

Chemistry Lab: Molecular Geometry Lab - VSEPR

Name: _____ Date: _____ Period: _____

Objective:

- Draw Lewis structures for a number of compounds and use the drawings to construct molecular models.
- Determine the geometry of the compounds using your models.

Chemical Formula	Total Number Valence Electrons	Lewis Dot Structure	Molecular Geometry Drawing w/ approximate bond lengths	VSEPR shape name
carbon dioxide				
water				
carbon tetrafluoride				
phosphorus trichloride				
sulfur trioxide				

ammonia				
phosphate ion				
sulfur dioxide				

Post Lab Questions:

- Without making a model of the following molecular compounds, draw the Lewis Structure for the compounds, and identify the VSEPR shape of the molecule.

a) N_2	c) $COCl_2$
b) NO_3^-	d) NO_2^-

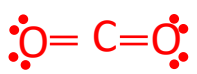
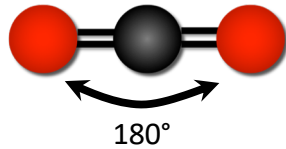

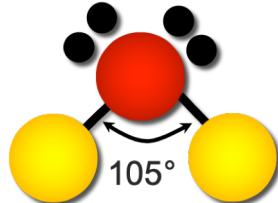
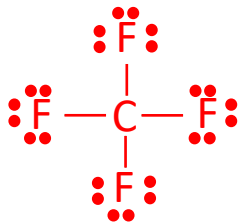
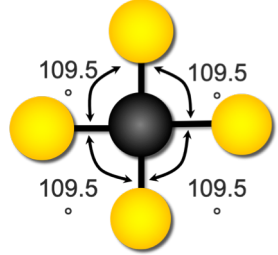
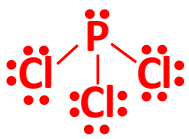
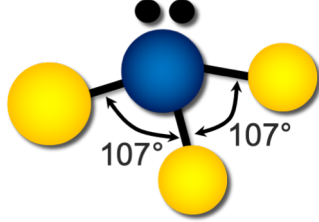
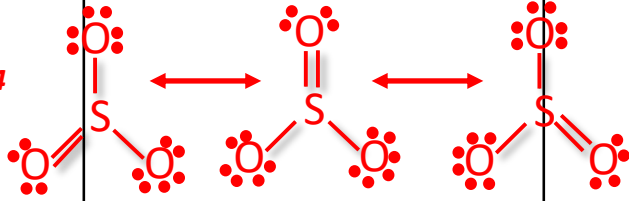
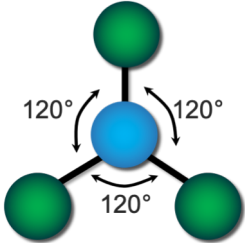
- Describe the difference between a lone pair of electrons and a shared pair of electrons.
- Which model, studied in this lab, consists of bonded atoms which are the *farthest* apart? What is the bond angle of these atoms?
- Which model, studied in this lab, consists of bonded atoms which are the *closest* together? What is the bond angle of these atoms?

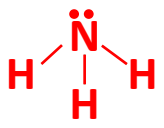
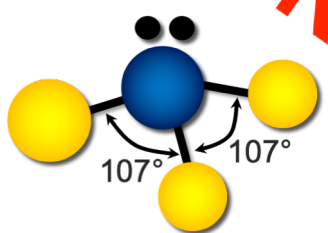
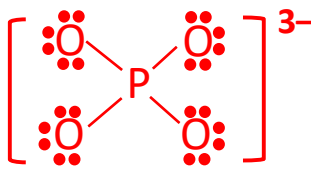
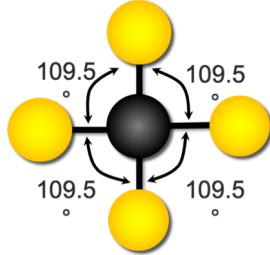
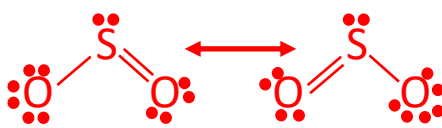
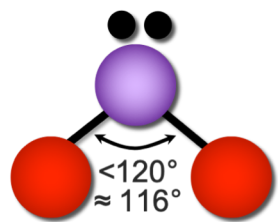
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Objective:

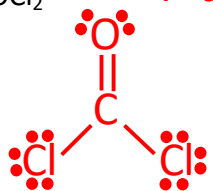
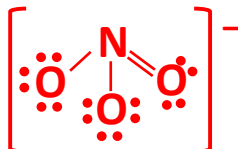
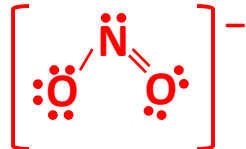
- Draw Lewis structures for a number of compounds and use the drawings to construct molecular models.
- Determine the geometry of the compounds using your models.

Chemical Formula	Total Number Valence Electrons	Lewis Dot Structure	Molecular Geometry Drawing w/ approximate bond lengths	VSEPR shape name
carbon dioxide CO_2	 16	$4 + 2(6) = 16 e^-$ 		<i>linear</i> <i>nonpolar</i>
water H_2O	 8	$2(1) + 6 = 8 e^-$ 		<i>Bent,</i> <i>two lone pairs</i> <i>polar</i>
carbon tetrafluoride CF_4	 32	$4 + 4(7) = 32 e^-$ 		<i>Tetrahedral</i> <i>nonpolar</i>
phosphorus trichloride PCl_3	 26	$5 + 3(7) = 26 e^-$ 		<i>trigonal pyramidal</i> <i>polar</i>
sulfur trioxide SO_3	 24	$6 + 3(6) = 24 e^-$  <p style="text-align: center;"><i>Showing resonance</i></p>		<i>trigonal planar</i> <i>nonpolar</i>

ammonia NH_3	 8	$5 + 3(1) = 8 e^-$ 	 KEY trigonal pyramidal polar
phosphate ion PO_4^{3-}	 32	$5 + 4(6) + 3 = 32 e^-$ 	 Tetrahedral nonpolar
sulfur dioxide SO_2	 18	$6 + 2(6) = 18 e^-$  Showing resonance	 bent, one lone pair polar

Post Lab Questions:

1. Without making a model of the following molecular compounds, draw the Lewis Structure for the compounds, and identify the VSEPR shape of the molecule.

a) N_2 $2(5) = 10 e^-$: $N \equiv N$: linear nonpolar	c) $COCl_2$ $4 + 6 + 2(7) = 24 e^-$  trigonal planar nonpolar
b) NO_3^- $5 + 3(6) + 1 = 24 e^-$  trigonal pyramidal polar	d) NO_2^- $5 + 2(6) + 1 = 18 e^-$  bent polar

2. Describe the difference between a lone pair of electrons and a shared pair of electrons.

A lone pair of electrons is not shared with other atoms. A shared pair of electrons is shared between two atoms.

3. Which model, studied in this lab, consists of bonded atoms which are the *farthest* apart? What is the bond angle of these atoms? **Linear. 180°**
4. Which model, studied in this lab consists of bonded atoms which are the *closest* together? What is the bond angle of these atoms? **Bent with two lone pairs. $\approx 105^\circ$**