

6.4 Molecular Shapes



1. Review!

Draw the Lewis Structure of the cyanide ion: CN

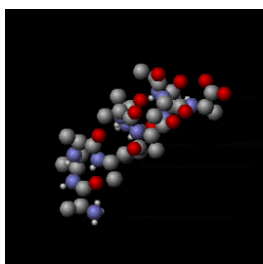
Draw the Lewis Structure of SiO₂

Draw the Lewis Structure of SO₂

VSEPR Model

Valence Shell Electron Pair Repulsion model predicts shapes of molecules.

Shape minimizes repulsion of shared and unshared electron pairs.

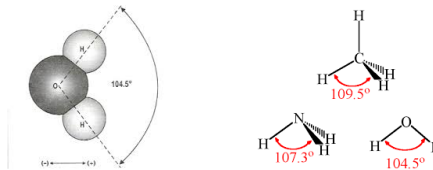


Molecular Shapes Resource

Look at Resource Page 6 in your booklet:

Note terminal atoms, lone pairs, and hybridization of your central atom.

Also, look at the column labeled Bond Angle. This is the angle between a central atom and its terminal atoms.



Hybridization

Hybrid: two things combine, forming something with characteristics of both.

Hybridized orbitals occur when atomic orbitals (s, p, and d) mix, & form new, symmetric orbitals.

The hybridization of the central atom determines shape.



Determining Hybridization

0. Make a Lewis Structure

1. Add lone pairs & terminal atoms. (Number = 1 - 6)

2. Determine hybridization of central atom (Resources 6):

1 = s	2 = sp	3 = sp ²
4 = sp ³	5 = sp ³ d	6 = sp ³ d ²

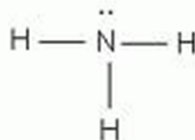
3. Using Resource, determine shape (Using lone pair count, number of terminal atoms, and hybridization.)

2. Shape of Ammonia Example

What is the hybridization of the nitrogen atom, and

overall shape of ammonia (NH_3)?

First, figure out Lewis structure:



Terminal atoms = 3

Lone pairs = 1

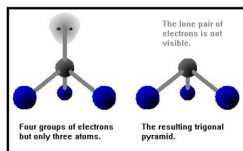
Hybridization = sp^3

What shape is it?

Trigonal pyramidal

(Model Demo).

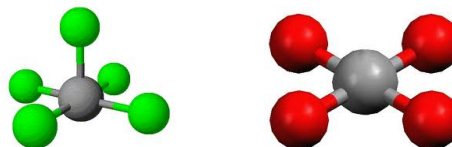
Bond angle = 107.3° .



Expanded Octet

Central atoms can have more than 8 electrons.

D orbitals are involved, and leads to sp^3d or sp^3d^2 hybridization.



3. Expanded Example

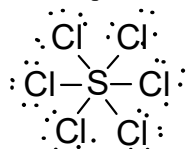
What's the hybridization and shape of SF_6 ?

Lewis Structure:

Terminal Atoms = 6

Lone Pairs = 0

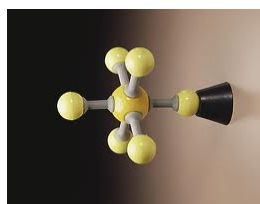
Hybridization = sp^3d^2



Shape =

Octahedral

Bond angle = 90° .



4. Ammonium Ion Example

What's the hybridization and shape of NH_4^+ ?

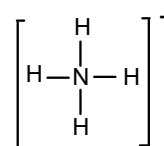
Lewis Structure:

Terminal atoms = 4

Lone pairs = 0

Hybridization = sp^3

Shape = Tetrahedral



Homework

Preview 6.5

6.4 Problems in your Booklet

Due: Next Class