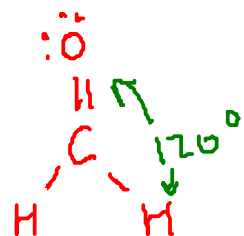
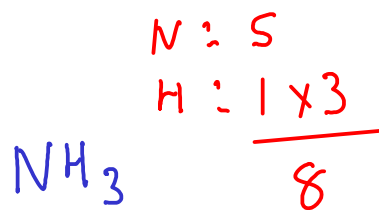


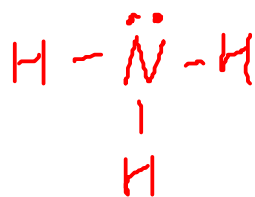
Shape? This molecule is TRIGONAL PLANAR. There are THREE THINGS around the central carbon: =O, -H, and -H



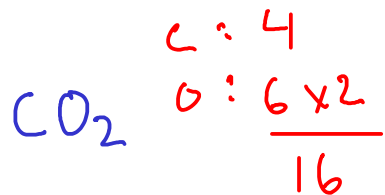
Polar? C-H bonds are nonpolar, but C=O bonds ARE polar. Electrons are pulled towards the oxygen and away from the other side of the molecule. This pull is not 'canceled' by the opposing hydrogen atoms (which are much less electronegative than oxygen), so the molecule is POLAR!



Shape? This molecule is PYRAMIDAL. There are four things around the central nitrogen atom, but only three of them are atoms. We have tetrahedral bond angles (109.5), and we describe the shape as pyramidal.



Polar? N-H bonds should be polar. The nitrogen at the "top" of the pyramid will draw electrons towards itself (and away from the hydrogen atoms at the "bottom") - making this a POLAR molecule



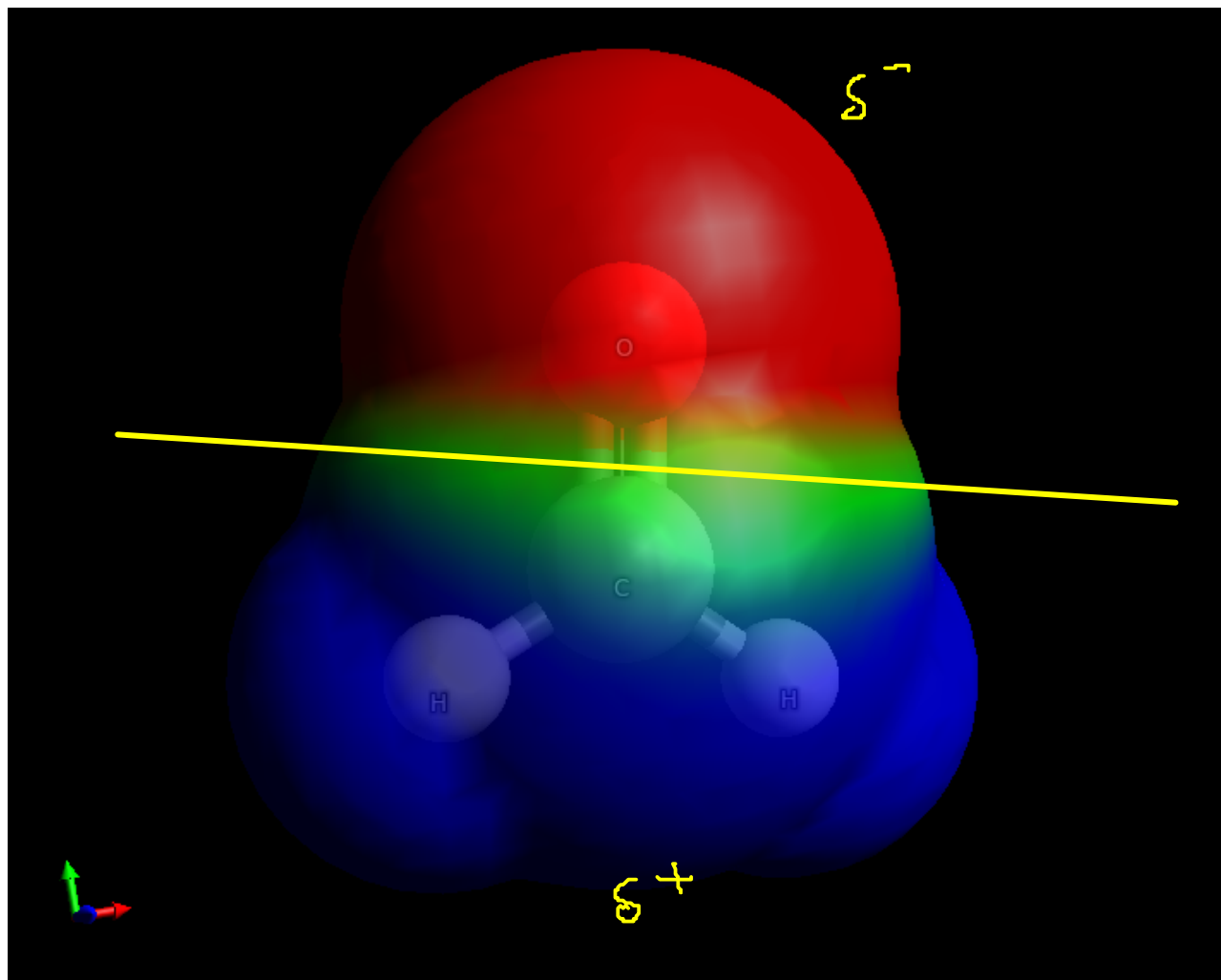
Shape? LINEAR. There are only two things around carbon, and they will be 180 degrees apart.



