## Matter:

**Matter**

**Matter is anything that has mass and takes up space**. *You can’t see oxygen gas, but it is made of atoms and has mass and takes up space.*

Molecules

**Molecules are made of 2 or more atoms**.

-*Some molecules are made up of all the same kind of atom.   
 What do we call these kinds of molecules?*

*-Some molecules like water (hydrogen + oxygen) are made up  
 of different kinds of atoms.*

**Atoms**

**Atoms are the basic particle from which all elements are made.**  
**Atoms are the smallest part of an element that still has the same properties of that element!**

*-For example an atom of the element gold, has the same  
 properties (density, melting point etc) as a pound of gold.*

*-Atoms are so small they still cannot be seen.*

*-Scientists look at the behavior of atoms*.

Element

**An element is a substance made up of only one kind of atom**. **Elements cannot be broken down into simpler** **substances**. *There are about 118 known elements (Periodic Table).*

Compounds

**A compound is a substance made up of more than one kind of atom**. *Water is a compound (hydrogen + Oxygen)*

Atoms

Sub atomic particles

Nucleus  
The center of an atom.

Protons

Positivly charged particles in the nucleus of an atom.

Neutrons

Neutral (no) charged particles in the nucleus of an atom.

Electrons

Negatively charged particles orbiting (zooming around) the nucleus of an atom.

PHYSICAL & CHEMICAL CHANGES OF MATTER

**Physical Changes:**

Changes of matter that **do not** change the chemical make-up

(the substance stays the same).

The molecular composition stays the same!

**Examples** of physical changes:

-**Size**: If you cut a cookie in ½, both halves are still a cookie

-**Shape**: If you cut a round chocolate chip cookie into the   
 shape of a star, it is still a chocolate chip cookie.

-**Phase Change**: (solid, liquid, gas), Water is H2O when it is

ice, water vapor or liquid water state.

-**Boiling Point**: water boils at the same temperature weather   
 it is in a cup or a pool

-**Melting Point**: gold melts at the same temperature weather   
 it is a tiny gold earring or a 10 pound block of gold.

Liquid gold has the same molecules as solid   
 gold.

-**Freezing Point**: water freezes at the same temperature

**Chemical Changes:**

Changes of matter that do **change** the chemical make-up (the substance is now a different substance).

The molecular composition is now different

Examples of Chemical changes

-Rusting: If you leave a steel tool outside in the rain it will   
 rust. The rust is a newly formed substance.

-Burning: If you burn wood, it is no longer wood.

-cooking: bake a cake!

Phases & States

[States of Matter](http://www.chem.purdue.edu/gchelp/atoms/states.html)

[States of Matter: Molecules](http://www.harcourtschool.com/activity/states_of_matter/index.html)

[States of Matter: Info](http://idahoptv.org/dialogue4kids/season7/matter/facts.cfm)

## Kinetic Theory of Matter

***All particles that make up matter are always moving!***

* **Solids**

**Particles in solids vibrate back and forth. There is very little movement, but there is movement!**

*Can you feel your chair move?*

* **Liquids**

**Particles in liquids move around freely, bumping and tumbling into each other.**

*Can you feel the water in your pool move?*

* **Gas**

**Particles in gasses are far apart and move at high speeds. Particles may collide, but do not otherwise interact.**

*Can you see the gas particles move?*

* **Plasma**

***Glowing Gas*! Plasma is a gas that is charged up by an energy source. This energy frees up the electrons which creates a glowing plasma. Example: Stars, our sun**

***Add heat = Greater particle movement***

***Subtract heat = Less particle movement***

***The addition or subtraction of heat can change a substance from one phase to another.***

Link to water molecules in different states

<http://www.physics-chemistry-interactive-flash-animation.com/matter_change_state_measurement_mass_volume/water_states_molecules.htm>

**HEAT**

**Heat** is a flow of energy from an object at a high temperature (*lots of particle movement*) to an object at a lower temperature (*little particle movement*).

Remember the molecules of matter are in constant motion.

Example:

1. Put ice in a warm drink
2. Why does the ice melt?
3. Answer, the heat from the drink warms the ice and the ice melts. The energy leaves the drink and flows to the ice, thus lowering the temperature of the liquid.

**Absolute zero**

The temperature at which there is no particle movement. Absolute zero is matter’s lowest possible temperature. No heat energy remains in that substance. There is no particle movement at this temperature.

