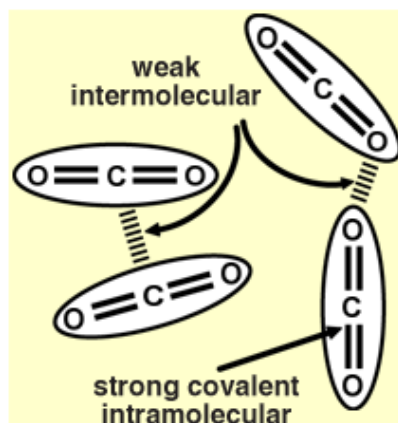


Topic:	Intermolecular Forces
Objective:	FK_03_06
<p>Given a molecule and the electronegativity values the student must be capable of doing the following:</p> <ul style="list-style-type: none"> • determine the polarity of each bond • determine the polarity of the molecule (polar / nonpolar) • determine its behavior between positive and negative plates 	

Introduction



<http://www.bbc.co.uk/scotland/education/bitesize/higher/img/chemistry/energy/bsp/fig13.gif>

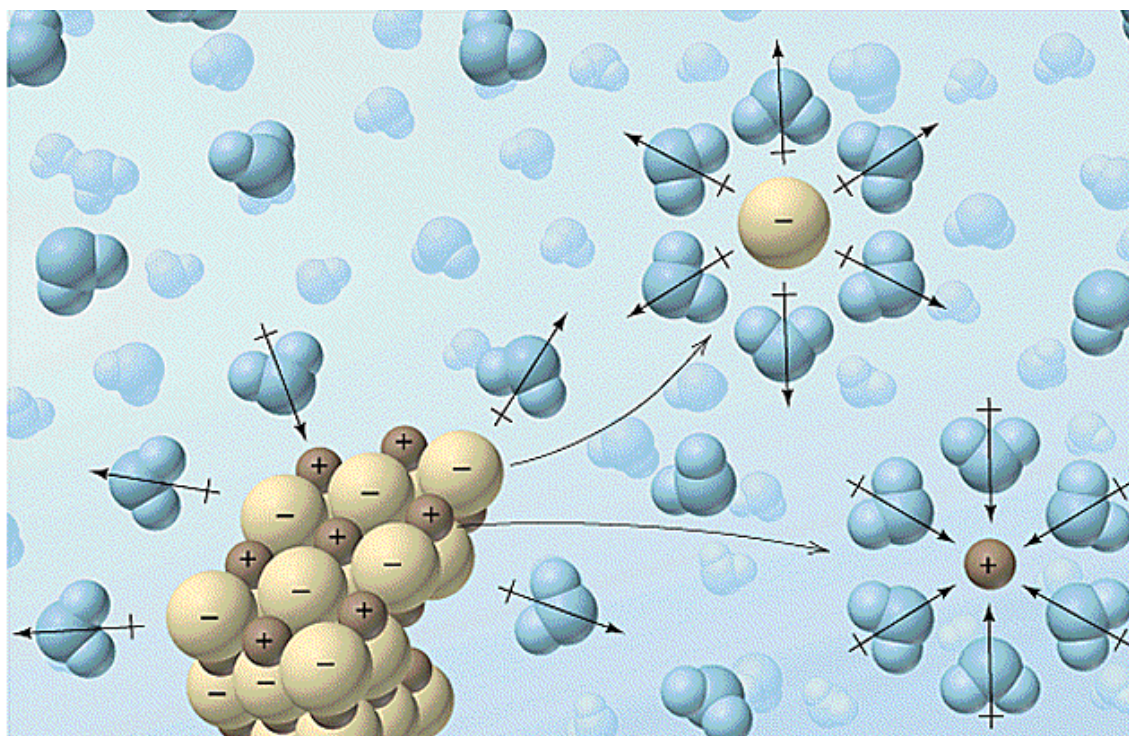
Intermolecular forces (forces between molecules) are much weaker than covalent bonds.