Polar? C=O bonds should be polar. HOWEVER, they are arranged symmetrically (directly opposite one another) around the carbon atom, so the overall molecule will be NONPOLAR.

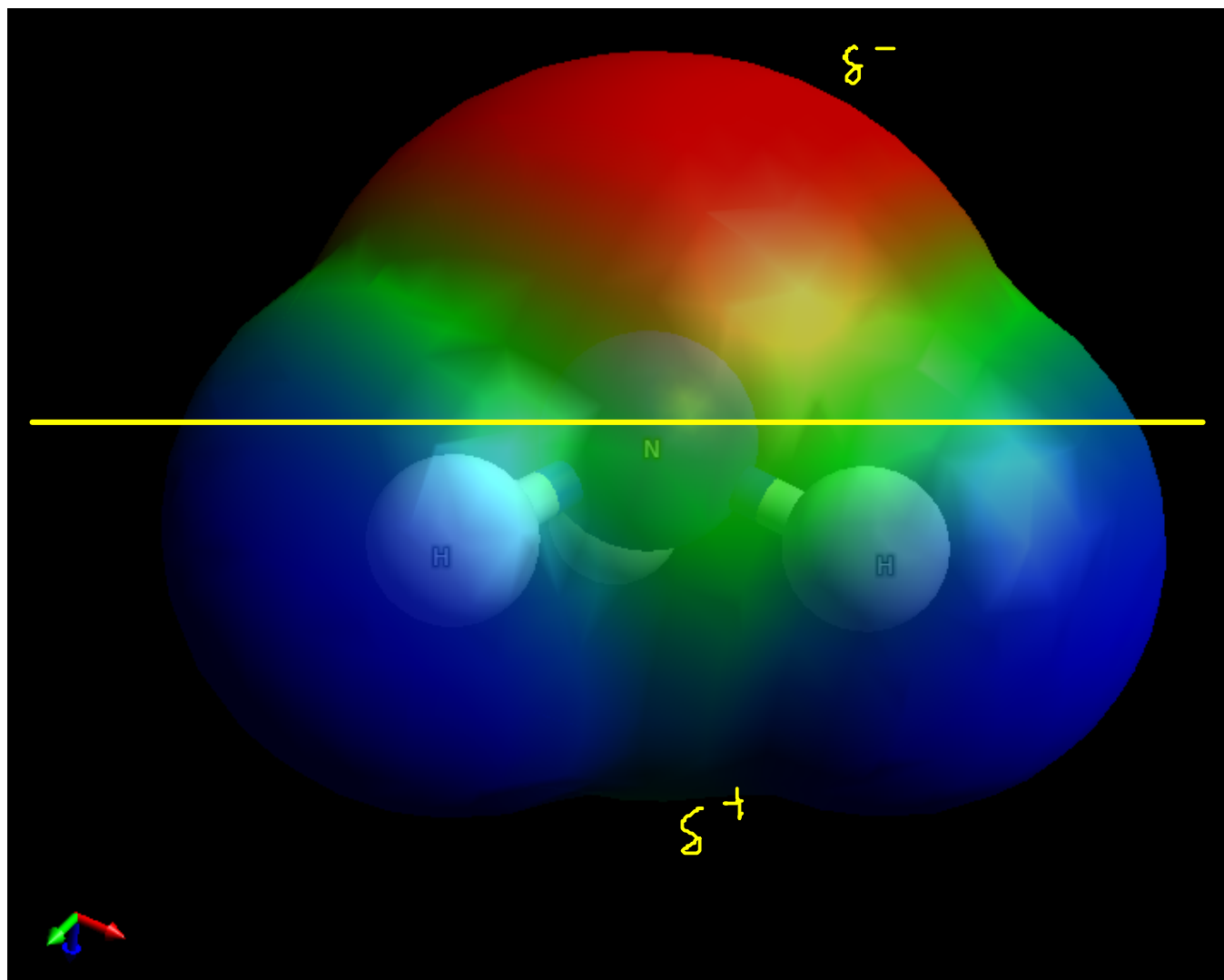
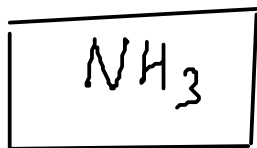


