A. Ancheta

Name: _____ Period: _____ Date: _____ Seat No.:____

Intermolecular Forces

Review:

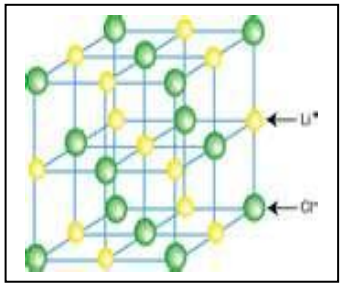
Chemical compounds are combinations of atoms held together by chemical bonds or intra-molecular forces. These chemical bonds are of two basic types – ionic and covalent. Ionic bonds result when one or more electrons from one atom or group of atoms is transferred to another atom. Positive and negative ions are created through the transfer. In covalent compounds no electrons are transferred; instead electrons are shared by the bonded atoms.

- Ionic - bonds between metals and nonmetals; electronegativity difference greater than 1.7; metal loses electrons and nonmental gains electrons.

- Covalent – bonds between nonmentals.

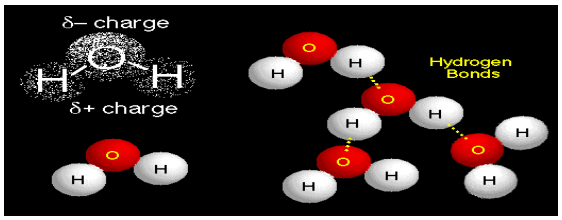
However, there are inter-molecular forces between molecules which determine the physical properties of a substance, such as melting point, boiling point, solubility and odor.

- Ionic compounds – Crystalline lattice formed by positive and negative ions (**Ionic forces**) when molecules interact. This is a very strong attraction.
    1. high melting point(mp) & boiling point(bp)
    2. non smell
    3. solid at room temperature
    4. extremely low vapor pressure



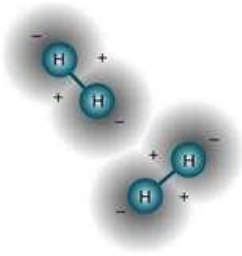
- Covalent compounds

  Polar – **dipole forces** or interaction between partial positive and partial negative ends of the molecules.
    1. medium mp and bp.
    2. smell with a few exception
    3. all three phases at room temperature.
    4. low vapor pressure



  Example: hydrogen bonding in water

  Nonpolar – weak interaction or **London dispersion forces** between random slight positive and negative ends of the molecules as electrons move.
    1. low mp and bp
    2. smell with some exceptions
    3. all three phases at room temperature.
    4. high vapor pressure



Fill out the following using the information you just read.

Table l. Summary of characteristics of compounds

Compound	**Ionic**	**Covalent (Polar)**	**Covalent (nonpolar)**
Type of chemical bond (intra molecular forces)			
Type of intermolecular forces			
Relative Melting points (high, medium, low)			
Relative Boiling Point (high, medium, low)			
Smell (yes, no, most)			
Phase at room temperature (s, l, g)			
Vapor pressure			

Questions:

1. Which type of chemical bonding has the strongest intermolecular forces? _____
2. Predict which of the following chemicals will melt first? Explain why.
   NaCl, Paraffin Wax, Baking Soda, Aluminum.

_____

3. Identify the intermolecular forces present in the following solids.

a. Ar _____ b. HCl _____ c. HF _____
d. $CaCl_2$_____ e. CH_4 _____ f. CO _____
g. $NaNO_3$ _____ h. NH_3_____

4. Rationalize (give a reasonn) the difference in boiling points for each o f the following pairs of substances.

a. HF 20°C HCl -85°C

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b. HCl – 85°C LiCl 1360°C

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5. In each of the following groups of substances, circle the one that has the given property. Justify your answer by stating its intermolecular force.
   a. highest boiling point: HCl, Ar, or F_2 _____
   b. lowest boiling point: HF, Cl_2, HCl _____