Three types of intermolecular attractive forces are known to exist between neutral molecules:

- dipole-dipole forces
- London dispersion forces
- hydrogen-bonding forces

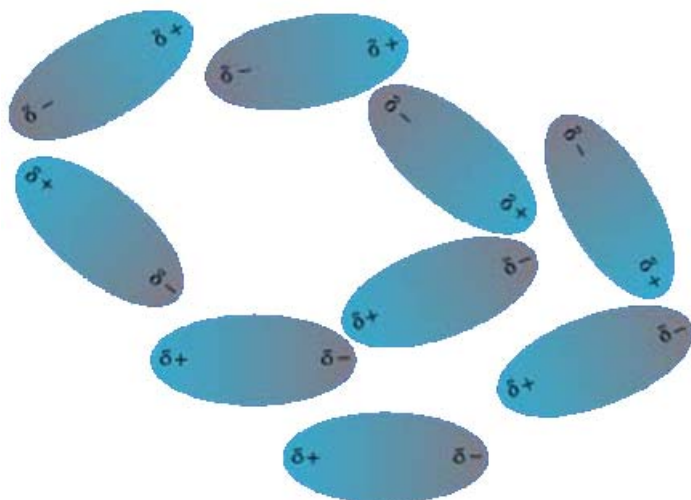
Ion-dipole forces

An ion-dipole force exists between an ion and the partial charge on the end of a polar molecule.



http://itl.chem.ufl.edu/2041_f97/lectures/g_003.GIF

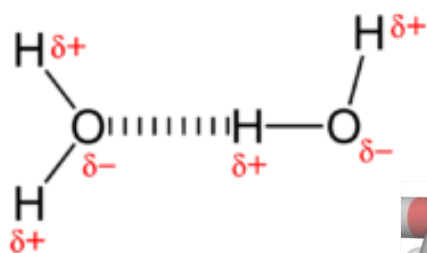
Dipole-dipole forces



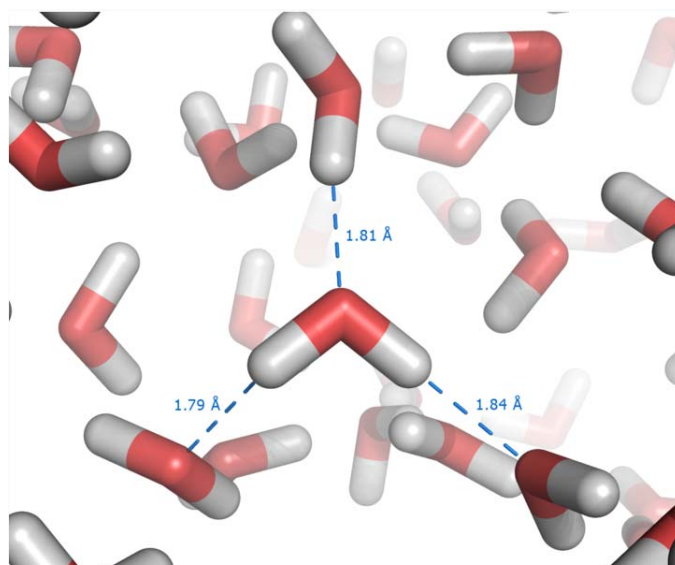
http://stezlab1.unl.edu/reu1999/dputn226/ChemHelp/RET_Web_Pages/im_forces/dip_dip.jpg

A dipole-dipole force exists between neutral polar molecules. Polar molecules attract each other when the positive end of one molecule is near the negative end of another.

Hydrogen bonding

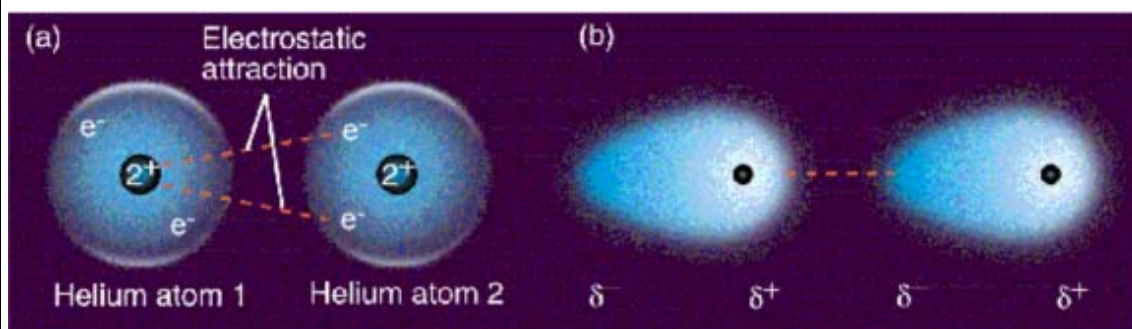


Hydrogen bonding is a special type of intermolecular attraction that exists between the hydrogen atom in a polar bond (particularly H-F, H-O or H-N) and an unshared electron pair.