This ball-and-stick model shows electrostatic potential - red for more negative and blue for more positive



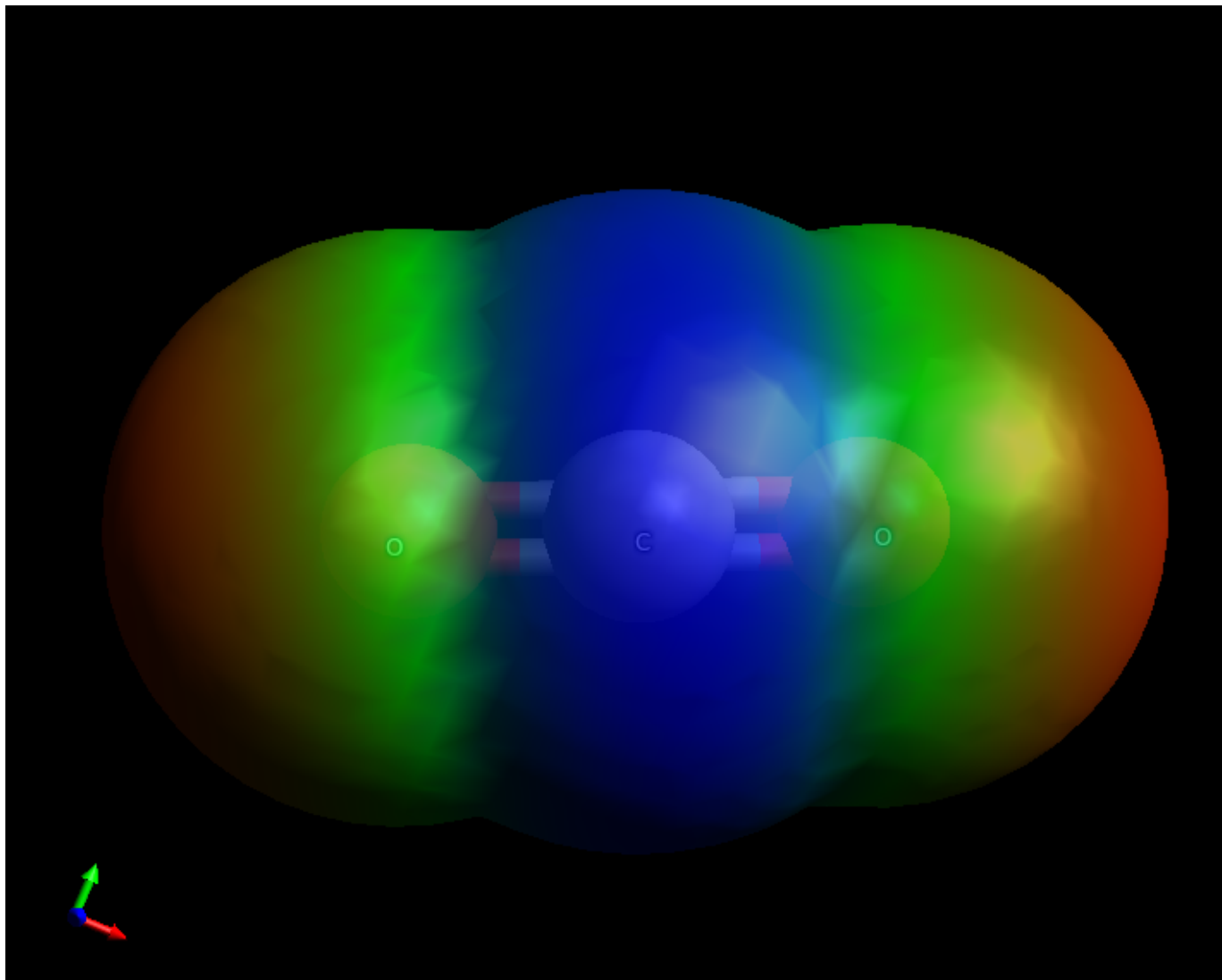
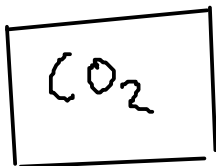
oxygen "side",
slightly negative

