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HONORS: Intermolecular Forces Worksheet

1. Why are the intermolecular attractions in $H_2O_{(g)}$ weaker than the attractions in $H_2O_{(l)}$ or $H_2O_{(s)}$?

2. Consider the following: Br_2 (Mass of 159.81 g), Ne (Mass of 20.18 g), HCl (Mass of 36.46 g), and N_2 (Mass of 28.01 g). **(Hint: Mass may not be the only factor involved! :-))**
   a. Which of the above would have the largest London dispersion forces? Why?

   b. Which of the above would have the largest dipole-dipole attractions? Why?

3. Which of the following molecules would exhibit hydrogen bonding: methane (CH_4), ammonia (NH_3), methyl fluoride (CH_3F), or dihydrogen monosulfide (H_2S)? Explain why!

4. List the type(s) of intermolecular forces that are present in each of the following examples:

Compound	Intermolecular Forces	Compound	Intermolecular Forces
HBr		H_2O	
I_2		CH_2Cl_2	
CS_2		C_2H_6	
NH_3		ClF_3	
H_2S		CH_3COOH	

5. Use your understanding of intermolecular forces to explain why: **(Hint: You may need to calculate molecular masses!)**
   a. ICl boils at 97 °C, while Br_2 boils at 59 °C.

   b. $CHCl_3$ boils at 61°C while $CHBr_3$ boils at 150 °C.

6. For each of the following, select the molecule that you would expect to have the higher boiling point and explain your reasoning: **(Hint: You may need to calculate molecular masses!)**
   a. HF or HCl

   b. CH_4 or C_3H_8

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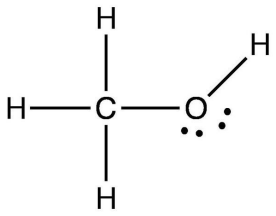
7. List the substances $BaCl_2$, H_2, CO, HF, and Ne in order of increasing boiling points and explain how you arrived at your answer.

8. How can we use intermolecular forces to explain the fact that chlorine is a gas at room temperature, while bromine is a liquid, and iodine is a solid?

9. Arrange the following in order of increasing melting point: RbF, CO_2, CH_3OH (Methanol), CH_3Br. Explain how you arrived at your answer.



10. **<u>Challenge</u>**: If you lived in Alaska, would it be better to keep methane (CH_4), propane (C_3H_8), or butane (C_4H_{10}) in an outdoor storage tank during the winter? Explain your answer.