

Name:  
Period:  
Date:

Intermolecular Forces Tracked (Obj 3 and 4)

1. Complete the table below for the three types of intermolecular forces.

Type of force	Description	Between what types of molecules	Relative strength
Dipole-Dipole	attraction between oppositely charged dipoles	polar molecules	medium
LDF	One molecule makes electrons on another molecule move and induces a charge	all	weakest
H bonding	special attraction between molecules containing H-F, H-N, H-O	Hydrogen atoms bonded to highly electronegative atoms	strongest

2. Explain what effect molecular polarity and intermolecular forces have on the following properties:  
a. Boiling point

the stronger the forces the higher the boiling point

b. Solubility

substances with similar polarities and intermolecular forces will mix, but different ones won't

3. Acetone boils at about 56°C, water boils at 100°C, and CO<sub>2</sub> boils at -57°C.

a. Would you expect acetone to be polar or nonpolar? Explain why.

~~nonpolar~~ <sup>polar</sup> because it has a medium boiling point

b. What intermolecular forces would you predict are in acetone? Explain why.

LDF & dipole-dipole; Much higher than CO<sub>2</sub> which only has LDF, but not close enough <sup>to have H bonding</sup>

c. Rank the three molecules from greatest to weakest polarity. Explain your ranking.

water, ~~acetone~~ <sup>acetone</sup>, CO<sub>2</sub>; high boiling point means strong forces/polarity

d. Would you expect acetone to be soluble in water? Explain why.

yes because it is likely polar as is water

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4. Complete the chart below

Molecule	Valence electrons	Lewis Structure with bond polarity	Geometry type	Molecule polarity	Type of intermolecular forces
SeH <sub>2</sub>	1Se x 6 = 6 2H x 1 = 2 <u>8</u>		bent	non	LDF
AsH <sub>3</sub>	1As x 5 = 5 3H x 1 = 3 <u>8</u>		trig pyr pyr	non	LDF
SiBr <sub>4</sub>	1Si x 4 = 4 4Br x 7 = 28 <u>32</u>		tetrahedral	non	LDF
CHCl <sub>3</sub>	1C x 4 = 4 3Cl x 7 = 21 1H x 1 = 1 <u>26</u>		tetrahedral	polar	LDF dipole-dipole
HF	1H x 1 = 1 1F x 7 = 7 <u>8</u>		linear	polar	LDF dipole-dipole H bonding

5. Which of the chemicals in the chart above would mix with oil? Which would mix with water?

oil: SeH<sub>2</sub>, AsH<sub>3</sub>, SiBr<sub>4</sub> water CHCl<sub>3</sub>, HF

6. Answer the following questions using the chart below

a. Rank the compounds from weakest to greatest force.

pentanal, 1-pentanol, butanoic acid

b. Which compound(s) would you expect to be polar and why?

butanoic acid because it is soluble in polar water

IUPAC Name	Molecular Weight	Boiling Point	Water Solubility
butanoic acid	88	164 °C	very soluble
1-pentanol	88	138 °C	slightly soluble
pentanal	86	103 °C	slightly soluble