Honors Chemistry: Intermolecular Forces Questions

1. Sketch a diagram depicting the hydrogen bonding found in a solution of CH_3NH_2 and water.

2. Consider the following substances:

	C_6H_6	CH_3CH_2OH	C_8H_{18}	$CHCl_3$
structure				
Polar? Y/N				
Principal IMF				

a) Which has the highest viscosity? Justify your answer.

b) Which of the liquids in question two has the highest surface tension? The lowest?

c) Which of the following liquids has the highest rate of evaporation?

3. How is the surface tension of a liquid related to its intermolecular forces of attraction?

4. Why is ethanol (CH_3CH_2OH) so soluble in water?

5. Why is Br_2 a liquid at room temperature but Cl_2 is a gas?

6. Identify the type of intermolecular force that must be overcome to:

   (a) melt ammonia, NH_3

   (b) sublime dry ice (CO_2)

   (c) boil CH_3Cl

   (d) dissolve NaCl in water

7. Which of the following substance would dissolve in water the easiest? C_8H_{18}, HCOOH, O_2, CCl_4 .

8. List three differences between a nonpolar molecule and a polar molecule.

   1)

   2)

   3)

9. Describe the steps you would go through in determining the polarity of a substance given its formula.

10. Describe the steps you would go through in determining the type of IMF employed by a given substance.

11. Rank order the following substances in order of decreasing freezing points: CH_4, C_3H_8, C_4H_{10}, C_8H_{18}

_____

Lowest freezing point highest freezing point

13. State the general rule for predicting the solubility of one substance in another. Give two examples of this rule.

14. Which of the following liquids would have the *highest* vapor pressure ? Circle and justify you answer.

H_2O CS_2 CCl_4 CH_3Cl

15. How is the vapor pressure of a liquid related to its intermolecular forces of attraction?

16. What makes it possible for a spider to walk on water? Explain.....

17. Specifically, why does HCl have a higher boiling point than HI?

	HF	HCl	HBr	HI
structure				
ΔEN				
Polar? Y/N				
Principal IMF				

a) All of these "hydrogen halides" are gases at STP except for HF, which boils at 19^{o}C. Suggest a reason why HF has such a relatively high boiling point.

b) HCl has a lower boiling point than HI. Suggest a reason why this may be so.

19. Identify the type of intermolecular force that must be overcome in order to:

(a) boil gasoline (C_8H_{18}) _____

(b) evaporate CH_2F_2 _____

20. Assume that air consists of nitrogen, oxygen, argon, and water vapor. As the temperature is lowered air can be made to condense (turned into a liquid), list the order in which the components of air will liquefy.

_____
first to condense last to condense

21. What are two ways to boil a liquid?

1)

2)

22. What is true about the vapor pressure of any liquid at its boiling point?