
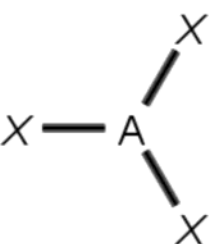

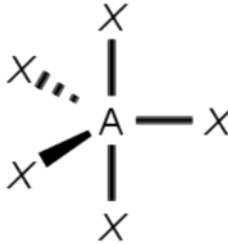







Molecular Shape and Polarity

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 ₂ E	bent	
AX ₃ E	trigonal pyramidal	
AX ₂ E ₂	bent	
AX ₄ E	Seesaw	

AX ₃ E ₂	T-shaped	
AX ₂ E ₃	linear	
AX ₅ E	Square Pyramidal	
AX ₄ E ₂	Square planar	

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

$$\Delta EN > 0.4$$

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
polar	polar	polar	polar	non	non

4. Covalent bonds that include fluorine, oxygen, and nitrogen are almost always polar.

a. Why is this a true statement? Consider electronegativity values.

They are the most EN atoms + are 0.5 away from anything else

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

C-F: or any other

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

atom bonded to F



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

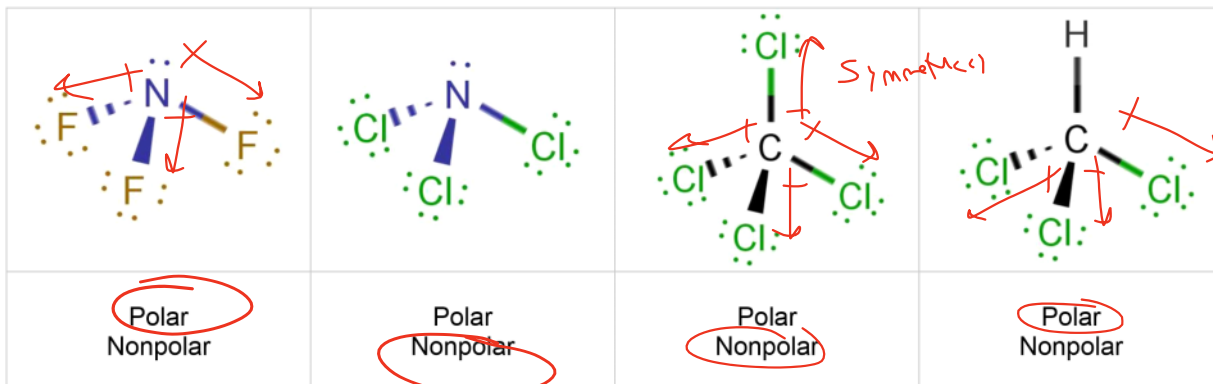
True

- All molecules that contain a polar bond are polar.

False - if a molecule is perfectly symmetrical, it cannot be polar

6. Consider the following compounds:

- Label all polar bonds with a dipole arrow (\rightarrow) pointing toward the negative pole.
- Determine if each of these compounds is polar or non-polar. They are drawn with the correct geometry.



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

③

H-bond

④

ion-ion

①

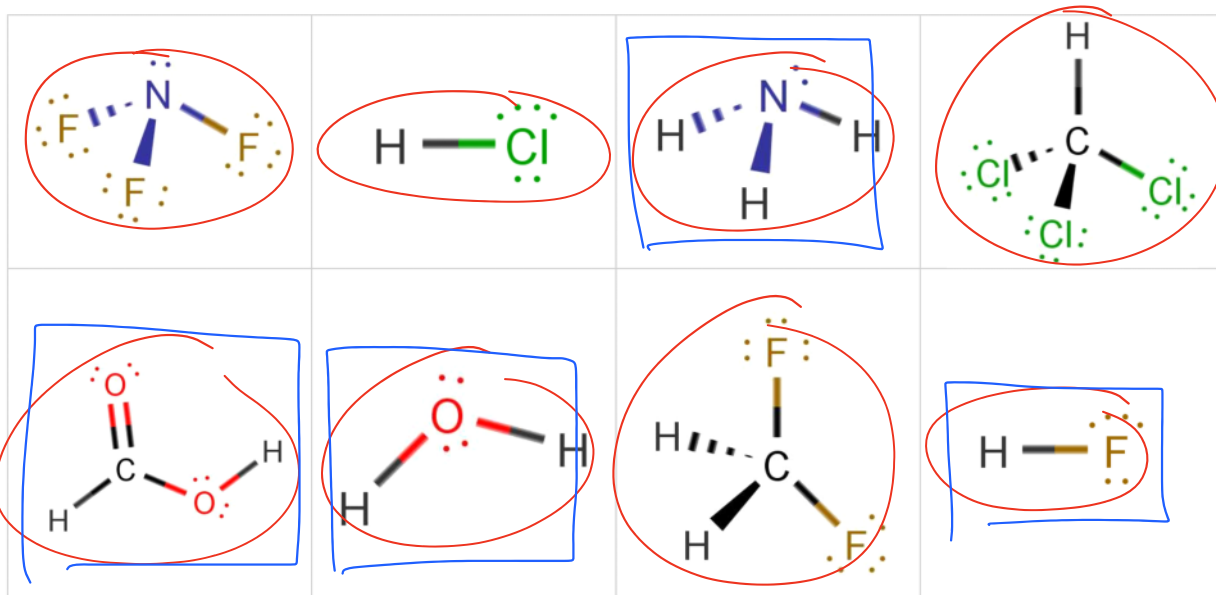
London dispersion forces

②

dipole-dipole

LDF < DD < Hbond < ion Strongest Weakest

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	Circle all appropriate IMF
CO ₂		linear	Ion-ion Dipole-dipole H-bond LDF
CH ₃ Cl		tetrahedral	Ion-ion Dipole-dipole H-bond LDF
CH ₃ CH ₃		both carbons are tetrahedral	Ion-ion Dipole-dipole H-bond LDF
CH ₃ CO ₂ H		tetrahedral trig. planar	Ion-ion Dipole-dipole H-bond LDF
CH ₃ NH ₂		tetrahedral trig. pyramidal	Ion-ion Dipole-dipole H-bond LDF
H ₂ S		bent	Ion-ion Dipole-dipole H-bond LDF
ICl ₃		T-shape	Ion-ion Dipole-dipole H-bond LDF
SiF ₄		tetrahedral	Ion-ion Dipole-dipole H-bond LDF