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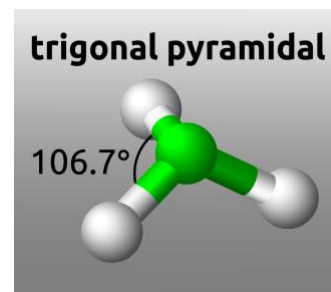
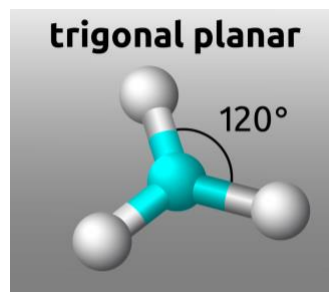
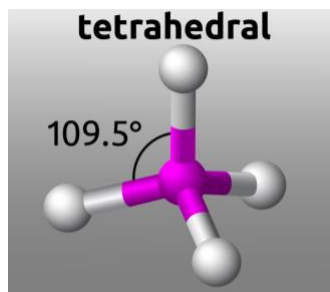
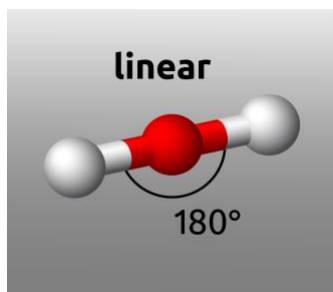
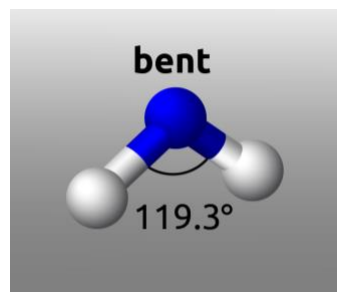
# Covalent Candy Molecules

## *Student Lab Sheet*

### Background Theory

The valence shell electron pair repulsion (VSEPR) theory determines the geometry of a molecule. It's called "vesper" theory for short. The shapes that are possible are tetrahedral, trigonal planar, trigonal pyramidal, bent, and linear.

- Bent (two atoms and two pairs of unbonded electrons around one central atom)
- Linear (two atoms and no unbonded electrons around one central atom)
- Trigonal pyramidal (three atoms, one unbonded pair of electrons around one central atom)
- Trigonal planar (three atoms and no unbonded electrons around one central atom)
- Tetrahedral (four atoms around one central atom)



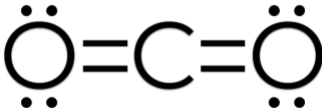
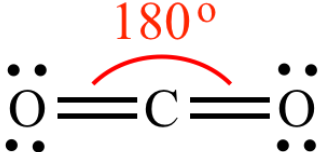

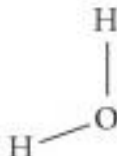
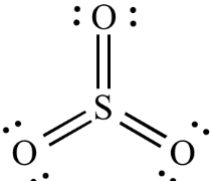
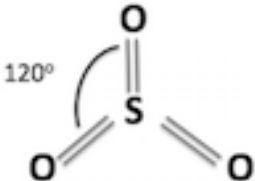
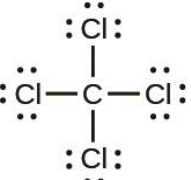
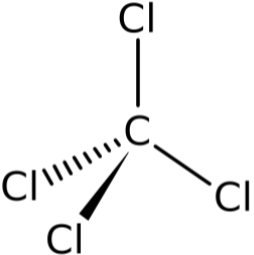
To determine the shape of a molecule, you must look at the central atom. Unbonded electrons around the central are not accounted for in the geometry, however, they are important because they determine the geometry. Unbonded electrons around atoms that are not the central atom have little effect on the geometry.

