Warm Up:

Draw the electron dot structures for the following molecules:

Hydrochloric Acid: HCl

Thionyl chloride: $SOCl_2$ (S is in the center with O and each Cl bonded to the S)

Warm Up:

Draw the electron dot structures for:

chlorine

oxygen

acetylene (C_2H_2, bonds HCCH)

ethanol (CH_3CH_2OH, bonds C to C to O to H)

Objective:

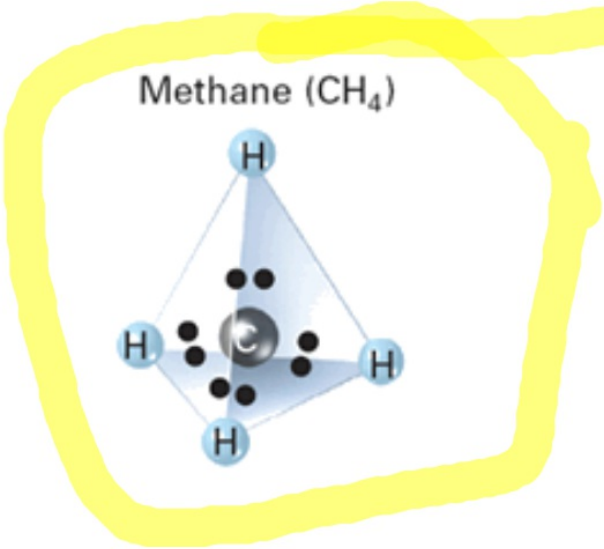
TSWBAT:
Predict the three dimensional shape of covalent compounds based on VSEPR theory.

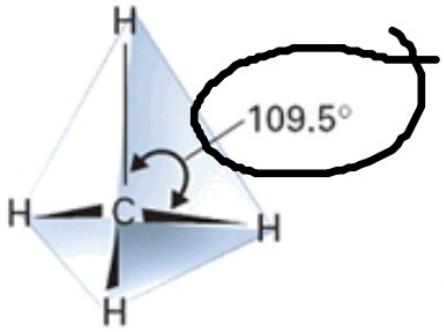
VSEPR Theory

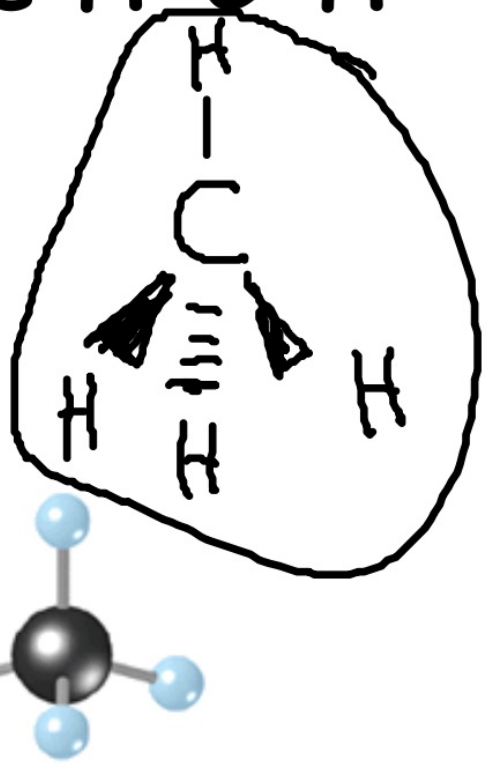
This acronym stands for "Valence Shell Electron Pair Repulsion" Theory

How does VSEPR theory help predict shapes of molecules?

X-ray crystallography shows that the hydrogens in a methane molecule are at the four corners of a geometric solid. All of the H-C-H angles are 109.5°, the "Tetradhedral Angle."







