Mr. Bracken
AP Chemistry

Name BRACKEN KEY
Period ____

Intermolecular Forces Worksheet #2

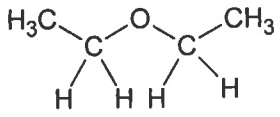
1. Hydrazine (N_2H_4), hydrogen peroxide (HOOH), and water (H_2O) all have exceptionally high surface tensions compared to other substances of similar molecular weights.

   (a) Write the Lewis structures for each of the three compounds listed above.

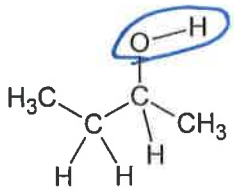
   (b) Provide an explanation to account for high surface tensions.

All three of these compounds show hydrogen-bonding leading to very strong intermolecular forces among the molecules.

2. Consider the two molecules shown below.



Ethyl ether



Butyl alcohol

   (a) Which compound is more soluble in water? Explain.

butyl alcohol is more soluble because the O-H bond allows hydrogen-bonding to occur between butyl alcohol and the surrounding water

   (b) Which compound has a greater equilibrium vapor pressure at 25°C? Explain.

Ethyl ether lacks hydrogen bonding so its molecules are not attracted to each other allowing it to evaporate much easier than butyl alcohol.

3. Which has a greater boiling point, ethane (C_2H_6) or hexane (C_6H_{14})? Explain your reasoning.

HEXANE HAS A GREATER BP BECAUSE IT HAS STRONGER LONDON FORCES. IT IS A LARGER MOLECULE AND IS MORE POLARIZABLE, LEADING TO STRONGER LONDON FORCES

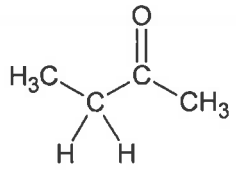
4. Ammonia (NH_3) and methane (CH_4) have similar formula weights, but ammonia has a much higher normal boiling point (-33°C) than CH_4 (-164°C). What explains such different boiling points?

NH_3 HAS EXTENSIVE HYDROGEN BONDING. THIS STRONGER ATTRACTION CAUSES IT TO HAVE A MUCH HIGHER BP.

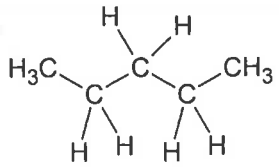
5. Why does MgO melt at a much higher temperature (2,852°C) than NaF (993°C)?

Mg^{2+} O^{2-} THE HIGHER THE IONIC CHARGES, THE STRONGER THE ATTRACTION.

6. Consider the two molecules shown below.



Butanone



Pentane

(a) Which molecule would be expected to have the greater boiling point? Explain.

BUTANONE BECAUSE IT HAS STRONGER DIPOLE-DIPOLE INTERMOLECULAR FORCES

(b) Which molecule would be expected to be more soluble in water? Explain.

BUTANONE IS MORE POLAR, AND WATER'S HIGH POLARITY WILL ALLOW BUTANONE TO BE MORE SOLUBLE THAN THE NONPOLAR PENTANE.