Contents

1 Week 1

Friday, October 2

▷ Determing formal charge:

- Formula: $FC = V - N - \frac{B}{2}$
- V = valance electrons of element
- N = lone pair electrons; B = bonded electrons

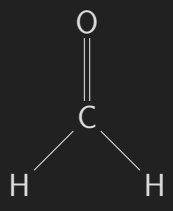
1. What is the formal charge on P in the following structure? Each F and O has three lone pair of electrons.
   - P = 5 - O - 8(0.5); P = +1
2. What is the formal charge on O in the structure above?
   - O = 6 - 6 - 2(0.5); O = -1
3. What is the formal charge on P in the following structure? Each F still has three lone pairs of electrons, and O had the tow pairs indicated.
   - P = 5 - 0 - 10(0.5); P = **0**
4. Of the two structures shown for POF_3, which is the most stable, and will, therefore, be the most abundant form?
   - **Structure II**
   - O has formal charge of **0** and is the most electronegative element with difference in charge between the resonance structures.
   - F has greater electronegativity, but remains the same between both structures, so it's not relevant.
   - Key difference: the double bond in structure II gives oxygen the lower magnitude formal charge between the two.
5. The fundamental concept upon which VSEPR, and hence molecular shapes, is based is that:
   - Electrons pairs repel each other;
     - negative charge repels other negative charges.
   - Electron repulsion is minimized by maximum angular separation;
     - in other words, angular separation maximizes distance between electrons.
   - Bonding pair electrons and lone pair electrons both occupy regions around the central atom;

        - if they didn't occupy the same space than they wouldn't interact and thus wouldn't affect shape.
    - The electron dommain geometry and the molecular geometry is identical if there all of the electrons are bonding electrons;
        - the lone pairs are have a greater influence than bonded pairs, resulting in less space for bonded pairs.
    - **All of the above**

▷ General method of determining structure:

1. Count steric number—the total number of electron pairs in a molecule. Can be bonds or lone pairs.
2. Determine predicted geomterical structure predicted (EDG) by VSEPR using steric number.
    - Octahedral:6, Bipyramid:5, Tetrahedral:4, Trigonal:3, Linear:2
3. Determin impact (the MG) of lone pairs; more lone pairs results in less space between bonded pairs. Shape depends on EDG.

6. A resonance form of SOF_2, completely consistent with the octet rule, is shown below. What is the electron domain geometry (EDG), and molecular geometry (MG) of this molecule?
    - **Tetrahedral EDG and trigonal pyramidal MG**
7. Draw a Lewis dot structure of formaldehyde (CH_2O): what is the molecular shape of this molecule?



    - Steric number = 3
        - Double bonds count as 1 for steric number.
    - No lone pairs on central atom, C, so it's shape planar.
    - **Trigonal planar**
8. The EDG for CH_3^- (a carbanion) is tetrahedral, and the MG is trigonal pyramidal. Why are the H−C−H bond angles less than $109.5°$ as in a perfect tetrahedron?
    - **The lone pair electrons take up more space than bonding pair electrons.**

2 Week 2

Monday, October 5

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Wednesday, October 7

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Friday, October 9

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