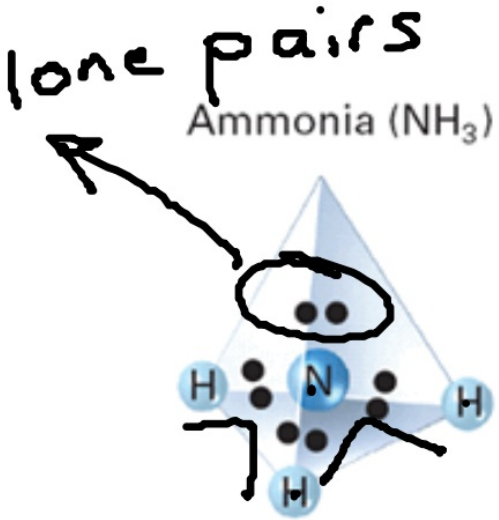
VSEPR Theory

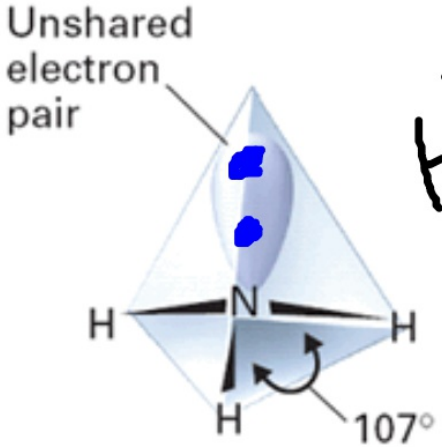
The valence-shell electron-pair repulsion theory, or *VSEPR theory*, explains why methane arranges itself into a tetrahedron.

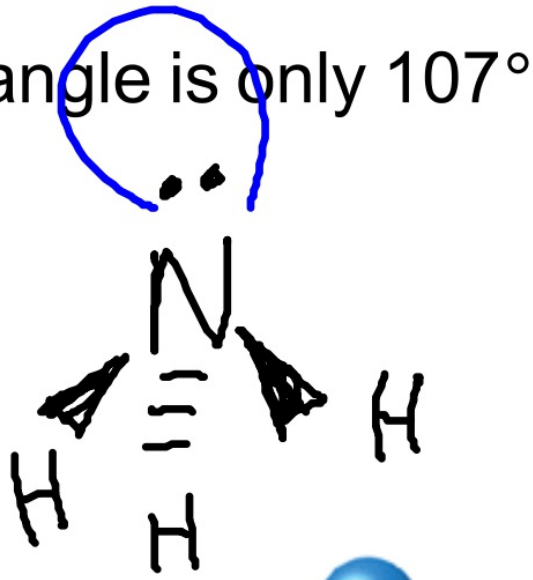
According to VSEPR theory, the repulsion between electron pairs causes molecular shapes to adjust so that the valence-electron pairs stay as far apart as possible.

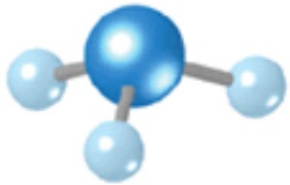
Very important concept- this is WHY molecules adopt the shapes we find in nature.

The measured H—N—H bond angle is only 107°.







