During Class Invention

Intermolecular Attractive Forces

Name(s) with Lab section in Group

_____

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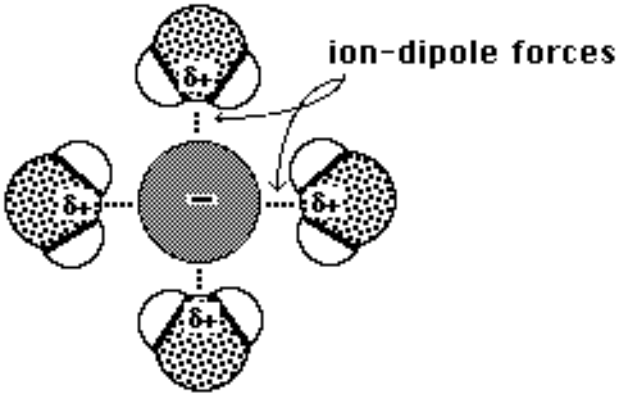
1. Sketch the orientations of molecules and/or ions involved in the following intermolecular attractive forces. Include at least one specific example where each attractive force is important. For each one, tell what causes the force and describe its strength relative to the others.

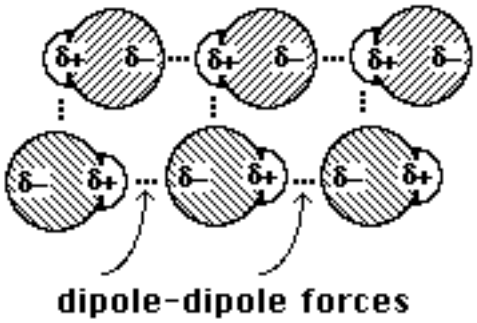
a) ion-dipole forces

Ion dipole forces are important when an ionic solid dissolves in water. In the figure on the right an anion is solvated by water molecules. The water molecules are oriented so there is an electrostatic attraction between the ion and the water molecule. The strength of attraction depends on the size of the polar molecule and the size of the ion, the charge on the ion and the dipole moment on water. The smaller the ion and the greater the charge the stronger the attractive force.



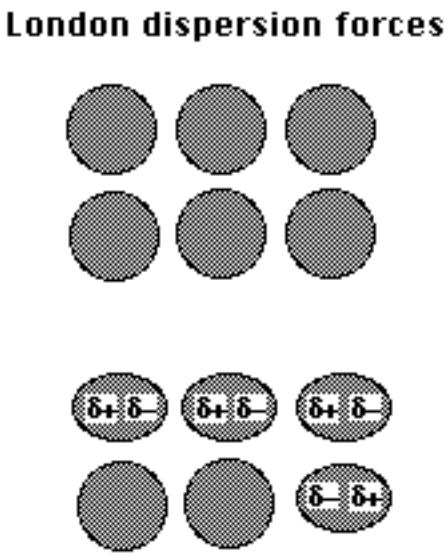
b) dipole-dipole forces

Dipole-dipole forces exist between polar compounds such as hydrogen chloride molecules as shown to the right. The molecules align themselves such that the opposite charge resulting from the unequal sharing of electrons form an attractive interaction.



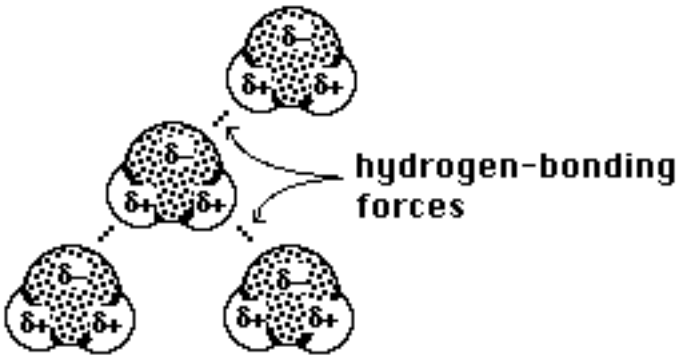
c) London dispersion forces

London dispersion forces exist between atoms and nonpolar compounds. In the example on the right six atoms are shown in a form depicting the symmetric distribution of electrons. In the second group of six some instantaneous dipoles are shown. The instantaneous dipoles result from the unequal distribution of electrons. One atom with an instantaneous dipole will effect other atoms adjacent to it producing a short range attractive interaction.

