

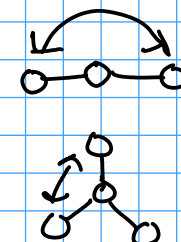
VSEPR

- "Valence Shell Electron Pair Repulsion" model
- assumes that the bonded and unbonded electrons around an atom will push each other as far away as possible.
- leads to simple geometric molecular shapes!

* unpaired electrons OR bonds to other atoms

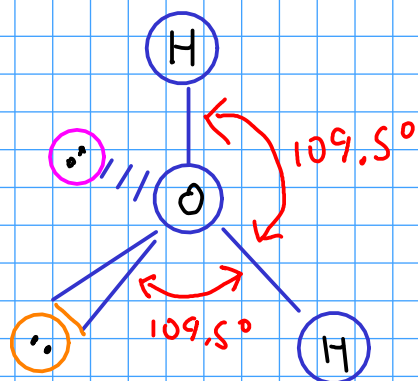
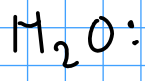
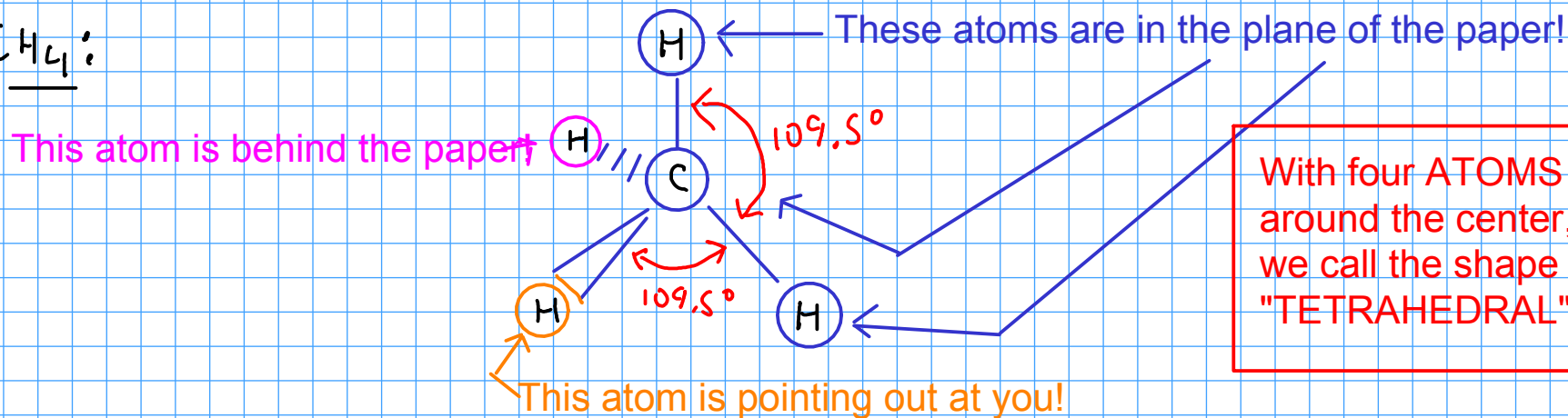
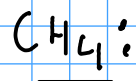
VSEPR shapes:

Groups around central atom *	Shape	Bond angle(s) in degrees
2	linear	180
3	trigonal planar	120
4	tetrahedral / pyramidal / bent	109.5
5	trigonal pyramidal (and derivatives)	90 and 120
6	octahedral (and derivatives)	90

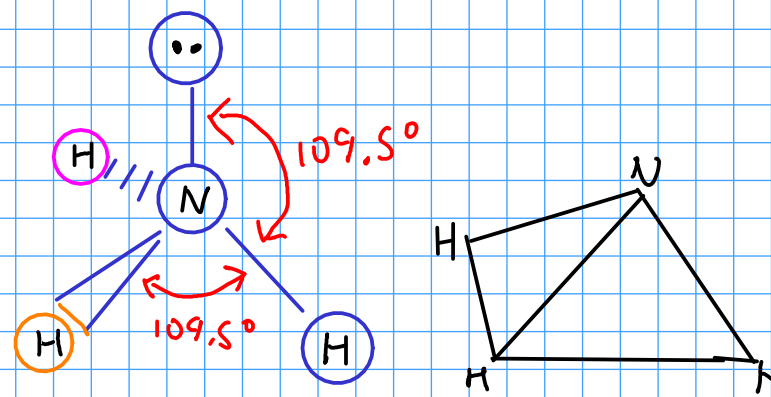
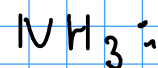


More on "4 things around a central atom":

- A compound that obeys the octet rule can have a maximum of four groups around its central atom. But we describe the molecular shape based on how ATOMS are arranged around the center. What if some of those groups aren't atoms, but pairs of UNSHARED electrons?

