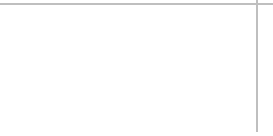
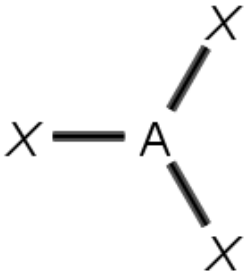
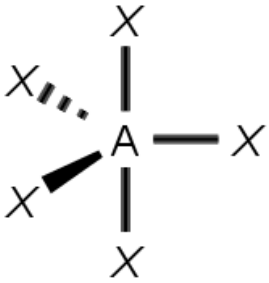
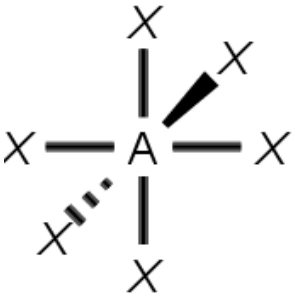
Molecular Shape and Polarity

AX_2	AX_3	AX_4	AX_5	AX_6
Linear	Trigonal Planar	Tetrahedral	Trigonal Bipyramidal	Octahedral
180°	120°	109.5°	120°, 90°, 180°	90°
				

1. The parent geometry of each shape group is shown above. Use these as a reference point to draw and name each of the following.

Electron Groups	Name	Sketch the Shape in 3D
AX_2E		
AX_3E		
AX_2E_2		
AX_4E		

AX_3E_2		
AX_2E_3		
AX_5E		
AX_4E_2		

2. How do you know if a bond is polar?

3. Determine if a covalent bond between each pair of atoms is polar or non-polar:

S and O O and H O and F N and O C and H N and Cl

4. Covalent bonds that include fluorine, oxygen, and nitrogen are almost always polar.
    a. Why is this a true statement? Consider electronegativity values.

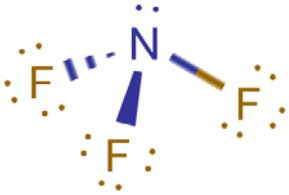
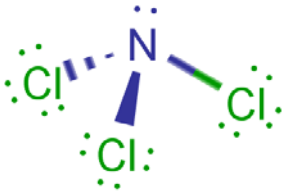
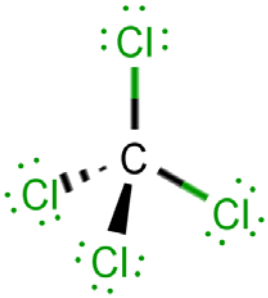
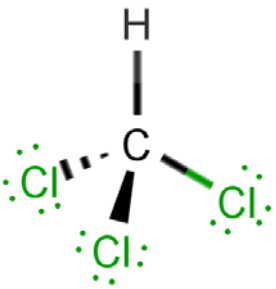
    b. What is one example of a polar bond that contains fluorine?

    c. What is one example of a non-polar bond that contains fluorine?

5. True or false. For each false statement, explain why it is not true.
   a. A polar molecule must contain at least one polar bond.

   b. All molecules that contain a polar bond are polar.

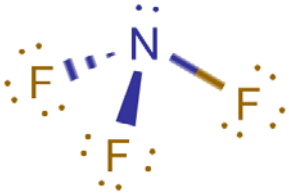
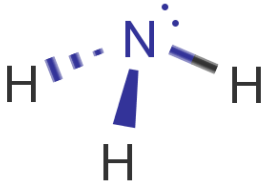
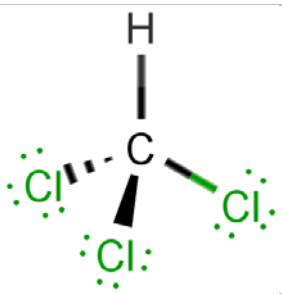
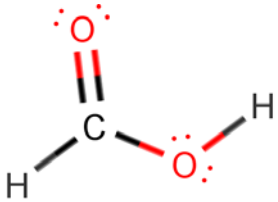
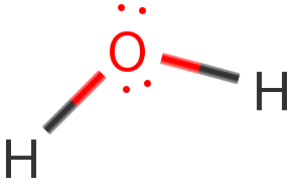
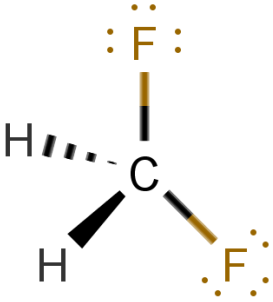
6. Consider the following compounds:
   a. Label all polar bonds with a dipole arrow ( ) pointing toward the negative pole.
   b. Determine if each of these compounds are polar or non-polar. They are drawn with the correct geometry.

			
Polar Nonpolar	Polar Nonpolar	Polar Nonpolar	Polar Nonpolar

7. Rank these four intermolecular forces from weakest to strongest:

   H-bond ion-ion London dispersion forces dipole-dipole

8. Consider the following compounds: Circle the compounds that can interact through dipole-dipole and put a box around those that can H-bond.

9. For each of the compounds below, determine the molecular geometry and list all intermolecular forces that help stabilize condensed phases.

Compound	Structure (draw it in in the correct geometry)	Molecular Geometry for EACH central atom	Circle all appropriate IMF
CO_2			Ion-ion Dipole-dipole H-bond LDF
CH_3Cl			Ion-ion Dipole-dipole H-bond LDF
CH_3CH_3			Ion-ion Dipole-dipole H-bond LDF
CH_3CO_2H			Ion-ion Dipole-dipole H-bond LDF
CH_3NH_2			Ion-ion Dipole-dipole H-bond LDF
H_2S			Ion-ion Dipole-dipole H-bond LDF
ICl_3			Ion-ion Dipole-dipole H-bond LDF
SiF_4			Ion-ion Dipole-dipole H-bond LDF