

Name _____
Section _____

Intermolecular Interactions

Dispersion forces exist between all molecules. They involve displacements of all the electrons in molecules, and they increase in strength with increasing molecular mass. The forces also depend on molecular shapes.

Forces associated with permanent dipoles involve displacements of electrons pairs in bonds rather than in molecules as a whole. These forces are found only in substances with resultant dipole moments (polar molecules) Their existence adds to the effect of dispersion forces also present.

When comparing substances of roughly comparable molecular masses, dipole forces can produce significant differences in properties such as melting point , boiling point and enthalpy of vaporization.

When comparing substances of widely different molecular masses, dispersion forces are usually more significant than dipole forces.

Complete the following table. The name and formula are given for each compound. Draw a structural formula for a molecule of each compound. Then determine the molecular weight of each of the molecules. Dispersion forces exist between any two molecules, and generally increase as the molecular weight of the molecule increases. Next, examine each molecule for the presence of hydrogen bonding. Before hydrogen bonding can occur, a hydrogen atom must be bonded directly to an N, O, or F atom within the molecule. Tell whether or not each molecule has hydrogen-bonding capability.

Substance	Formula	Structural Formulas	Molecular Weight	Hydrogen Bond (Yes or No)
ethanol	C_2H_5OH			
1-propanol	C_3H_7OH			
1-butanol	C_4H_9OH			
n-pentane	C_5H_{12}			
methanol	CH_3OH			
Neopentane	C_5H_{12}			
diethyl ether	$C_2H_5OC_2H_5$			
n-hexane	C_6H_{14}			

DATA TABLE

Substance	Boiling Point
ethanol	
1-propanol	
1-butanol	
n-pentane	
Diethyl ether	
neopentane	
methanol	
n-hexane	

	Explain the difference in boiling point of the following pairs
Propanol and Butanol	
n-pentane and 1-butanol	
n-pentane and n-hexane	
Pentane and neopentane	

Questions

- Two of the liquids, n-pentane and 1-butanol, had nearly the same molecular weights, but significantly different boiling point values. Explain the difference in boiling point values of these substances, based on their intermolecular forces.

2. Which of the alcohols studied has the strongest intermolecular forces of attraction? The weakest intermolecular forces? Explain

3. Which of the alkanes studied has the stronger intermolecular forces of attraction? The weaker intermolecular forces? Explain using the boiling points of the different compounds