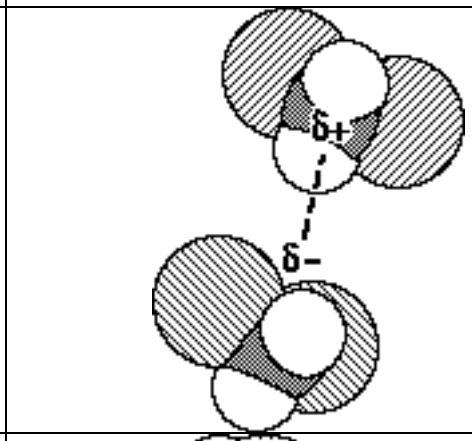
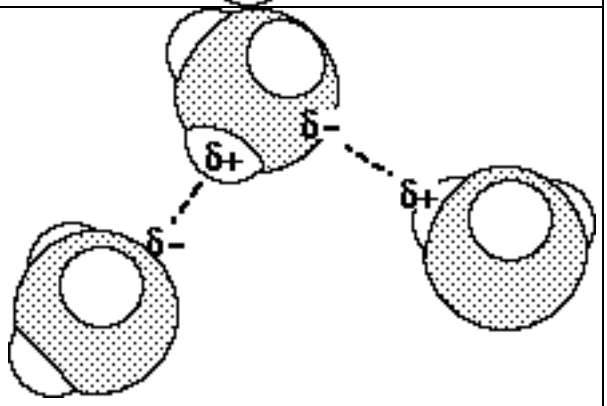
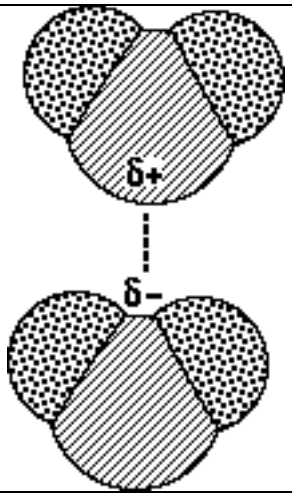


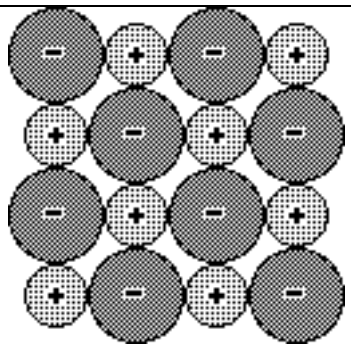
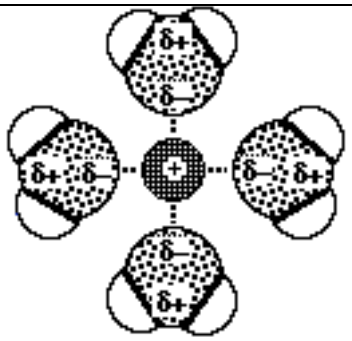
d) hydrogen-bonding forces

Hydrogen-bonding forces occur when a hydrogen atom covalently bonded to a very electronegative atom (O,N,F) is attracted to lone pair of electrons on an atom on an adjacent molecule.



2. Complete the following table.

System	Primary Intermolecular Force	Sketch of Interaction Between Particles
$CH_2Cl_{2(l)}$	**dipole-dipole and dispersion forces**	
$NH_{3(l)}$	**Hydrogen bonding and dispersion forces**	
$SO_{2(g)}$	**dipole-dipole and dispersion forces**	

$KBr_{(s)}$	**Ionic bonding**	
$I_{2(s)}$	**London dispersion**	
$NaCl_{(aq)}$	**ion-dipole**	
$CH_3CH_2OH_{(aq)}$	**hydrogen-bonding**