hydrogen "side",
slightly positive



nitrogen "side"
slightly negative

hydrogen "side"
slightly positive



This molecule is NONPOLAR. No positive "side" or negative "side"

EXAMPLES
Water, H_2O

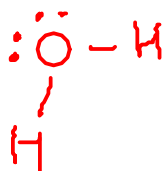


Shape? There are FOUR things around the water molecule, but only two are atoms. This is a BENT molecule (approximately 109.5 degree bond angle)

$$H: 2 \times 1$$

$$O: 6$$

8



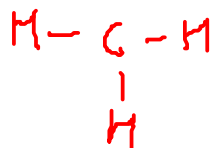
Polarity? POLAR. O-H bonds are polar, and electrons are pulled towards the oxygen "end" of the molecule.

methane, CH_4

$$C: 4$$

$$H: 4 \times 1$$

8



Shape? TETRAHEDRAL. Four atoms around the central carbon atom, all 109.5 degrees apart.

Polar? C-H bonds are nonpolar. All bonds are nonpolar, so we have a NONPOLAR molecule.

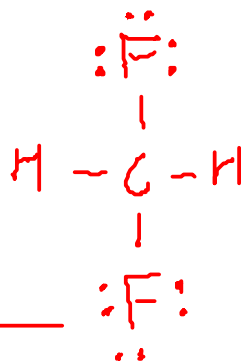
CH_2F_2

$$C: 4$$

$$H: 2 \times 1 = 2$$

$$F: 2 \times 7 = 14$$

20

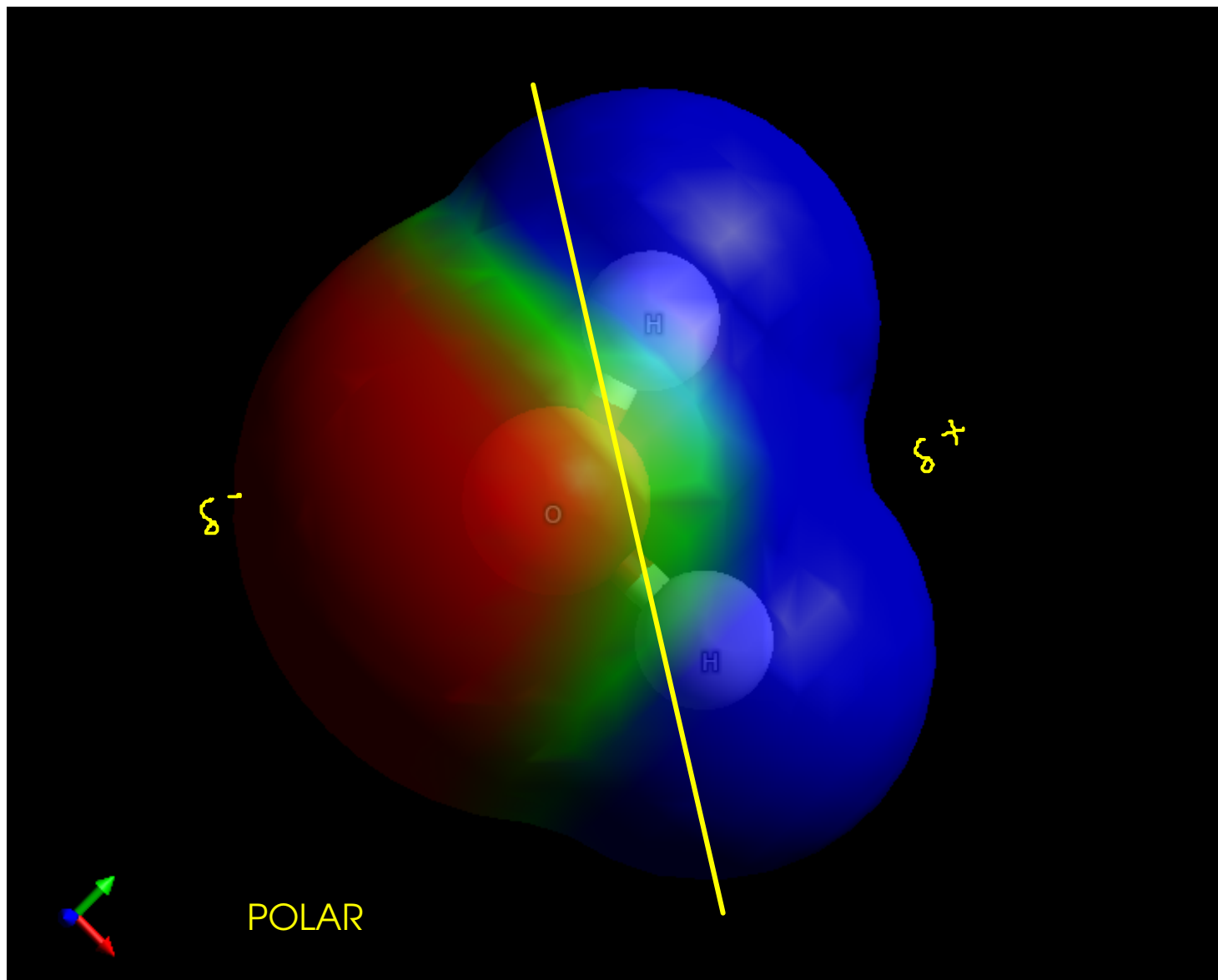
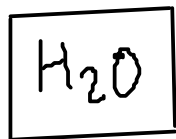


