CHEM111 Week XX Recitation: Molecular Shapes and Bond Angles Part I Name: _____

1. Draw the Lewis structures for each of the five binary molecules listed below (BeF_2, BH_3, CH_4, PCl_5, and SF_6.)

BeF_2 **BH_3** **CH_4** **PCl_5** **SF_6**

2. What *general* information does looking at any of the Lewis structures above provide about the respective molecule?

3. Complete the chart below for each Lewis structure shown above.

	BeF_2	**BH_3**	**CH_4**	**PCl_5**	**SF_6**
Binary compound name					
Valence Electrons					
Bonding Electron Pairs					
Lone Pairs (central atom only)					
Steric Number					
Electronic Geometry					
Molecular Geometry					
Predicted Bond Angle					

4. Generally, what is the difference between the electronic and molecular geometries of a molecule? Compare them for the molecules above. Explain in what case the electron and molecular geometries of a molecule would be the same and why. Reference the examples above in your answer.

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Go to: https://chemapps.colostate.edu/dli/molecular-shapes/molecular-shapes-expanded.html and select three of the five molecules from above. Only three can be selected at a time, so you will have to change the set of molecules to compare all five molecules.

5. In the list below each molecule, turn the spin and hydrogens on. Turn everything else off. How does your prediction about the molecular shape above compare to the actual shapes of each molecule? Note any differences and revise your answers above if necessary.

6. Draw the 3D structure of each molecule in the space below. Use dash/wedge notation to indicate any bonds that are behind and in front of the page, respectively. Compare the shapes that you draw to those in the link above and modify your drawing if necessary.

BeF_2 **BH_3** **CH_4** **PCl_5** **SF_6**

7. Turn off the spin for each molecule and measure the actual bond angles by double clicking on an outer atom, single clicking on the central atom, and single clicking on another outer atom to complete the bond. Record the bond angles for each molecule below and compare the actual bond angles to those you predicted in the chart. Revise your answers in the chart if necessary.

BeF_2 _____ **BH_3 _____** **CH_4 _____** **PCl_5 _____** **SF_6_____**

8. How well do the Lewis structures you drew correspond to the actual geometry and bond angles of the molecules? What are the limitations of Lewis structures? (Note, do not change the original Lewis structures unless they contain the incorrect number of valence electrons, bonds, or lone pairs.)

9. Explain the general trend in bond angles using the information gathered above. What influences the bond angles in a molecule? Is there a general trend in bond angles? ("The bond angles in molecules increase/decrease with…")

10. Use VSEPR theory to explain why the bond angles within one of these molecules are all the same. In your response, describe what makes up a single covalent bond and why that would cause those bonds to spread out to the bond angles seen above.