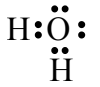
Formula	Electron dot symbol	Number of electron pairs around the central atom	Electron pair geometry	Molecular Structure	Shape of the molecule	Polarity (Polar or nonpolar)	Hybridization of central atom
Water H_2O		4	Tetrahedral		bent or v-shaped	polar	
PF_3							
XeF_2							
XeF_4							
HI							
PCl_5							
SCl_2							
CH_2Cl_2							
Cl_2O							
NH_3							
CCl_4							
CS_2							
$COCl_2$							

THE SHAPES OF MOLECULES

The purpose of this experiment is to learn to predict the shapes of molecules by building a model of the molecule with a molecular modeling kit and applying the Valence Shell Electron Pair Repulsion Theory (VSEPRT):

Materials:
Model Kit

Procedure:
For each of the ten substances listed on the attached table, give the following information in the space provided.

1. The electron dot symbol for the molecule

2. The number of electron pairs of electrons around the central atom.

3. The electron pair geometry; only three of the five possibilities will be selected in this experiment; linear, trigonal planar, and tetrahedral.

4. Build a model of the substance with your model kit and draw its molecular structure.

5. Observe your model. Give the shape of the molecule from the arrangement of its atoms. The possibilities are linear, bent or v-shaped, tetrahedral, trigonal planar, and trigonal pyramidal. Note: It may be helpful to remove any sticks representing non-bonded electron pairs.

6. Observe the arrangement of the atoms. Are they arranged in a symmetrical or asymmetrical manner? That is, does one region on the outside of the molecule have a cluster of more electronegative element(s) and another region have less electronegative element(s)? If is does, then it is a polar molecule. If the areas are symmetrical, then the molecule is nonpolar.

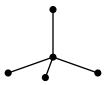
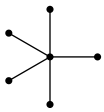
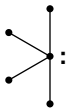
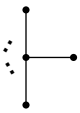
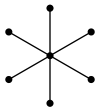
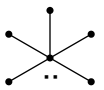
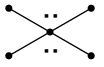
Questions:

Q1. Do any of the molecules studied have polar covalent bonds but are nonpolar molecules because of their symmetry? Explain!

Q2. According to your models, what is the bond angle for each of the following bonds? Cl-P-Cl, Br-Be-Br,, and S-C-S

Q3. Which one substance of the ten materials studied, has chemical bonds with the greatest degree of ionic character? Explain your choice.

Molecular Structure

Hybdridization	# of σ Bonds	# of Non-Bonding Pairs	Molecular Shape		Bond Angles	Example
sp	2	0		Linear	180°	
sp^2	3	0		Trigonal planar	120°	
sp^2	2	1		Angular	<120°	
sp^3	4	0		Tetrahedral	109.5°	
sp^3	3	1		Trigonal pyramidal	<109.5°	
sp^3	2	2		Angular	<109.5°	
sp^3d	5	0		Trigonal bipyramidal	120°, 90°	
sp^3d	4	1		Sawhorse (irregular tetrahedron)	<120°, <90°	
sp^3d	3	2		T-shaped	<90°	
sp^3d	2	3		Linear	180°	
sp^3d^2	6	0		Octahedron	90°	
sp^3d^2	5	1		Square pyramidal	<90°	
sp^3d^2	4	2		Square planar	90°	