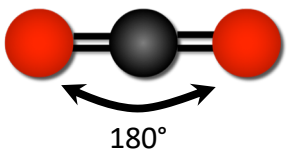
Chemistry Activity: Molecular Geometry – VSEPR Theory

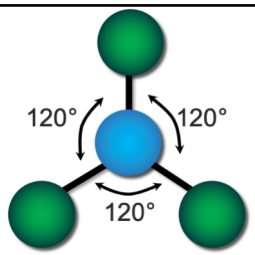
Introduction:

The Valence Shell Electron Pair Repulsion Theory (VSEPR) is used to determine the geometry of a molecule. There are many shapes possible for molecules. The molecular shapes we will be using in this activity are the linear, bent, trigonal planar, trigonal pyramidal, and the tetrahedral shape.



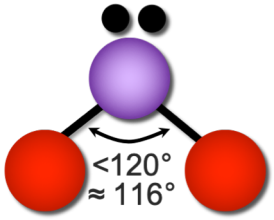
Linear

Linear: molecules with two electron pairs bonded to the central atom.
Remember: double and triple bonds count as one.



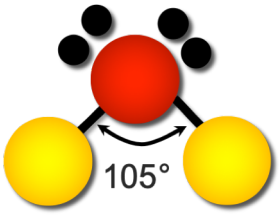
Trigonal Planar

Trigonal Planar: molecules with three electron pairs bonded to the central atom.



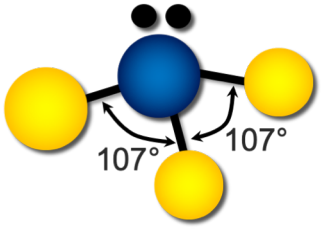
Bent

Bent: molecules with two electron pairs bonded to the central atom and one lone pair.



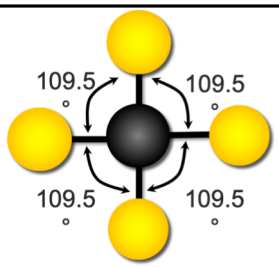
Bent (also)

Bent: molecules with two electron pairs bonded to the central atom and two lone pairs.



Trigonal Pyramidal

Trigonal Pyramidal: molecules with three electron pairs bonded to the central atom and one lone pair.



Tetrahedral

Tetrahedral: molecules with four electron pairs bonded to the central atom.

What's the difference between Trigonal Planar and Trigonal Pyramidal? Trigonal planar is flat. Think of one plane. Whereas trigonal pyramidal is in the shape of a pyramid.

What's the difference between the two types of Bent geometry? One molecule has one lone pair, and the other has two lone pairs. They are both identified as Bent. Remember that a lone pair has a stronger force of repulsion making the molecule seem bent. The bond angle for the molecule with two lone pairs will be smaller.

Objective: Identify the VSEPR geometric shapes of molecules using 2D drawing and 3D models.

Materials:

various materials provided by your teacher for construction of models
Butcher paper or white boards

Procedure:

1. Write the chemical formula for the molecular compound. Record the number of valence electrons for the compound.
2. Draw the Lewis Dot Structures for the molecules listed
3. Make a model of each compound using the materials supplied by your teacher. Keep in mind that according to the VSEPR theory atoms position themselves around the central atom so that the atoms are as far apart as possible. Also keep in mind that lone pairs of electrons have a stronger repulsive force than shared pairs of electrons.
4. Draw the model of the structure, indicating the approximate bond angles.
5. Identify the geometry of the molecule based on your model. Name the correct geometry.