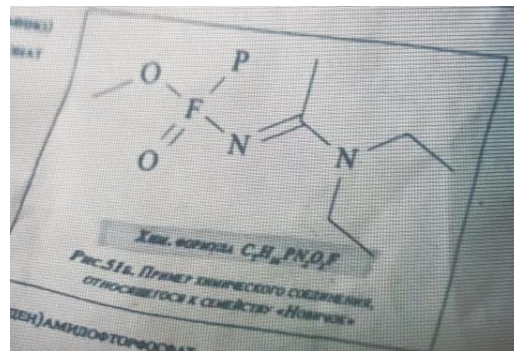
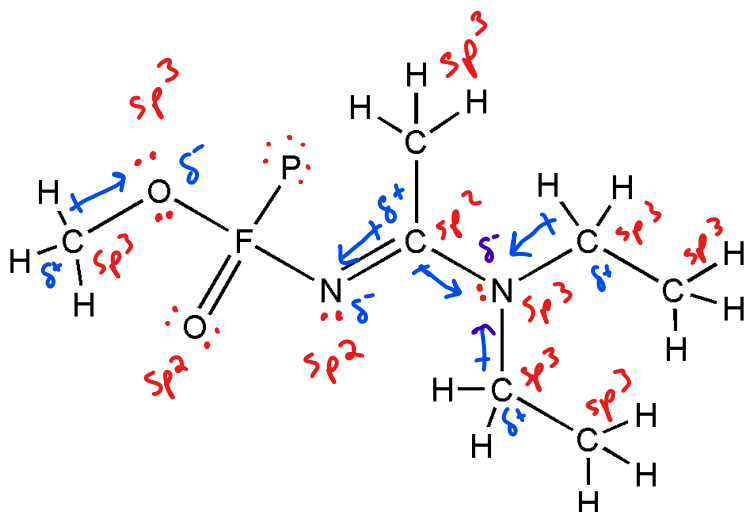




1. Assuming all N and O atoms are neutral (Formal Charge = 0), and that P has an octet, add lone pairs to the structure.
2. Label the hybridization of each N, C, and O.
3. Indicate the direction of any polar bonds involving Carbon using arrows, and label partial charges on the structure as appropriate.
4. Do any C's or H's have nonzero formal charge? If so, what are they?

no. All are zero.

5. Find the formal charges of F and P, and the overall charge of this molecule.

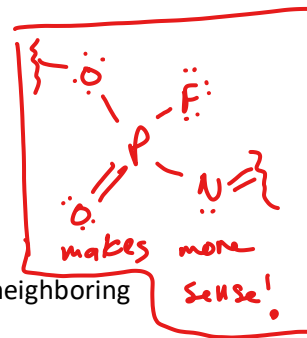
$$F: 7 - 0 - 5 = +2$$

$$P: 5 - 6 - 1 = -2$$

Overall charge would be zero.

6. Does this seem like a reasonable structure? Why or why not?

No. F goes beyond an octet, and multiple atoms have formal charges beyond +1 or -1.



7. What is the strongest intermolecular force present in this substance (as in, between neighboring identical molecules)?

dipole - dipole

8. Can this molecule H-bond with itself (as in, a neighboring identical molecule)?

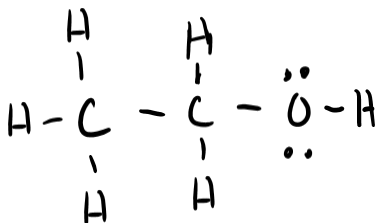
no. Has no D-H donor.

9. Could this molecule H-bond with CH<sub>3</sub>CH<sub>2</sub>OH? (see next page for full Lewis Structure of ethanol)

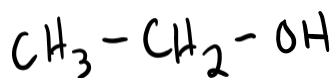
Yes. The O & N atoms w/ lone pairs are H-bond acceptors.

**Bond-line structures:** (see Ch 1.6 and 2.2 in textbook)

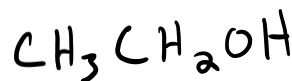
Full Lewis Structures are tedious to draw for every molecule! Organic chemists use a shorthand notation that appears in next week's lab handout. Below are several different ways to draw ethanol ("alcohol").



Lewis Structure



Partially Condensed Structure



Condensed Structure

**Bond-Line structure**

10. In the bond-line structure, how are carbons represented?

corners or endpoints of lines.

11. In the bond line structure, which atoms are not shown whatsoever?

H's that are attached to carbons only.

Which atoms are still labeled explicitly?

Non-carbon atoms ("heteroatoms")

+ H's attached to them.

12. What else is not shown in the bond-line structure?

Lone pairs!

13. For each molecule below, if a bond-line structure is given, add lone pairs directly to the bond-line structure first, then draw the full Lewis Structure.

**Note** – bond-line structures always have nonzero formal charges labeled. You can assume all atoms have zero formal charge unless otherwise shown. This means you can assume that Carbon will always have a total of 4 bonds (for figuring out # of H's attached), and N, O and X will have their "usual number" of bonds + lone pairs (unless they have nonzero formal charge).

If the Lewis Structure is given, draw the bond-line structure.