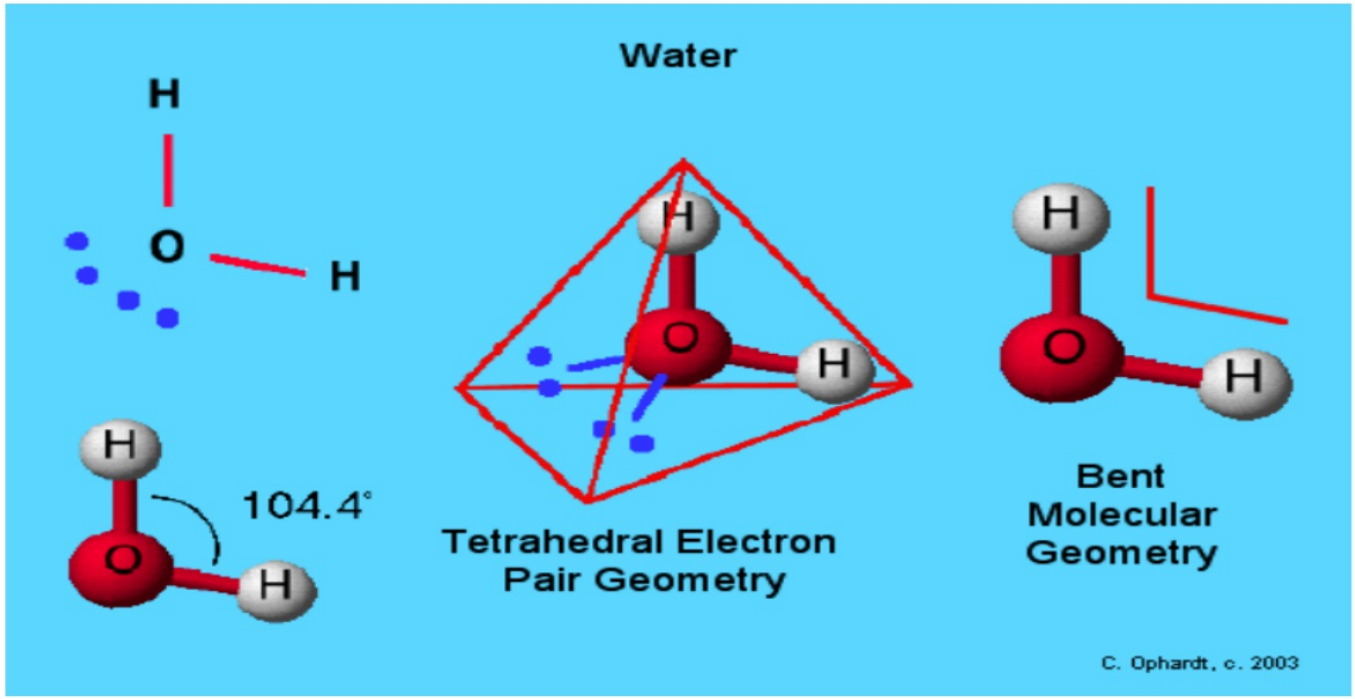


107° Pyramidal

Compare this to the bond angle in methane: 109.5°

VSEPR Theory

The measured bond angle in water is about 105°.



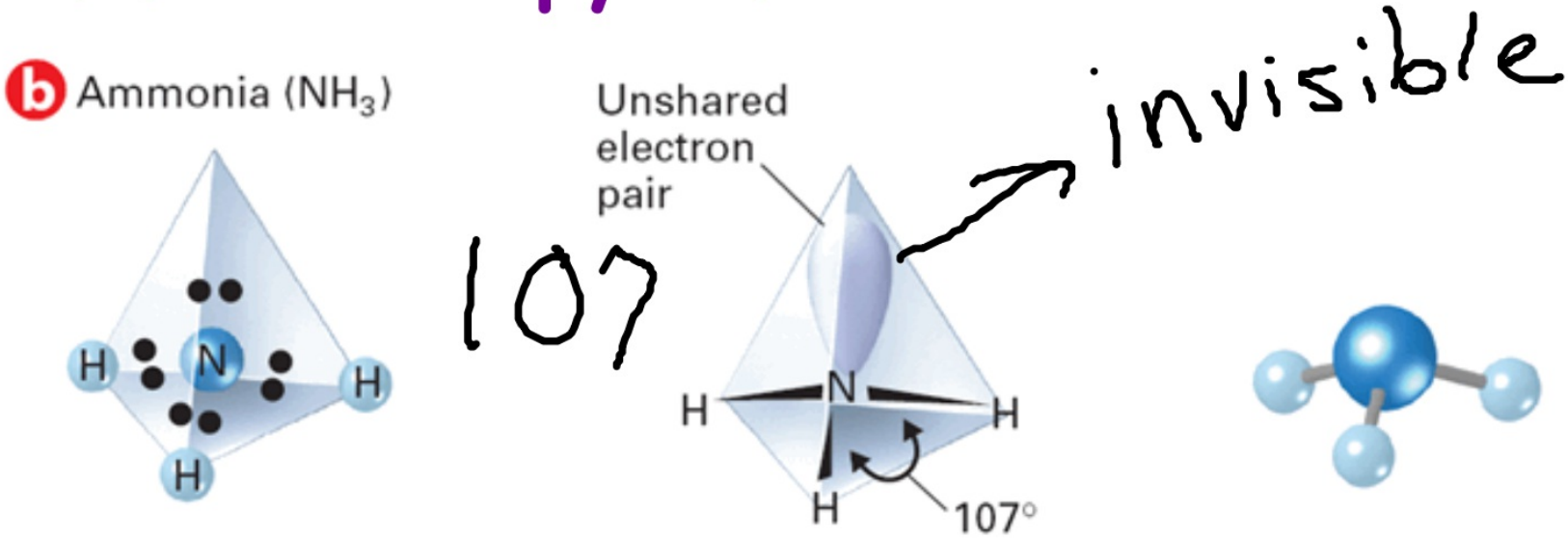
Compare this to methane (109.5°)

Compare also to ammonia (107°)

The 3D shape of the carbon dioxide molecule is "linear."

