States of Matter - Solids, liquids, Gases

**Review of Ionic vs Covalent Bonds**

**Ionic:**

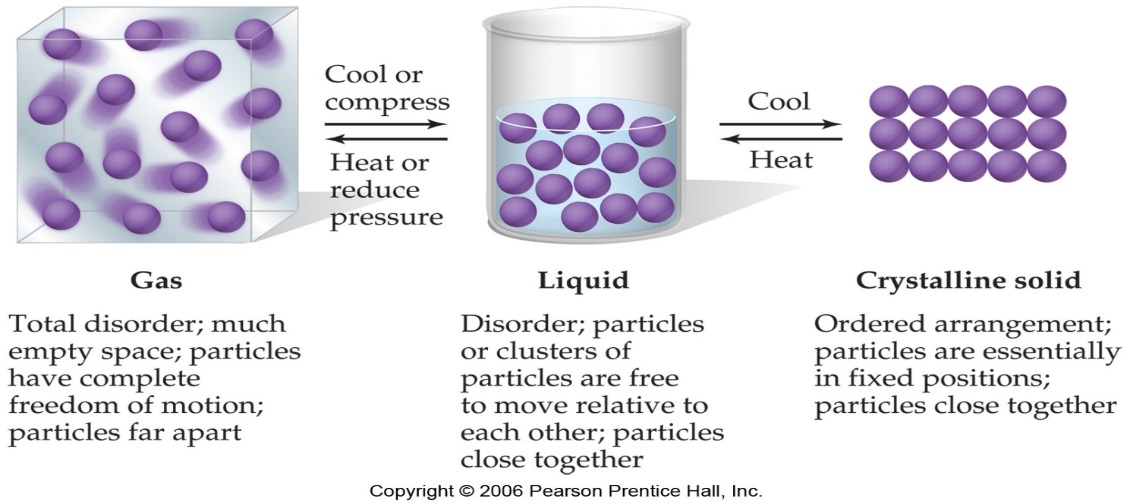
* \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_ of electrons
* \_\_\_\_\_\_\_\_\_\_ bond

**Covalent:**

* Nonmetal and \_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_ of electrons (equal or \_\_\_\_\_\_\_\_\_)
* \_\_\_\_\_\_\_\_\_\_\_ bond

**States of Matter:**

* Forces other than chemical \_\_\_\_\_\_\_\_\_ determine if a substance is a solid, liquid or gas at \_\_\_\_\_\_ temperature



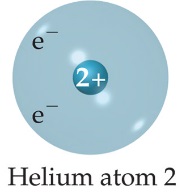
**Intermolecular forces:**

* Intermolecular forces are how one \_\_\_\_\_\_\_\_\_\_\_\_\_ interacts with the molecule next to it.
* It is not an interaction between \_\_\_\_\_\_\_\_\_\_\_, that is a BOND (ionic or covalent).
* Intermolecular forces are \_\_\_\_\_\_\_\_\_ than bonds between atoms

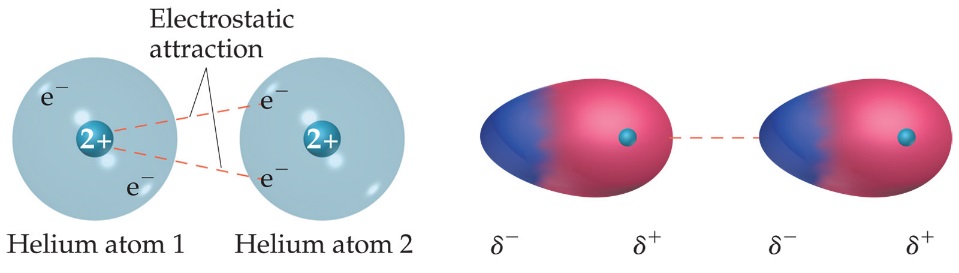
**Dispersion forces**- weak attractions due to shifts in the \_\_\_\_\_\_\_\_\_\_\_ that are in the electron cloud.

* These are \_\_\_\_\_\_\_\_\_\_\_ forces
* Example: Dry ice

Carbon dioxide is a gas at room temperature yet when the temperature is \_\_\_\_\_\_\_\_ enough the particles will have enough \_\_\_\_\_\_\_\_\_\_ for each other to come close together and form a \_\_\_\_\_\_\_.



* The electrons in the \_\_\_\_\_\_\_\_\_\_ level of helium \_\_\_\_\_\_\_\_ each other (so tend to stay far away from each other), occasionally wind up on the same \_\_\_\_\_\_\_\_\_\_ of the atom.
* At that instant, the helium atom is \_\_\_\_\_\_\_\_\_, with an \_\_\_\_\_\_\_\_\_ of electrons on one \_\_\_\_ and a shortage on the other side.



