12.3 Liquids

* Liquids have definite volume, no definite shape

- Liquids have more kinetic energy than solids - therefore molecules repel each other w/more energy

The Kinetic Molecular theory states that particles do NOT have fixed positions, but forces of attraction do limit their range of motion

- Liquids are generally less dense than solids
- Many liquids are incompressible - takes an enormous pressure to make even small changes in volume

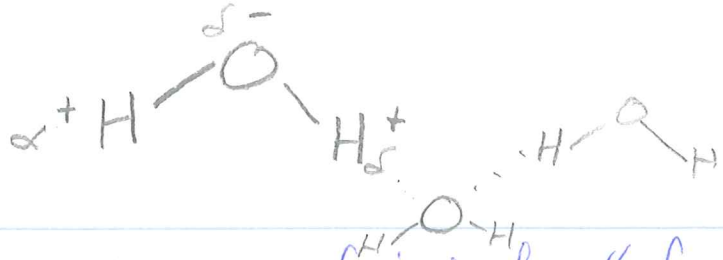
Liquids and gases are both considered fluids - can flow - liquids are less fluid than gases @ same temp. due to intermolecular forces.

Viscosity - the measure of resistance of liquids to flow - determined by intermolecular forces, size & shape of particles, and temp.

- Thicker, more dense fluids are highly viscous.
- Water has low viscosity

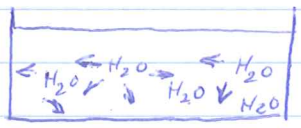
- Not all fluids are considered to have viscosity

- Ketchup Races Demo



Surface tension - measure of inward pull of particles in the interior of a liquid.

- This is why some bugs can walk on water and why belly-smackers hurt!



- Gives the surface a more "solid-like" behavior

Jar w/ H_2O Demo

- Water surface tension of H_2O in jar remains when inverted & is stronger than the force of gravity that you would expect to make water drop out

Surface tension can be used to test how many drops of water can exist on a penny before falling off.

Penny Drop Lab

Surfactants - substances that can be added to liquids and decrease attractive forces.

ex) Elimmating Hydrogen bonds in H_2O

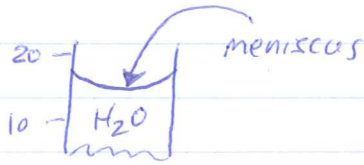
- decreases surface tension w/surfactants (detergents) increase ability for water to interact w/dirts on surfaces or clothing and remove them.

<u>Cohesion</u> - Attraction of "like" molecules to one another.

This is why droplets of H_2O on windshield join up to make larger droplets.

<u>Adhesion</u> - Attraction of "un-like" molecules
ex) plastic straw in pop - <u>capillary action</u>

We use meniscuses to measure volume all the time, which is a result of adhesion



- A meniscus exists because gravity pulls down on the H_2O molecules in cylinder, but the H_2O molecules near the sides are attracted to the glass or plastic cylinder and experience greater attraction than between H_2O molecules (co-hesion) Adhesion > Cohesion

<u>Vapor</u> - gas phase of substances normally a liquid @ room temp. - requires kinetic energy

- <u>Vaporization</u> = liquid → gas or vapor
<u>Evaporation</u> = vaporization only @ surface of liquid

Substances can vaporize only if they have enough energy to overcome or match the pressure of the air around them, which allows them to boil & escape the liquid.

<u>Evaporation Demo</u>

The pressure exerted by a vapor or gas over a liquid is known as <u>vapor pressure</u>

Hand boiler demo

When enough heat is applied to the vessel, the heat causes the molecules to spread apart & gain kinetic energy, ↑ pressure in liquid & equal the vapor pressure in the container, thus boiling, and vapor is released (gas)

- This is the boiling pt. of a liquid

- This temperature required for boing to happen is different for different liquids, and at different pressures - so it is possible for liquids to boil @ lower temps. (like room temp.)

Volatile chemicals - have low boiling pts/vapor points