O=C=O

Ammonia is "pyramidal":



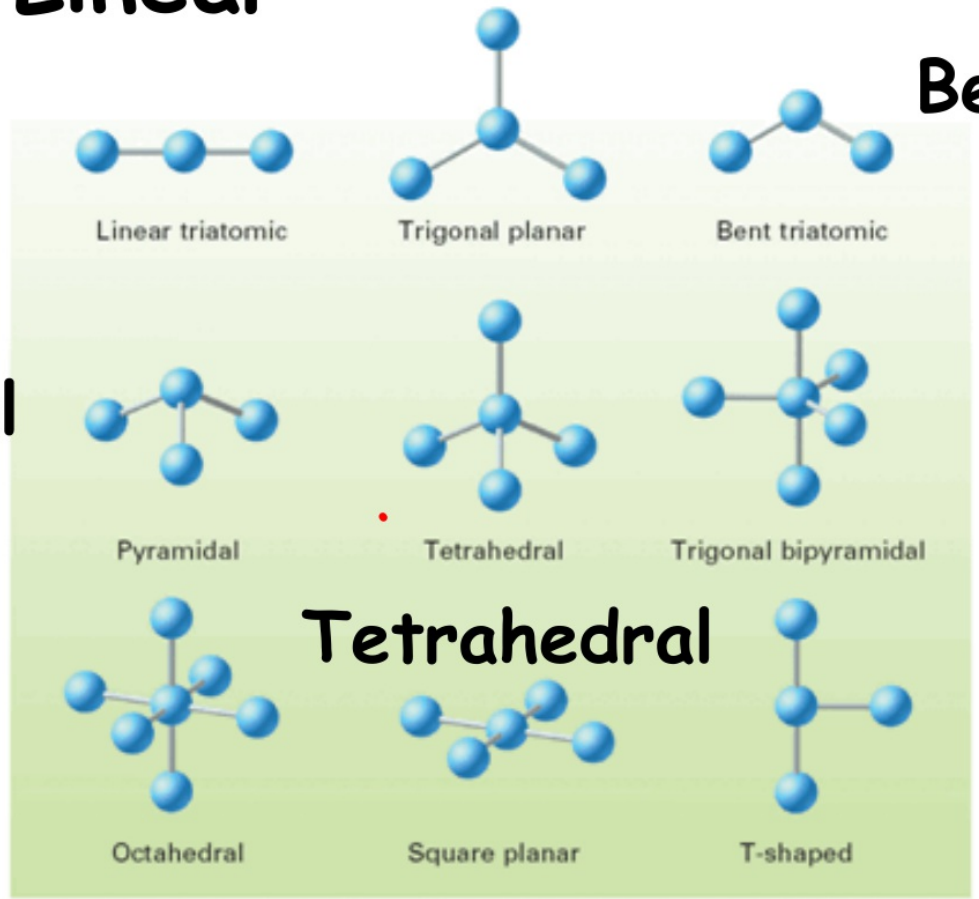
Nine Possible Molecular Shapes (p. 233 text)

Linear

Trigonal Planar (flat)

Bent triatomic

v-shaped



Pyramidal

Tetrahedral

Warm Up:

Draw the electron dot structures for:

chlorine

oxygen

acetylene (C_2H_2, bonds HCCH)

ethanol (CH_3CH_2OH, bonds C to C to O to H)

Learning Check:

VSEPR theory enables prediction of 3-D molecular shape because the valence electron pairs

1. are attracted to each other.
2. form molecules with only four possible shapes.
3. stay as far apart as possible.
4. always form tetrahedral shapes.

Warm Up

Draw the electron dot structures of:

HBr

Objectives:

TSWBAT

Predict the covalent bonding and molecular shapes of simple molecules using Lewis Dot Structures and VSEPR Theory

Show the electron dot structure and predict the 3D shape:(p. 233)

CO_2 (Carbon dioxide)