* Another Helium nearby would be \_\_\_\_\_\_\_\_\_\_ to the “polar” Helium. Remember – it is only a

temporary arrangement – the electrons are still \_\_\_\_\_\_\_\_\_\_\_\_\_\_!

* These forces are \_\_\_\_\_\_\_\_\_\_ forces
* Exist mainly between \_\_\_\_\_\_\_\_\_\_ gas atoms and \_\_\_\_\_\_\_\_\_ molecules
* The strength of dispersion forces \_\_\_\_\_\_\_\_\_\_\_ with increased molecular weight.
* (bigger atom/molecule = \_\_\_\_\_\_\_\_\_\_\_ force)

Which has the stronger Dispersion force?

1. Cl2
2. Br2

Which has the stronger Dispersion force?

1. He
2. Ne
3. Ar
4. Xe

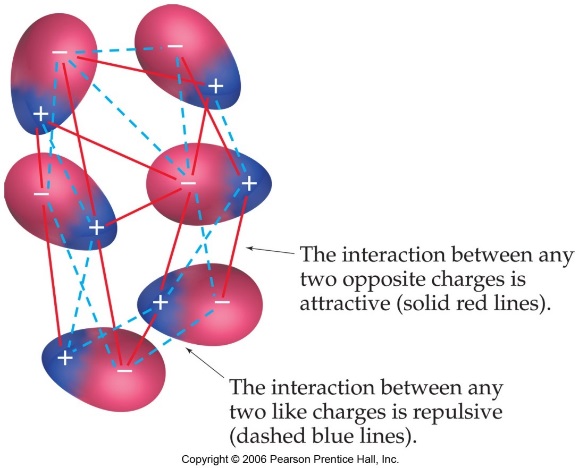
Which has the stronger Dispersion force?

1. CH4
2. C2H6
3. C4H10

**Dipole-Dipole Forces** - form between 2 **\_\_\_\_\_\_\_\_\_\_\_** molecules.

* Remember polar molecules have an area that is \_\_\_\_\_\_\_\_\_\_\_\_ positive and \_\_\_\_\_\_\_\_\_\_ negative due to \_\_\_\_\_\_\_\_\_\_\_ in the bond that holds the atoms together
* Example: HCl

The positive end of one is attracted to the \_\_\_\_\_\_\_\_\_\_\_\_ end of the other and vice-versa.



Which of the following molecules have dipole-dipole forces present?

1. NH3
2. CH4
3. Both

**Hydrogen bonds** - form when both molecules contain \_\_\_\_\_\_\_\_\_\_\_\_\_ and either **\_\_\_\_\_, \_\_\_\_\_,** or **\_\_\_\_**.

* Are unusually **\_\_\_\_\_\_\_\_** forces
  + Example: (H2O)
* Water is \_\_\_\_\_\_\_\_. The interaction occurs when the negatively charged oxygen on one water molecule is attracted to the \_\_\_\_\_\_\_\_ charged Hydrogen on a different water molecule.

Which of the following compounds has hydrogen bonding present?

1. H2S
2. H2O
3. Both

***Properties of Liquids***

**1. Surface Tension**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-Resistance of a liquid to increase in surface area
* Measure of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces
* Liquids with high intermolecular forces have \_\_\_\_\_\_\_\_\_ surface tensions
* Describe an example of Surface Tension:

**2. Capillary Action**

* Spontaneous \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a liquid in a narrow tube
* Caused by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces

cohesive forces-intermolecular forces \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ liquid molecules

adhesive forces- force between the liquid molecules and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; occur when the container is made of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ substance

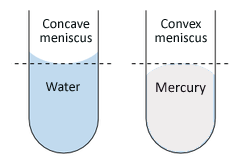
Example of Capillary Action

When water is placed in a glass graduated cylinder, the meniscus is concave

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces > \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces (glass is \_\_\_\_\_\_\_\_\_\_)

When mercury is placed in the same graduated cylinder, the meniscus is convex

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces > \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_forces (mercury contains only dispersion forces-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)



**3. Viscosity**

* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to flow
* Strong intermolecular forces result in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ viscosity
* Large molecules also have high viscosity due to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forces
* As temperature increases, viscosity \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4. Vapor Pressure**

* Pressure of vapor \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the surface of a liquid
* Caused when the molecules on the surface break away and go into the \_\_\_\_\_\_\_\_\_\_\_phase
* In order to break away, the molecules must possess a \_\_\_\_\_\_\_\_\_\_\_\_\_ amount of kinetic energy
* High intermolecular forces result in \_\_\_\_\_\_\_\_\_\_\_\_\_ vapor pressures
* Volatile liquids are liquids that evaporate \_\_\_\_\_\_\_\_\_\_\_\_ resulting in \_\_\_\_\_\_\_\_ vapor pressures
* Substances with weak intermolecular forces tend to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* As temperature increases, vapor pressure \_\_\_\_\_\_\_\_\_\_\_ (more molecules possess the minimum \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the rate of evaporation increases)