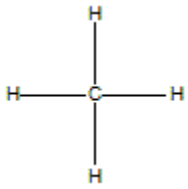
Lewis Dot Structures

1. Methane – CH_4

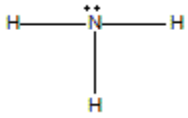
Number of Valence Electrons: 4 from C and 1 each from 4 H = 8

Carbon is more electronegative than hydrogen, but hydrogen can never be the "central" atom, as it can only form 1 bond. Carbon always forms 4 bonds (2 electrons each).



2. Ammonia - NH_3

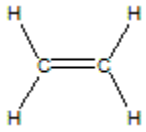
Number of Valence Electrons: 5 from N and 1 from each of the H = 8



The bonds account for 6 of the valence electrons, the 2 left over electrons are the lone pair of electrons on N.

3. Ethylene – C_2H_4

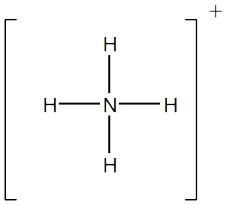
Number of valence electrons: 4 of each carbon (8 total) and 1 each from 4 H = 12



The single bonds account for 10 valence electrons. A double bond between the 2 carbon atoms is used to complete the octet rule for carbon and use all available valence electrons (12).

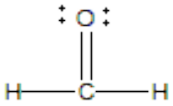
4. Ammonia ion - NH_4^+

Number of Valence Electrons: 5 from N and 1 from each of the H **less one from the +1 charge (1 lost electron)** = 8



5. Formaldehyde – CH_2O

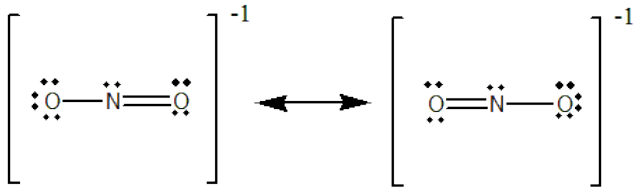
Number of Valence Electrons: 4 from C, 1 each from 2 H, 6 from O = 12



Carbon is central atom, as it is less electronegative than oxygen. The single bonds account for 6 valence electrons. Two additional valence electrons go into the second (double) bond between carbon and oxygen. The last 4 electrons go on the oxygen as 2 lone pairs. Both carbon and oxygen obey the octet rule in this structure.

6. Nitrite ion – NO_2^-

Number of Valence Electrons: 5 from N, 6 from each of the two oxygens (12 total), **1 additional electron from the -1 charge (gained electron)** = 18

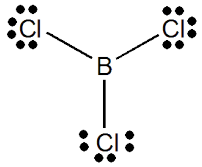


The number of valence electrons in the bonds is 6. One lone pair electrons on N (2 total); 2 lone pairs of electrons (4 total) on one O; 3 lone pairs of electrons (6 total) on the other O.

With one double bond to oxygen and one single bond to oxygen, this structure for nitrite ion exhibits **resonance**. The actual structure is an average of the 2 resonance structures. The bond length of the nitrogen-oxygen bonds is identical, indicating that the double bond character of both bonds is the same.

7. Boron trichloride – BCl_3

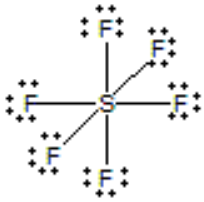
Number of Valence Electrons: 3 from B and 7 each Cl (21 total) = 24



This is an example of an exception to the octet rule. Boron likes to form 3 bonds. Similarly, Be likes to form only 2 bonds (BeF_2, $BeCl_2$).

8. Sulfur Hexafluoride – SF_6

Number of Valence Electrons: 6 from S and 7 each F (42 total) = 48



This is an example of an exception to the octet rule. Because S is in the 3rd row of the periodic table, it can form an expanded valence shell in order to create the required 6 bonds.