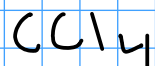


With two ATOMS and two LONE PAIRS, we call the shape "BENT"



With three ATOMS and one LONE PAIR we call the shape "PYRAMIDAL"

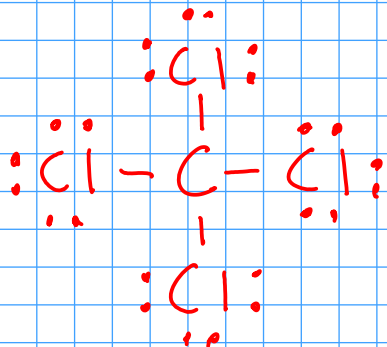
Examples:



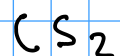
$$\text{C} : 4$$

$$\text{Cl} : 4 \times 7$$

$$\hline 32$$



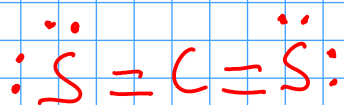
Molecular shape? There are FOUR atoms bonded to carbon (and no lone pairs). This gives a **TETRAHEDRAL** shape to the molecule.



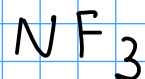
$$\text{C} : 4$$

$$\text{S} : 6 \times 2$$

$$\hline 16$$



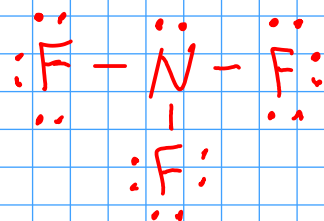
Molecular shape? There are only two things (two sulfur atoms) surrounding the carbon. There are no lone pairs on carbon, either. This is a **LINEAR** molecule!



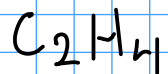
$$\text{N} : 5$$

$$\text{F} : 7 \times 3$$

$$\hline 26$$



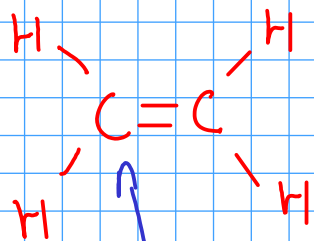
Molecular shape? There are three fluorine **ATOMS** around the nitrogen, **AND** a single lone pair of electrons. This means that the shape is a derivative of tetrahedral. Since there are only three **ATOMS** around the center, this molecule is **PYRAMIDAL**.



$$\text{C}: 4 \times 2$$

$$\text{H}: 1 \times 4$$

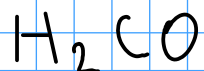
$$\hline 12$$



Shape? This molecule has TWO centers, so we should describe the shape of the molecule around each center!

Each carbon is TRIGONAL PLANAR (surrounded by three groups!)

3 groups: H-, H-, =C

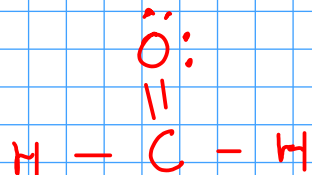


$$\text{H}: 1 \times 2$$

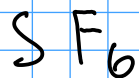
$$\text{C}: 4$$

$$\text{O}: 6$$

$$\hline 12$$



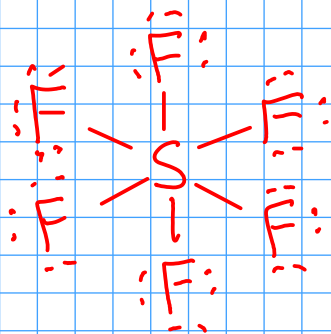
Shape? This molecule has THREE atoms and no lone pairs around the central carbon, so it's TRIGONAL PLANAR!



$$\text{S}: 6$$

$$\text{F}: 7 \times 6$$

$$\hline 48$$



Shape? This molecule has SIX fluorine atoms and no lone pairs surrounding the sulfur center. This forms an OCTAHEDRAL geometry, where atoms are 90 degrees apart!