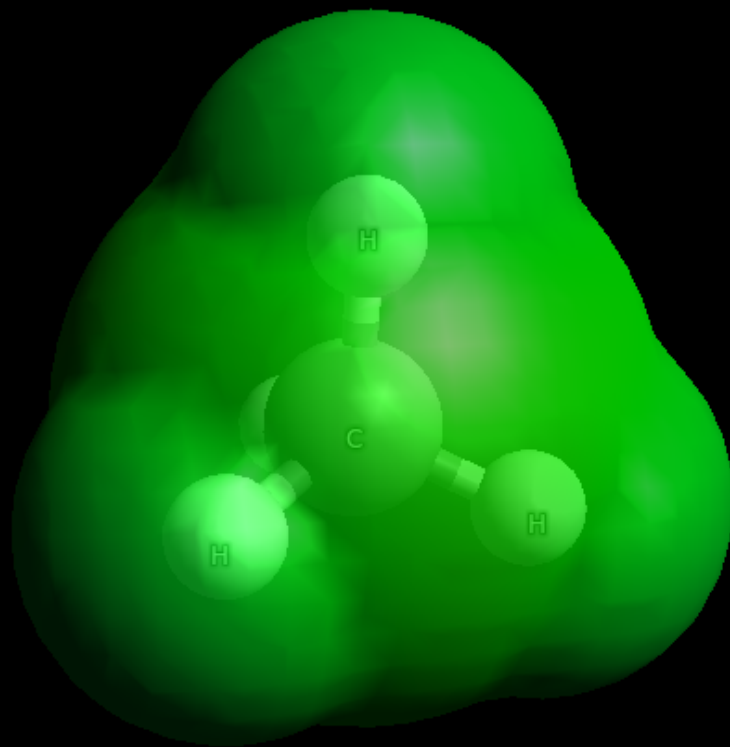
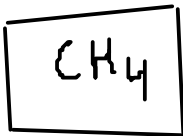
Shape? TETRAHEDRAL. Four atoms around the central carbon atom, just like methane.

Polar? C-H bonds are nonpolar, but C-F bonds are polar. The molecule is POLAR, and electrons will be pulled towards the fluorine "side" of the structure.

