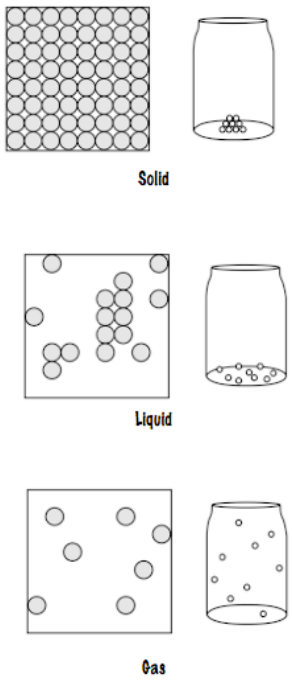
# Matter 5.4 Study Guide

**Matter** is anything that has **mass** and **volume**.

Mass is the amount of matter in an object. The mass of an object does not change! *The *weight* of an object changes based on the gravitational pull on it. A person will have the same mass on Earth or the moon, but their weight will be 1/6 of what it is on Earth.*

**There are 3 phases of matter: Solid, Liquid, Gas**

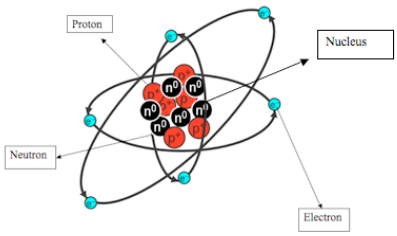
| Gas | Liquid | Solid |
|---|---|---|
| Assumes shape of it's container | Assumes shape of its container | Retains a **fixed** shape |
| Assumes the volume of its container-**no definite volume** | Has a definite volume | Has a definite volume |
| **Compressible** (lots of free space between particles) | Not easily compressible (little free space between particles) | Not easily compressible (little free space between particles) |
| Flows easily (particles can move past one another) | Flows easily (particles can move/slide past one another) | **Does not flow easily** (rigid-particles cannot move/slide past one another) |



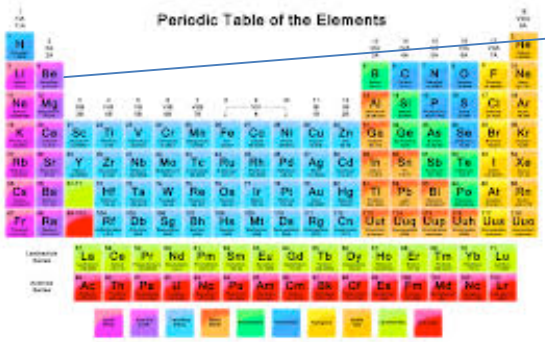

**Temperature** can alter the phase of matter~
As temperature increases, many kinds of matter change from a solid to a liquid to a gas. As its temperature decreases, that matter changes from a gas to a liquid to a solid.

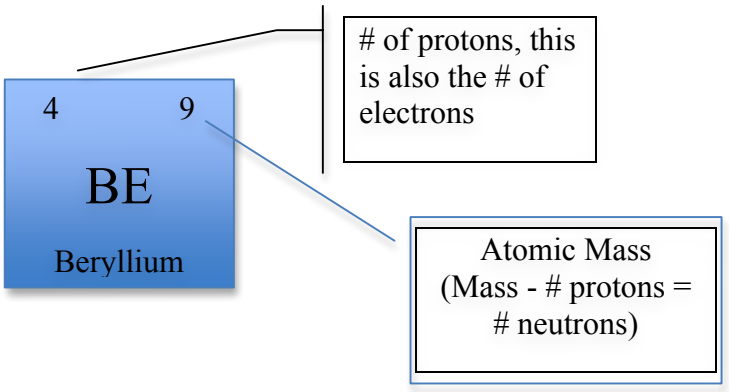
**Matter is made of particles that are too small to be seen by the unaided eye.**

- The smallest unit of an element is called an **atom**.
- Electrons orbit the atom and have a negative charge.
- Protons have a positive charge and are in the nucleus.
- Neutrons have no charge and are also in the nucleus.



