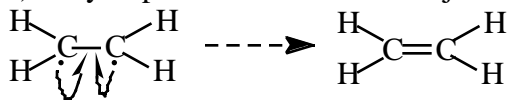


MAKING LEWIS FORMULAS (STRUCTURES)

1. Estimate the molecular structure:
 - a) The unique atom is often central.
 - b) Hydrogen is usually terminal (can bond only to one other atom).
 - c) Connect all atoms by at least one bond.
2. Add up all valence electrons (never make a mistake here).
 - a) If the molecule has a net positive or negative charge, adjust accordingly by subtracting or adding electrons.
3. Subtract the number of valence electrons used in bonds from the total number of valence electrons. The remaining number of electrons are distributed according to the octet rule. (Hydrogen is an exception, of course, as might be Li, Be, and B.) Realize that electrons do not belong to any element; they can go where needed. Use multiple bonds (double or triple bonds) if necessary, that is, if you do not have enough electrons, share them by making multiple bonds .
 - a) Any unpaired electrons can be joined to form multiple bonds as

 - b) Prefer to distribute electrons onto more electronegative atoms over less electronegative atoms.
4. For the major contributing form, prefer a form with the lowest formal charges on its atoms (the minimum charge separation). In the formula below, for Groups from 13-18, use 3-8)
$$\text{FC} = \text{Grp \#} - \left[\underbrace{1/2(\text{shared e's})}_{\text{sticks}} + \underbrace{\text{unshared e-s}}_{\text{dots}} \right]$$
5. The formal charge of the ion or molecule is the sum of the formal charges of all of the atoms.
6. The octet rule takes precedence over choosing the lowest formal charge guideline, *i.e.*, do not prefer a lower formal charge atom if the atom must become electron deficient to do so. Disregard this guideline if dealing with an element which is often electron deficient , as Li, Be, or B.
7. For the major contributing form, if you have a choice, put the negative charge on the most electronegative element and the positive charge on the least electronegative element.
8. If an atom has N valence electrons, it often forms 8-N covalent bonds. Elements found in groups 4 to 7 (Don't call them Grps 14 -17 to use this "rule") are most likely to obey this "8-N rule." Therefore, generally: halogens have 1 bond, O has 2 bonds, N has 3 bonds, C has 4 bonds. The "8-N rule" won't work when a coordinate covalent (donor-acceptor) bond exists.