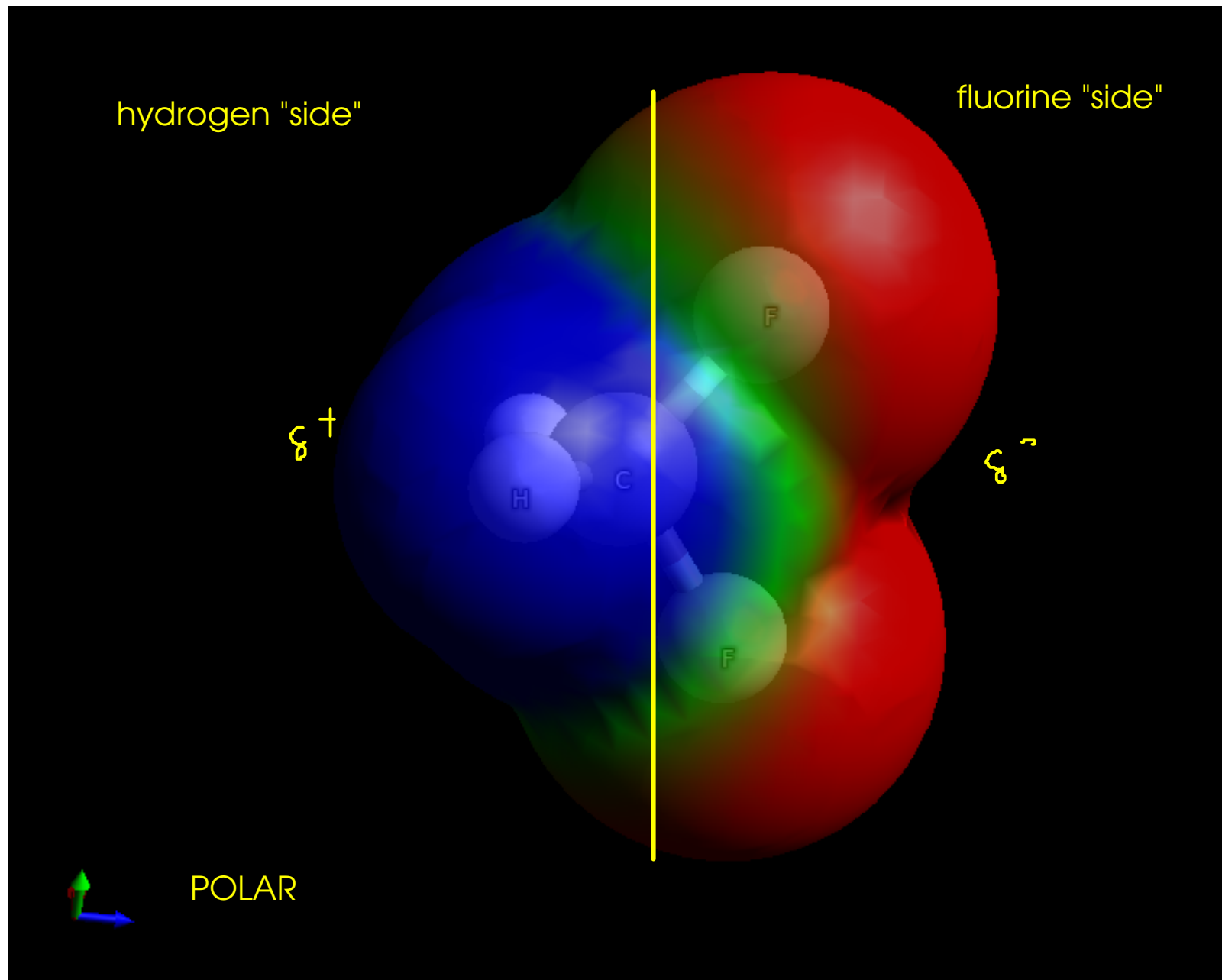
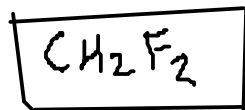


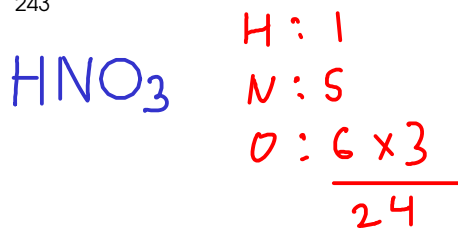
Note: This Lewis structure is correct but deceptive, since it LOOKS like the fluorines will cancel each other out!