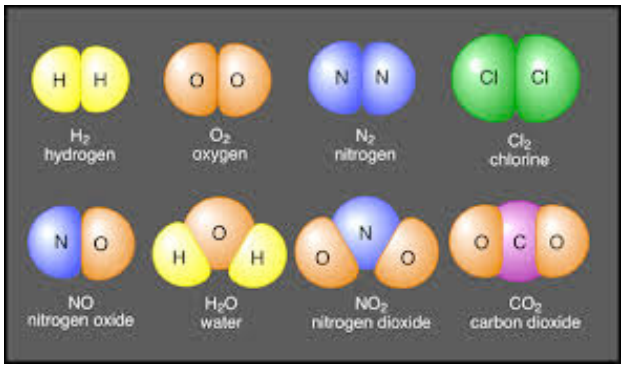
- There are more than 100 known elements that make up all matter.
- The **periodic table** lists the elements and it is used by scientists world-wide!
- Using the periodic table, you can tell how many protons, electrons, and neutrons are in an atom, the chemical name and symbol, the atomic mass, and much more!




**Molecules-** the smallest part of a compound

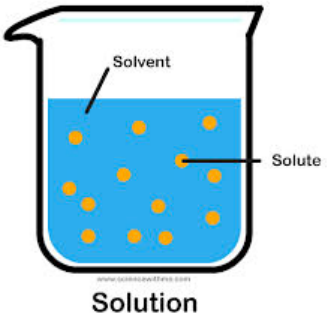
**Compounds-** when 2 or more elements combine chemically to form a new substance.
Examples: $H_2O$ = water; NaCl = table salt




**Mixtures** – a combination of two or more substances that do not lose their identifying characteristics when combined.

**Solution** – an example of a mixture. One substance (the solute) dissolves into another (the solvent)

**Nanotechnology** is the study of materials at the **molecular** (atomic) scale. Items at this scale are so small they are no longer visible with the naked eye.




**Vocabulary**

**Atom**- the smallest part of an element
**Atomic mass**- the sum of the number of protons and neutrons
**Atomic number**- the number of protons in the nucleus of an atom
**Chemical change**- a change that occurs when one or more substances are changed into a new substance with different properties (a chemical change cannot be undone b physical means.)

**Compound**- a new substance made when two or more elements combine chemically
**Density –** how much matter is put in a given volume of space
**Dissolve**- when one substance is incorporated into a liquid
**Electron**- a negatively charged particle that orbits the nucleus of an atom
**Element**- a substance that cannot be broken down into another substance
**Mass –** the amount of matter in an object
**Mixture**- a combination of two or more substances that do not lose their identifying characteristics when combined
**Molecule**- the smallest part of a substance that still has the properties that of substance
**Neutron**- a particle with no charge found in the nucleus on an atom
**Nucleus**- the center of an atom, contains most of the mass of the atom by housing the protons and neutrons
**Physical change**- a change that occurs when one or more physical properties of a substance are changed many physical changes can be undone by physical means)
**Proton**- a positively charged particle found in the nucleus of an atom
**Solute**- the part of a solution that dissolves into another substance (sugar, kool-aid, salt, etc.)
**Solution**- a mixture in which one substance dissolves in another
**Solvent**- the part of a solution in which another substance dissolves (water, milk, etc.)

## BIG IDEA QUESTIONS!

- What is matter?
- Name and describe the three phases of matter.
- If you could see the molecules in a solid, liquid, and gas, how would you expect to see each one of them moving?
- If you could make models to demonstrate the three phases of matter, what would you use for each phase? Why did you make these choices?
- How does temperature affect the phases of matter?
- How can you use temperature to change a solid to a liquid? a liquid to a solid? a liquid to a gas?
- How is a molecule different from an atom?
- Give an example of a molecule. How many atoms make up your molecule? How many elements make up your molecule? (example: water)
- How are atoms and elements alike? How are they different?
- How are compounds and elements related?
- If you mixed sand and water together, would you have a mixture or a solution? Explain your answer.
- If you mixed a packet of Kool-Aid with water, would you have a mixture or a solution? Explain your answer.
- Give some examples of mixtures and solutions. How do you know whether or not something is a mixture or a solution?
- How is it possible to separate ingredients in a solution? Name a solution, and tell how you would separate the ingredients