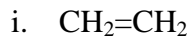
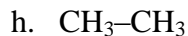


**Chapter 12 Practice Worksheet:  
Liquids, Solids, and Phase Changes**

1. Circle all of the molecules below that are polar:



2. Define each type of intermolecular force below. Give an example of each and describe what characteristic that example has that results in each type of intermolecular force.

a. Ion-dipole: \_\_\_\_\_

b. Dipole-dipole: \_\_\_\_\_

c. London dispersion forces: \_\_\_\_\_

d. Hydrogen bonding: \_\_\_\_\_

3. List the intermolecular forces that exist between molecules (or basic units) in each of the following. Circle the strongest force that will determine physical properties (e.g., boiling points) for each substance.

$\text{CH}_3\text{Cl}$  \_\_\_\_\_

$\text{H}_2$  \_\_\_\_\_

$\text{HCl}$  \_\_\_\_\_

$\text{Ne}$  \_\_\_\_\_

$\text{NH}_3$  \_\_\_\_\_

$\text{HF}$  \_\_\_\_\_

$\text{CH}_3\text{OH}$  \_\_\_\_\_

$\text{C}_2\text{H}_4$  \_\_\_\_\_

$\text{CO}_2$  \_\_\_\_\_

$\text{CO}$  \_\_\_\_\_

4. Explain the intermolecular forces that compete to determine whether or not an ionic substance will dissolve in water. Which force must be strongest in order for an ionic substance to dissolve?

Name: \_\_\_\_\_

Section: \_\_\_\_\_

5. How are boiling points affected by intermolecular forces?

6. Define surface tension and viscosity. How do intermolecular forces affect these properties (i.e., as intermolecular forces increase, what happens to each property?)?

7. Name the 6 types of phase changes.

Solid → liquid: \_\_\_\_\_ Reverse: \_\_\_\_\_

Liquid → gas: \_\_\_\_\_ Reverse: \_\_\_\_\_

Solid → gas: \_\_\_\_\_ Reverse: \_\_\_\_\_

8. List the following substances in order of increasing boiling points: BaCl<sub>2</sub>, H<sub>2</sub>, CO, HF, Ne, CO<sub>2</sub>

9. Why are heats of vaporization always larger than heats of fusion?

10. What is meant by **normal** boiling point and **normal** melting point?

11. a) Draw the phase diagram for water. Label each section and the phase changes that occur at each line (equilibria). Identify the normal boiling point and normal freezing point for water.

Name: \_\_\_\_\_

Section: \_\_\_\_\_

b) What does the negative slope of water's solid/liquid equilibrium line indicate? Why is carbon dioxide's positive?

c) What happens to the melting and boiling points of water as pressure is decreased?

12. What are the four types of crystalline solids? Briefly describe each type.