http://upload.wikimedia.org/wikipedia/commons/thumb/4/43/Liquid_water_hydrogen_bond.png/722px-Liquid_water_hydrogen_bond.png

London Dispersion Forces



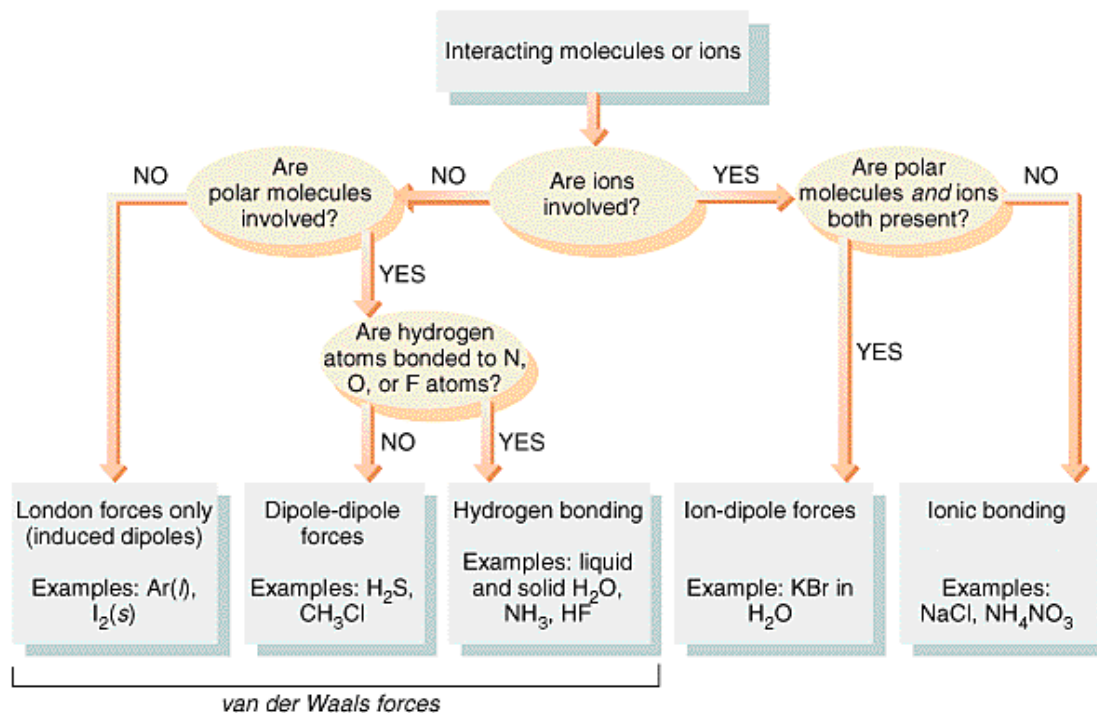
http://www.miramar.sdccd.cc.ca.us/faculty/fgarces/ChemProj/Ch201_Sp2001/Margarita/IMF.htm

The motion of electrons in an atom or a molecule can create an instantaneous dipole moment.

Thus, attraction between those instantaneous dipoles happen and this type of attraction is called London dispersion force.

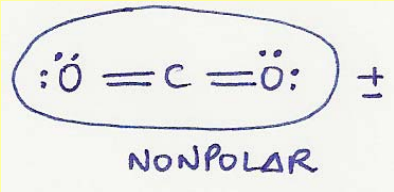

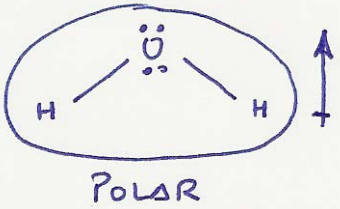
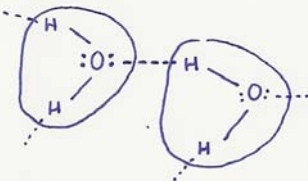
Summary

In order to know the type of force that exists between molecules, we can try the next questions and answers:



http://itl.chem.ufl.edu/2041_f97/matter/FG11_012.GIF

EXERCISE. Determine the type of intermolecular force that exists in the following examples.

Formula	Molecular Polarity	Intermolecular Force
CO ₂		<p>London Dispersion Force</p> 
H ₂ O		<p>Hydrogen bonding</p> 
HCl		
SO ₃		
SO ₂		
NH ₃		
BCl ₃		

Electronegativities:

C=2.5; O=3.5; H=2.1; Cl=3.0; S=2.5; N=3.0; B=2.0