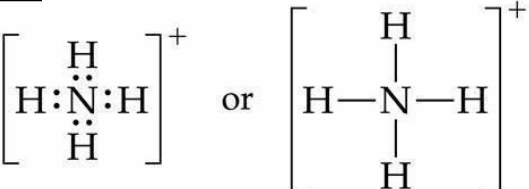
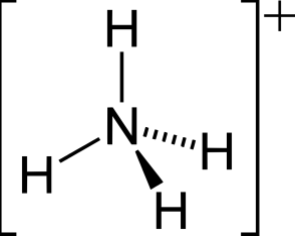
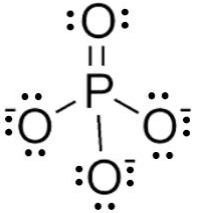
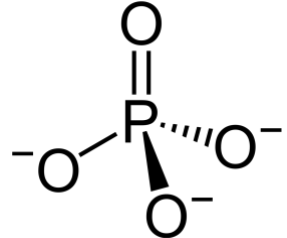
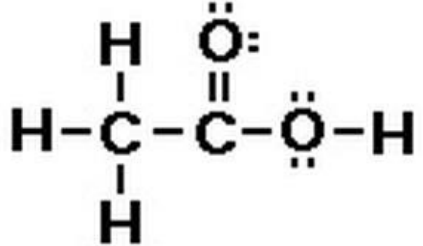
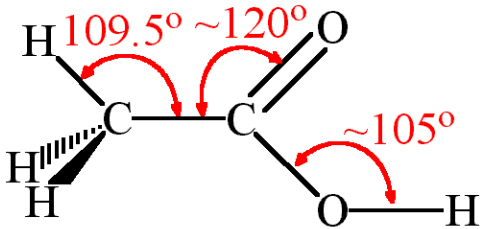
*In this experiment, you will:*

- Draw Lewis structures for a number of compounds and use them to determine how the molecular models need to be assembled.
- Determine the geometry of the compounds using your models.
- Be able to should start to see how the two-dimensional drawings really exist in three dimensions.

## Instructions

Complete each column in order. Build your model and then compare it to the samples at the front of the room if you are unsure of its geometry.

Molecule Name and Formula (write the chemical formula)	Total Valence Electrons	Lewis Structure (tick the box in the corner if a resonance structure is possible)	Drawing with Correct Geometry (use your models to help you)	VSEPR Geometry Name (the name of the shape and typical bond angle)
Carbon Dioxide	16	<input type="checkbox"/> 		Linear (180°)
Water <i>H<sub>2</sub>O</i>	8	<input type="checkbox"/> 		Bent (119.3°)
Sulfur trioxide <i>SO<sub>3</sub></i>	24	<input type="checkbox"/> 		Trigonal planar (120°)
Carbon tetrachloride <i>CCl<sub>4</sub></i>	32	<input type="checkbox"/> 		Tetrahedral (109.5°)

Ammonium $NH_4^{+1}$	8	<input type="checkbox"/> 	<input type="checkbox"/> 	Tetrahedral (109.5°)
Phosphate $PO_4^{-3}$	32	<input checked="" type="checkbox"/> 	<input type="checkbox"/> 	Tetrahedral (109.5°)
Acetic Acid (Expert level!! Hint: Both carbons are in the middle.) $CH_3COOH$	24	<input checked="" type="checkbox"/> 	<input type="checkbox"/> 	$CH_3$ – tetrahedral $C=O$ trigonal planar $O-H$ bent

## Analysis:

Without using the models, determine the geometry of these compounds (you can draw Lewis structures to help you):

$\text{NH}_3$  *trigonal pyramidal*

$\text{H}_2\text{S}$  *bent*

$\text{OCl}_2$  *bent*

$\text{HCN}$  *Linear*

$\text{F}_2$  *-*

$\text{SO}_2$  *bent*

$\text{SO}_4^{2-}$  *tetrahedral*

$\text{CO}_3^{2-}$  *trigonal planar*

$\text{O}_3$  *bent*

## Post-lab questions:

1. What is the name given to the compounds made in this lab?

*Covalent*

2. Give two properties of this type of molecule.

*Do not conduct electricity*

*Insoluble in water*

*Low boiling point*

*Low melting point*

*Non-metals*

*Often occur in a liquid or gaseous state*

*Solid compounds are soft*