Matter: Properties and Change 8.P.1.1

Students know:

∙ the structure of the atom:  
o that it is composed of extremely small particles that are too small to be seen with an optical microscope and that size at the

* atomic level is measured on the nanoscale.
* that there are three basic particles in the atom (proton, neutron, and electron).

∙ that the atom is the basic building block of matter, that a single atom has mass and takes up space, and that all matter is composed of atoms. Students know that each of the elements has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. Students recognize that scientists have identified more than 100 elements that combine in a multitude of ways to produce compounds that make up all living and nonliving things.

∙ •that an atom is the smallest unit of an element and that a compound is composed of two or more elements chemically combined. Students know that scientists identify and classify elements, compounds and mixtures according to their physical and chemical makeup.

∙ the differences among elements, compounds and mixtures.

**Elements:**

o Elements are pure substances that cannot be changed into simpler substances.

o Elements are composed of one kind of atom.

**Compounds:**

o Compounds are pure substances that are composed of two or more types of elements that are chemically combined.

o Compounds can only be changed into simpler substances called elements through chemical changes

**Mixtures:**

o Mixtures are physical combinations of two or more different substances that retain their own individual properties and are combined physically (mixed together).

o Mixtures can be separated by physical means (filtration, sifting, or evaporation). Characteristic properties can be used to identify different materials and to separate a mixture into its components.

o Mixtures may be heterogeneous or homogeneous.  
▪ In a heterogeneous mixture, which is not uniform throughout, the component substances can be visibly distinguished.

Tossed salad, granite, and iced tea are examples of heterogeneous mixtures.  
▪ In a homogeneous mixture, which is uniform throughout, the substances are evenly mixed and cannot be visibly distinguished. Air, steel, clear salt-water are examples of homogeneous mixtures.

∙ that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules can collide with and move past one another; and in gases the atoms and molecules move independently, colliding frequently. The atoms or molecules of a solid form a pattern that minimizes the structural energy of the solid. At the melting point temperature, the atoms or molecules acquire enough energy to slide past one another so that the material, now a liquid, can flow. In a gas the atoms or molecules move about freely and collide randomly with the walls of a container and with each other. The distance between molecules in a gas is much larger than that in a solid or a liquid.

∙ that there is a relationship between phase and density and that density is mass per unit volume.

**Essential Questions:**  
**8.P.1.1**

1**.** Identify the three basic structures of every atom?  
2. How are elements, compounds and mixtures different?  
3. Why do all atoms on the periodic table have a neutral charge?   
4. How are heterogeneous and homogeneous mixtures similar and different?   
5.  Why can all molecules also be compounds, but compounds cannot be molecules?