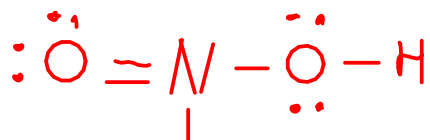


NONPOLAR (all bonds are nonpolar)

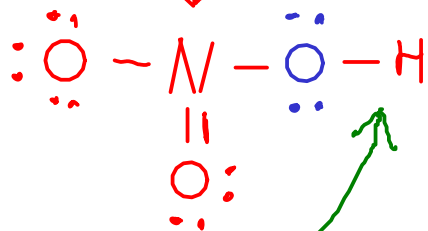




Start drawing skeleton by recognizing that this compound is an OXYACID hydrogen attached to a polyatomic ion.



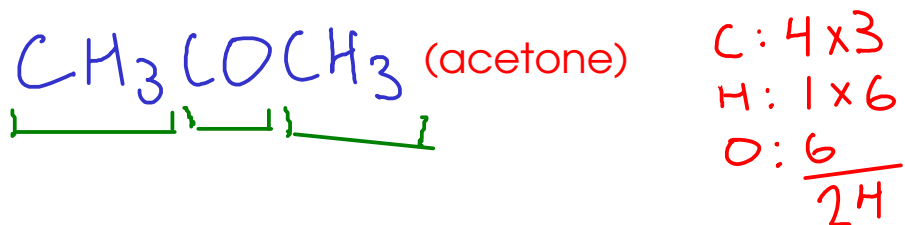
Resonance structures. The oxygen bonded to the nitrogen have a DELOCALIZED bond.



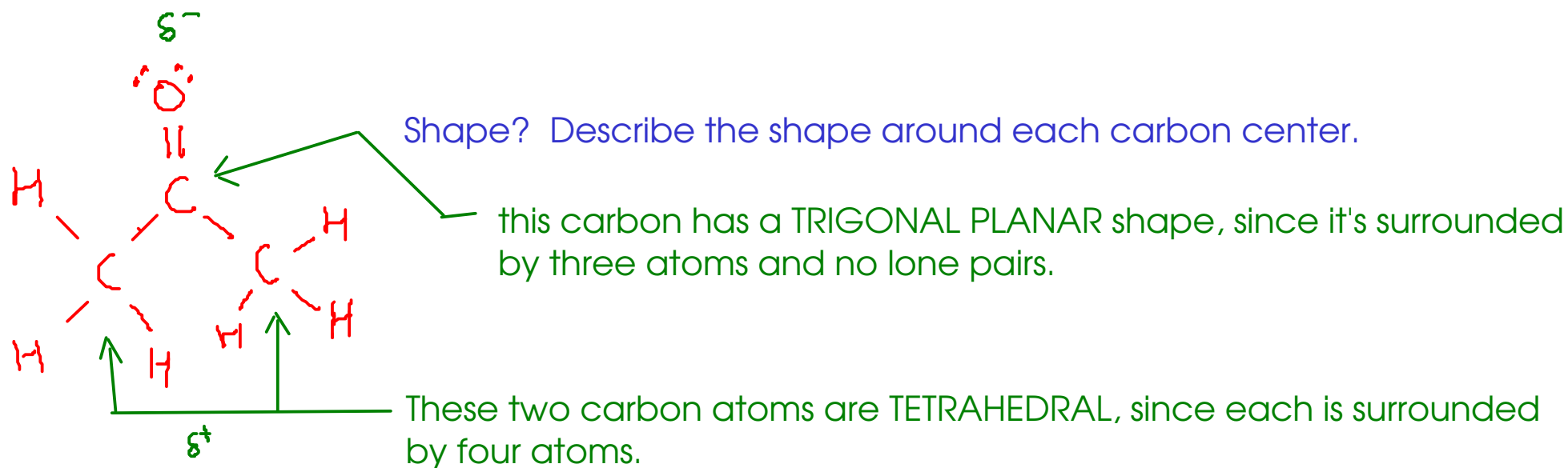
Shape? The nitric acid molecule has TWO "central" atoms. So, we describe the shape around each one. The molecule is TRIGONAL PLANAR around the nitrogen atom, and BENT around the oxygen atom (in blue).

Polar? We expect a polar molecule because electron density will be pulled away from the acidic HYDROGEN atom, giving that side of the molecule a slight positive charge.

In water, the acidic hydrogen can be pulled off of the molecule by water molecules. The hydrogen atom will then lose the shared electrons entirely!



Look at the formula of acetone. The way it's written gives us a clue to the structure. There are THREE carbon centers in this molecule!

