Lewis Structures and Formal Charges - Study Guide

*sections 7.3 and 7.4 in OpenStax*

**Lewis Structures of Atoms (sections 7.3)**

Fill in the following chart with the Lewis symbol of each element. Carbon is done for you.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Group | IA | IIA | IIIA | IVA | VA | VIA | VIIA | VIIIA |
| Element | Li | Be | B | C | N | O | F | Ne |
| # of  valence  electrons |  |  |  | 4 |  |  |  |  |
| Lewis Dot Structure |  |  |  | **.**  **.C.**  **.** |  |  |  |  |

**Drawing Lewis structures for Molecules and Polyatomic Ions (section 7.3)**

**Rules:**

1. Find the sum of valence electrons of ALL atoms in the polyatomic ion or molecule.
2. If it is an anion, add one electron for each negative charge
3. If it is a cation, subtract one electron for each positive charge.
4. Choose a central atom. The central atom is the LEAST electronegative element that isn’t hydrogen. Connect the outer atoms to the central atom using single bonds.
5. Fill the octets of the outer atoms. Almost all atoms want to have 8 valence electrons (there are exceptions). Hydrogen wants to have 2 valence electrons.
6. Fill the octet of the central atom. Atoms in the second period CANNOT have more than 8 valence electrons. However, atoms past the second period CAN have more than 8 valence electrons. These atoms are said to have an *expanded octet.*
7. Add double or triple bonds if necessary.
8. Make sure you use ALL of the valence electrons (not more, not less)

How many valence electrons (total) are present in each of the following substances?

a) SCl2 b) HCN c) SO42-

***Watch video tutorial on*** [Drawing Lewis Dot Structures for Molecules](https://www.youtube.com/watch?v=Vio5mIzvYW8&feature=youtu.be)

**Formal Charges (section 7.4)**

*The formal charge on an atom = number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electrons –*

*[number of \_\_\_\_\_\_\_\_\_\_\_ electrons + ½ number of \_\_\_\_\_\_\_\_\_ electrons]*

***Watch video tutorial on*** [Assigning Formal Charges](https://www.youtube.com/watch?v=Xp3a6GJ8aUE&feature=youtu.be)

Give some reasons why knowing the formal charges on the atoms in a structure is useful.

Calculate the formal charge on each atom for CO.

**End of Chapter 7 Practice Problems**

#23, 29a-h, 51

For detailed solutions to these problems, go to the [OpenStax website](https://openstaxcollege.org/textbooks/chemistry/resources) and download the “Student Answer and Solution Guide.”