DRAWING DOT STRUCTURES FOR SIMPLE MOLECULES

$COCl_2$

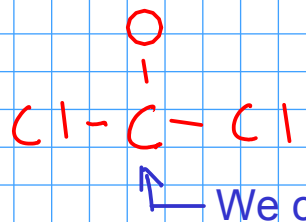
C : 4
O : 6
Cl : 2 × 7 = 14
24 electrons

1. Count valence electrons

2. Pick central atom and draw skeletal structure

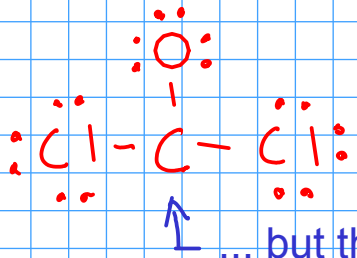
   - central atom is usually the one that needs to gain the most electrons!

   - skeletal structure has all atoms connected to center with single bonds



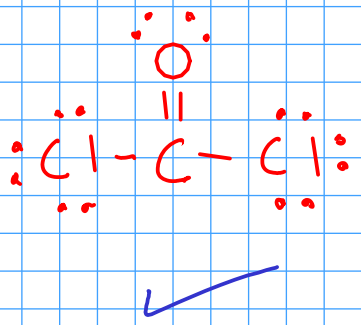
We chose carbon as the center because it needs to gain four electrons, more than either oxygen or chlorine!

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



... but the central carbon atom only has a share in SIX electrons.

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



Where to put the double bond? OXYGEN needed to gain TWO more electrons, so it's more likely to share two electrons than chlorine (which only needs one).

1) Count valence electrons

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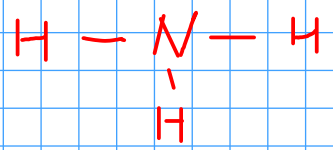
4) Check octet rule - each atom should have a share in 8 electrons (H gets 2). if not, make double or triple bonds.

NH_3

N: 5

H: $3 \times 1 = 3$

8



We put the remaining electrons onto the nitrogen atom since all the hydrogen atoms are already "full" (they can hold only two electrons since the first shell has no "p" subshell!)

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

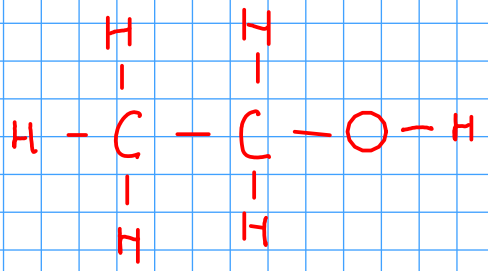
3. Distribute remaining valence electrons around structure, outer atoms first. Follow octet rule until you run out of electrons.

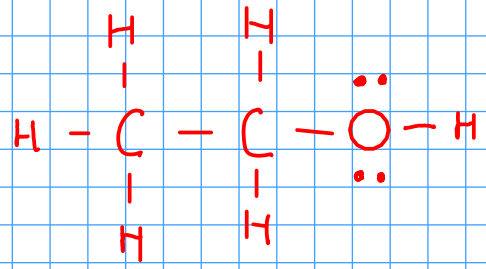
4. Check octet rule - each atom should have a share in 8 electrons (H gets 2). if not, make double or triple bonds.

CH_3CH_2OH ← ETHANOL

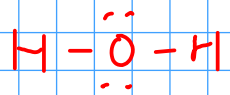
This molecule has THREE centers!

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





Remaining electrons go onto the OXYGEN atom, since there's nowhere else for them to go!



The ALCOHOLS (like ethanol, methanol, isopropanol) are similar in structure to WATER. They all mix very well with water in part because of this similarity.

A DOT STRUCTURE FOR A POLYATOMIC ION

NH_4^+

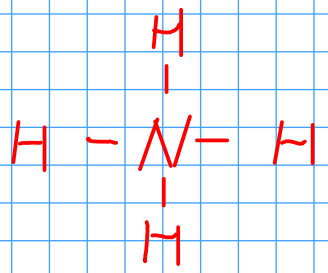
1. Count valence electrons

N : 5
H : 4 x 1
9
−1
8 electrons

To get a +1 charge, the ammonium ion must have lost one of its valence electrons. So we subtract one from the total.

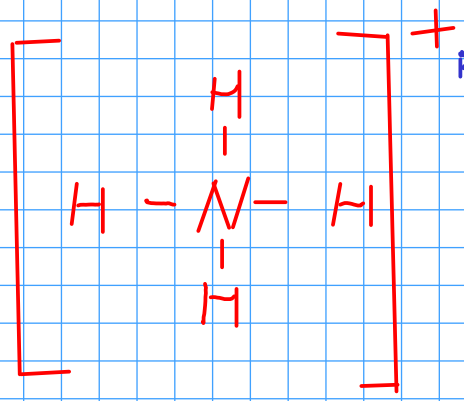
2. Pick central atom and draw skeletal structure

   - 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.



We typically draw brackets around CHARGED molecules so we can easily indicate the CHARGE