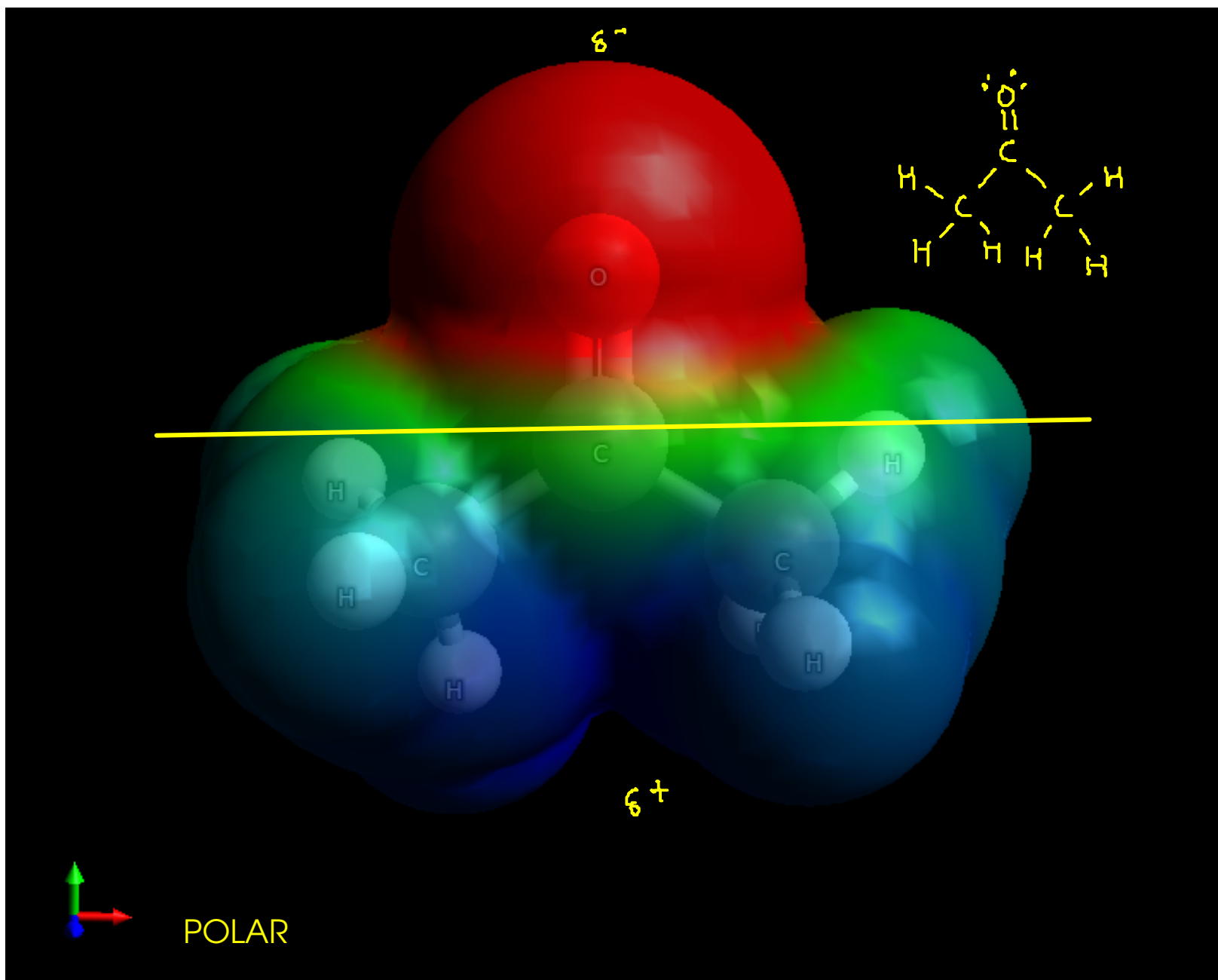


Polar? C-H bonds are nonpolar, but C=O bonds are polar. Electron density should be pulled towards the oxygen atom, creating a POLAR molecule

Experimentally, we find that acetone mixes very well with polar solvents like WATER.



"acetone"



- POLAR MOLECULES have

- higher boiling points and melting points that comparably sized nonpolar molecules.
- higher solubility in polar solvents like water than nonpolar molecules

"LIKE DISSOLVES LIKE"

- NONPOLAR MOLECULES have

- lower boiling points and melting points that comparably sized polar molecules.
- higher solubility in nonpolar solvents like carbon tetrachloride or oils