(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.

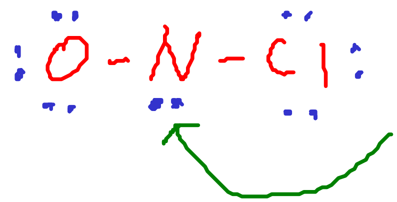
(4) Check octet rule - each atom should have a share in 8 electrons (H gets 2). if not, make double or triple bonds.

NOCl

N : 1 x 5
O : 1 x 6
Cl : 1 x 7
———
18 e^-

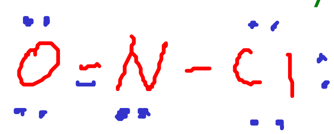
O - N - Cl

Pick NITROGEN as central atom since it needs 3 more electrons (more than O or Cl)



We ran out of space on the outer atoms and still had a pair of electrons left. They were put on the central nitrogen.

Even with the pair of electrons we put on N, the atom still has a share in only six valence electrons.



As in the last example, we'll take a lone pair from oxygen and make it into a bonding pair. The double bond then gives nitrogen a share in eight valence electrons.

(Why O? Same reason as last time - it needed two more electrons and is likely to share two of its own electrons to get the additional two electrons. Cl only needed one.)

(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

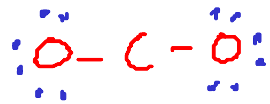
(3) Distribute remaining valence electrons around structure, outer atoms first. Follow octet rule until you run out of electrons.

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

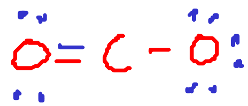
CO_2

C: 1 x 4
O: 2 x 6
16 e^-

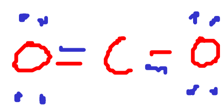
Pick C as central atom ...



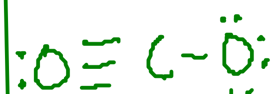
Carbon has a share in only FOUR valence electrons. Fix with double bond?



... now carbon has a share in SIX



A second double bond with the other oxygen atom gives carbon a share in eight valence electrons.



What's wrong with this structure? The two oxygen atoms are in the same environment and should bond the same way!

The triple bond/single bond structure suggests that there are two different bond lengths (bond distances) in carbon dioxide. X-ray diffraction experiments, on the other hand, show only one bond length in carbon dioxide.

So, the triple bond/single bond structure is incorrect.

(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.

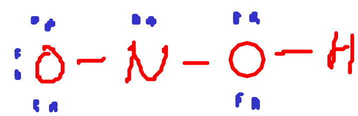
HNO_2 "nitrous acid"

In oxyacids, the acidic hydrogen atoms are attached to OXYGEN atoms in the structure!

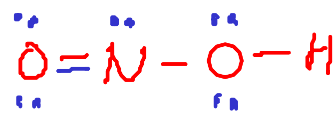
H: 1 x 1
N: 1 x 5
O: 2 x 6

18 e^-

Since this is an OXYACID, we must attach at least one H atom directly to an O atom.



We ran out of electrons after putting a lone pair onto the NITROGEN. But that nitrogen has a share in only six valence electrons!



... make a double bond!

Unlike the last example, the two oxygen atoms are in DIFFERENT environments (one bonds to only N, the other to both N and H), so we don't expect the bonding to be identical in this case.

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

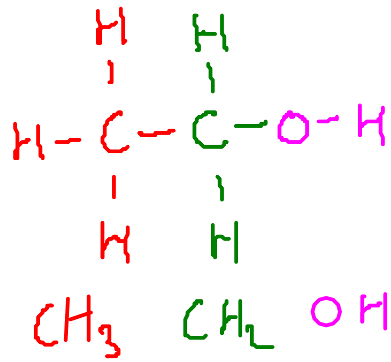
(3) Distribute remaining valence electrons around structure, outer atoms first. Follow octet rule until you run out of electrons.

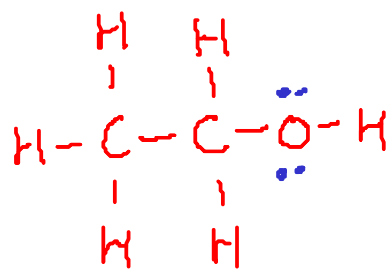
(4) Check octet rule - each atom should have a share in 8 electrons (H gets 2). if not, make double or triple bonds.

CH_3CH_2OH ETHANOL!

C : 4 x 2 = 8
H : 1 x 6 = 6
O : 6 x 1 = 6
| 20

This formula gives us a hint to the structure of ethanol. Ethanol has THREE central atoms chained together.





Now distribute the remaining four electrons ... They'll have to go onto oxygen since no other atom has any more "space".

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^+

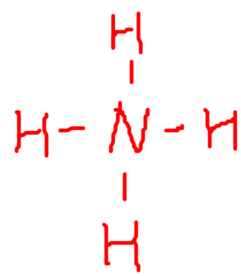
N: 1 x 5

H: 4 x 1

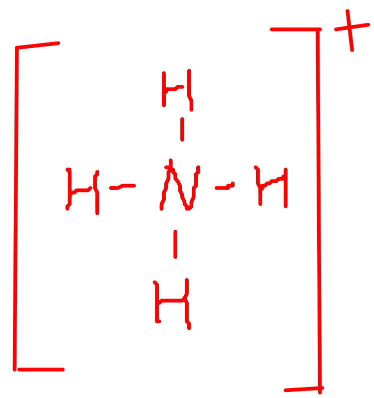
$9e^-$

$-1e^-$ (charge of +1 ... means 1 electron lost)

$8e^-$



After adjusting the electron count to account for the +1 charge, we use NITROGEN as our central atom and draw the skeletal structure ...



To indicate charge, draw brackets around the structure, then put the charge in the upper right corner (same place as we always indicate charge)