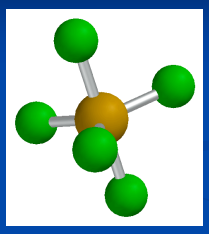
#13 - Molecular Models



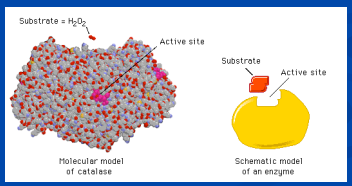
VSEPR - **The shapes of molecules**

The problem

- We would like to use simple pictures of chemical bonding to account for the observed shapes of a wide variety of molecules
  - We would rather avoid complicated calculations that can also predict shapes.
  - We will be satisfied with *estimates* of the geometry

Why bother?

- Reactivity is related to geometry
  - this is most obvious in biochemical systems, where reaction partners fit together like a 'lock and key'



Why bother?

- Reactivity is related to geometry
  - lone electron pairs suggest where new bonds may form
  - bond length is often correlated with bond strength
  - rates of reactions are often related to the way atoms are spatially arranged (steric effects)

Method: VSEPR

(Valence Shell Electron Pair Repulsion Theory)

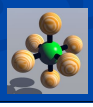
- Draw the Lewis dot structure
- Count the electron groups surrounding the central atom
  - multiple bonds behave as a single unit
  - lone pairs count as electron groups
- Arrange the electron groups to minimize repulsion of electron groups
  (arrange as far apart from each other as possible)

Arrange the groups to minimize repulsion

- Two groups: linear
- Three groups: planar triangle
- Four groups: tetrahedron
- Five groups: trigonal bipyramid
- Six groups: octahedron



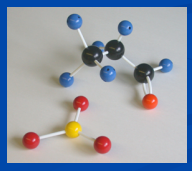




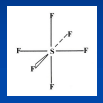
Your job…

- 10 molecules listed in text
- Before lab…
  - Determine the total # of valence electrons in each molecule
  - Draw the Lewis structure
  - *(Use worksheets in the text)*

- Determine the number of bonding pairs and non-bonding pairs around the central atom
- Determine the electronic and molecular geometry using VSEPR theory
- Construct an exact geometric model of the molecule.



- Sketch an exact 3-D representation of the molecule from the model.



- Indicate whether the molecule is polar or not.
- Have your TA initial your sketches.
- Turn in worksheets at the end of lab.
- You're done! (no lab report)