

DRAWING LEWIS STRUCTURES

Rules for Drawing Lewis Structures

1. The less electronegative element will usually be the central atom. The only exception to this rule is hydrogen. Hydrogen can never be a central atom because it can only accommodate two electrons. The reason it can only accommodate two electrons is because it is found in the first shell, which can have at most two electrons. Here are some examples with the central atom shown in bold print:



2. Surround the central atom with the remaining elements. Second shell elements, such as C,N,O, and F, must obey the octet rule. The octet rule states that an atom should be surrounded by eight electrons for stability. There are exceptions to the octet rule. As previously mentioned, H can only be surrounded by two electrons. From the third shell on, the central atom can expand its octet. For compounds with expanded octets, one finds the hybridization will involve s, p, and d orbitals. Where the octet rule is obeyed, only s and p orbitals are involved in the hybridization. It helps to have a feel for what is "normal" for common central atoms. Most often you will see H, C, O, N as central atoms, so I have come up with something I call the "HONC" Rule, shown below:

atom	# bonds	# e ⁻ pairs	“normal” bonding (formal charge = 0)
H	1	0	– H
O	2	2	– O – = O
N	3	1	– N – = N – ≡ N –
C	4	0	– C – = C – ≡ C – = C =

3. The group number of an element gives the number of electrons available for bonding (valence number of electrons). Only the outermost electrons are available for bonding.
4. If the compound is negatively charged, the magnitude of the charge gives the number of additional electrons available for bonding. If the compound has a positive charge, the magnitude of the charge gives the number of electrons that must be removed from the number of electrons available for bonding.
5. Do the electron dot formula first. Use different symbols for the electrons of different elements, so that you can keep track of which electrons have been used up. I often use ×, , or .
6. Use a little "logic" when surrounding the electrons around the atoms. For example, if chlorine is being attached to a central atom, then it only needs one more electron to complete its octet. If the central atom has an even number of valence electrons and an odd number of atoms are surrounding that atom, don't leave an unpaired electron on the central atom. A structure with an unpaired electron is very unstable. Think of an unpaired electron as being "lonely". Would you want to be lonely?
7. Once the electron dot structure is complete, translate this structure into a Lewis structure. Two electrons are shared between two atoms constitutes a single bond; four electrons shared is a double bond, and six electrons shared is a triple bond.