DRAWING DOT STRUCTURES FOR SIMPLE MOLECULES

1. Count valence electrons

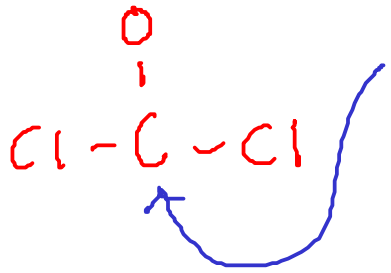
2. Pick central atom and draw skeletal structure
   - central atom is usually the one that needs to gain the most electrons!
   - skeletal structure has all atoms connected to center with single bonds

3. Distribute remaining valence electrons around structure, outer atoms first. Follow octet rule until you run out of electrons.

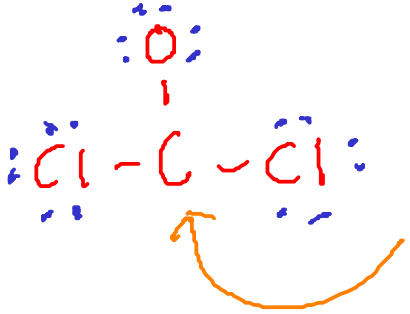
4. Check octet rule - each atom should have a share in 8 electrons (H gets 2). if not, make double or triple bonds.

$COCl_2$

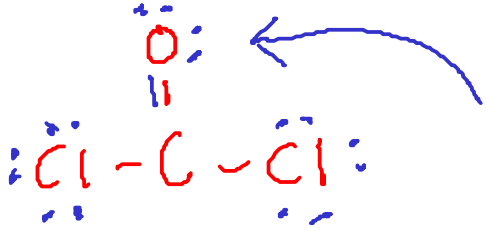
C : 1 × 4
O : 1 × 6
Cl : 2 × 7 = 14
24 electrons



We pick CARBON as the central atom (because it needs four more electrons - more than either chlorine or oxygen) and attach the other atoms to the carbon atom using single bonds.



But the carbon in the middle has a share in only SIX electrons!



Where do we out the double bond? The OXYGEN atom needs to get TWO more electrons initially. The more electrons an atom needs, the more likely an atom is to form more bonds! So we pick oxygen for the double bond instead of chlorine.

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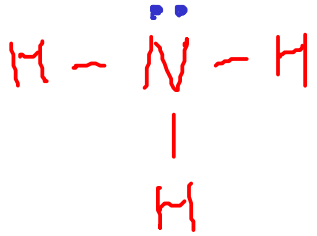
NH_3

N: 5
H: 3 × 1 = 3
8



We must put the remaining pair of electrons on NITROGEN, since hydrogen atoms are "full" when they have TWO electrons,

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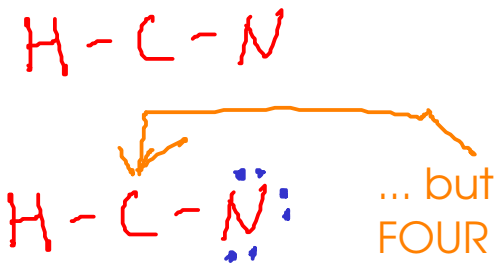
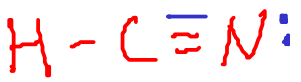
HCN

H: 1
C: 4
N: 5
10 electrons



... but CARBON has a share in only FOUR electrons!

... now carbon has a share in SIX electrons



With a TRIPLE BOND between nitrogen and carbon, carbon finally has a share in eight valence electrons!

A DOT STRUCTURE FOR A LARGER MOLECULE

1. Count valence electrons

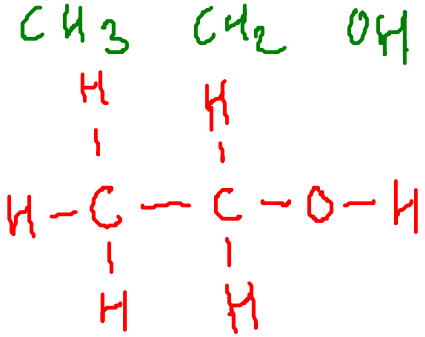
2. Pick central atom and draw skeletal structure
   - central atom is usually the one that needs to gain the most electrons!
   - skeletal structure has all atoms connected to center with single bonds

3. Distribute remaining valence electrons around structure, outer atoms first. Follow octet rule until you run out of electrons.

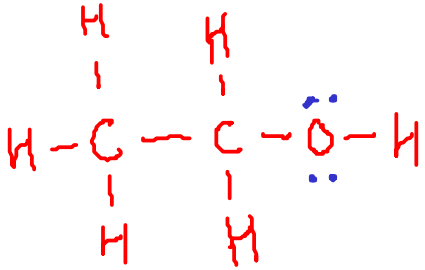
4. Check octet rule - each atom should have a share in 8 electrons (H gets 2). if not, make double or triple bonds.

CH_3CH_2OH ← ETHANOL

This molecule has THREE centers!



C 2 x 4 = 8
H 6 x 1 = 6
O 6 = 6
20 electrons



The remaining electrons go onto the OXYGEN atom, since the hydrogen and carbon atoms already have enough electrons.

WATER

The ALCOHOLS (like ethanol, methanol, and isopropanol) are similar in structure to water.

Small-molecule alcohols all dissolve very well in water due to this similarity!

A DOT STRUCTURE FOR A POLYATOMIC ION

1. Count valence electrons

2. Pick central atom and draw skeletal structure
   - central atom is usually the one that needs to gain the most electrons!
   - skeletal structure has all atoms connected to center with single bonds

3. Distribute remaining valence electrons around structure, outer atoms first. Follow octet rule until you run out of electrons.

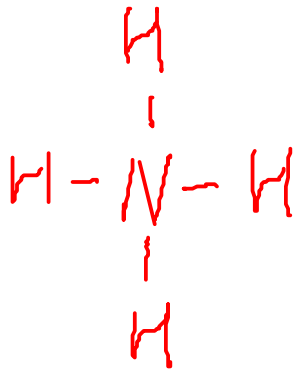
4. Check octet rule - each atom should have a share in 8 electrons (H gets 2). if not, make double or triple bonds.

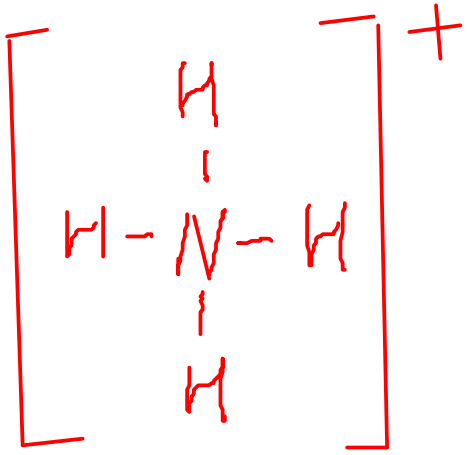
NH_4^+

N: 5
H: 1 x 4
9
−1
8

An ODD nyumber of electrons?

Subtract one elecron since this ion has a charge of +1





We draw brackets around the structure of polyatomic ions, then indicate the charge of the ion in the upper right (just like we do with other ions)