

CH301 Worksheet 9 Intermolecular Forces

- Rank the following solution properties (from lowest to highest): C_2H_6 , H_2O , CH_4 , NH_3
 - boiling point
 - viscosity
 - evaporation rate
 - capillary action
- Which of the above molecules are affected by instantaneous dipoles? Explain.
- Name two solution properties that have a trend that is opposite the trend for surface tension.
- Give the approximate strength of
 - a covalent bond
 - a hydrogen bond
 - a dipole-dipole interaction
- What is the *dominant* intermolecular force involved in the properties of the following species:
 - Potassium chloride, KCl
 - Xenon tetrafluoride, XeF_4
 - Ethanol, $\text{C}_2\text{H}_5\text{OH}$
 - NO_2^-
- Provide an explanation for the following physical properties:
 - Water beads up on your windshield, but acetone doesn't.
 - Butane, C_4H_{10} , is a gas at STP, while pentane, C_5H_{12} , is a liquid.
 - Molecular nitrogen boils at 77 K, while nitric oxide boils at 110 K.

6. Explain the basic theory behind
(a) instantaneous dipoles
- (b) hydrogen bonding.
7. Why can an ionic bond be considered to be both an intermolecular and intramolecular force?
8. Dr. Laude has used core concepts associated with kinetic molecular theory, intermolecular forces and charge density to help him explain and rank the various properties of chemical compounds. For each core concept below, list two properties that can be explained by the concept. Then write a one sentence argument you would use to rank a series of compounds and rank the compounds provided for each.

Kinetic molecular theory:

Two properties you can rank: _____

One sentence argument:

Ranking of H_2 , SF_6 , CHCl_3 , H_2O and CCl_4 :

Charge Density:

Two properties you can rank: _____

One sentence argument:

Ranking of NaCl , NaI , LiF , CaCl_2

Intermolecular forces:

Two properties you can rank: _____

One sentence argument:

Ranking of H_2 , SF_6 , CHCl_3 , H_2O and CCl_4 :

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