FYI, Ice is not near absolute zero. Ice still has heat energy inside of it (the particles are still moving)

Thermal Expansion

All gases, many liquids, and most solids expand with increased thermal energy (heat). *The molecules move Faster and spread farther apart with added heat making the substance bigger!*

**Mass:**

*The amount of matter in something.*

*Example: what has more mass a 10 pound bowling ball or a 25 pound bag of cotton candy?*

**Volume:**

*The amount of space matter takes up. Or the amount of stuff something can hold.*

*Example: What has more volume, a can of soda, or a gallon of milk?*

**Weight:**

*The way we measure the force of gravity on EARTH!  
Example: Mr Hipps weigh’s 185 pounds!*

**Gravity:**

*The force that holds us down. This is a force that attracts. Everything with mass has some amount of gravity…even you!*

*Example: Without gravity, Mr. Hipps would be floating into space, and so would you!*

**Density:**

*The amount of matter in a given space or volume.*

*Example: What has more density a bowling ball or a basketball?*

*What has more density water or milk?*

*What has more density peanut butter or jelly?*

**Mixtures:**

*Anything you can combine is a mixture.*

*Example: salad, mashed potatoes and gravy, a brick, a desk*

**Solution**

*A mixture where the particles are spread out evenly,*

*Groups of molecules distributed evenly throughout.*

*Example: soda, tea, milk, etc*

**Suspension**

*A solution in which the particles are not dissolved. It is heterogeneous, example sand or other sediment in water.*

**Colloid**

*A solution with bigger particles. They are usually foggy or milky looking. They usually block light. The particles do not settle out.*

*Examples: milk, marshmallows, paint, toothpaste, shaving cream*

**Homogenous**

*A mixture where the parts are evenly spread out* ***equally,*** *these mixtures are the same throughout!  
Examples: milk, soda, paint*

**Heterogeneous**

*A mixture where the parts are not evenly spread out. These mixtures are different, not the same throughout.*

*Examples: salad, most soups, cereal, dirt*

**Solute**

*The thing being dissolved in a liquid.*

*Example: sugar in coffee is the solute (so is the coffee)*

**Solvent**

*The liquid doing the dissolving (almost always water)*

*Example: The water dissolving the sugar and coffee is the solvent.*

**Solubility**

*The ability of a* ***solvent*** *to dissolve a* ***solute****.*

*Example: a cup of water has the same solubility as a gallon of water when comparing their solubility.*

*Now, the gallon of water will dissolve more total salt.*

*However the cup of water will dissolve the same percentage of salt as the gallon of water.*

**Saturated**

*When a solvent can no longer dissolve any more solute.*

*Example: At saturation, no more sugar will dissolve in a glass of tea, even if you fill the glass completely full of sugar.*

**Dissolved**

*Solute gets smaller! Particles in a solution become so small you cannot see them*

*Example: soda, milk, tea or stirring Kool Aide till the mix disappears*

**Granulated**

*Particles that are larger in size than a powder, smaller than gravel*

*Example: sugar & salt*

**Dilute**

*A solution below saturation is said to be dilute.*

*Examples: You can dilute a solution by adding more solvent.*

*You can also make a diluted solution by putting in very little solute.*

**Concentrated**

*A solution with lots of solute that is close to or at saturation.*

*Example: To make Kool Aide more concentrated, add more mix*

**Phase Changes**

**Boiling point**

The exact temperature that a liquid turns into a gas (phase change). *The addition of heat speeds up molecules causing a change of phase!*

Example: For water the boiling point is 100 degrees Celsius and/or 212 degrees

Fahrenheit.

**Freeze**

A change of phase when a liquid changes into a solid state because of a loss of heat. *The loss of heat slows down molecules causing a change of phase!*

Example: Water changes into a solid when it is placed in a freezer.

**Freezing Point**  
The temperature at which a liquid becomes a solid. *The loss of heat slows down molecules causing a change of phase!*

Example: Water morphs into a solid (ice) at 0

degrees Celsius or 32 degrees Fahrenheit.

**Absolute Zero**

No heat energy! There is absolutely no particle movement. This has only been attained or measured in a lab.

**Condense**

A change of phase where a gas changes into a liquid because the gas contacts a cooler surface. *Water in the air comes in contact with the cooler glass.* *The loss of heat slows down molecules causing a change of phase!*

Example: Water from the air condenses on the

outside of a glass of ice water.

**Evaporate**

A change of phase when a liquid changes into a gas because of heat. *The addition of heat speeds up molecules causing a change of phase!*

Remember heat makes molecules move faster. Gasses have fast moving particles.

Example: Water on a desk “disappears” when heat   
 is added.

**Sublime**

When matter goes from a solid to a gas, or a gas to a solid. *The addition or loss of heat speeds up or slows down molecules causing a change of phase!*

This is interesting because it completely misses the liquid phase.

Example: Dry Ice