming is an exothermic (–) process
 - Given a chemical reaction, estimate ΔH° using bond energies.
 - Calculate ΔH° using standard enthalpies of formation, and compare to the values obtained from Bond-Energy calculations
- Make sure you can answer all the assigned homework problems!