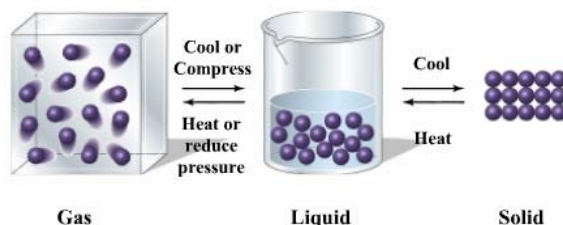


1 • Intro: Matter and Measurement

1.2 - 1.3 Classification/Properties of Matter lecture/worksheet

Matter can exist in one of three **states of matter**: a gas, a liquid, or a solid. A **gas** is highly compressible and will assume both the shape and the volume of its container. A **liquid** is not compressible and will assume the shape but not the volume of its container. A **solid** also is not compressible, and it has a fixed volume and shape of its own.

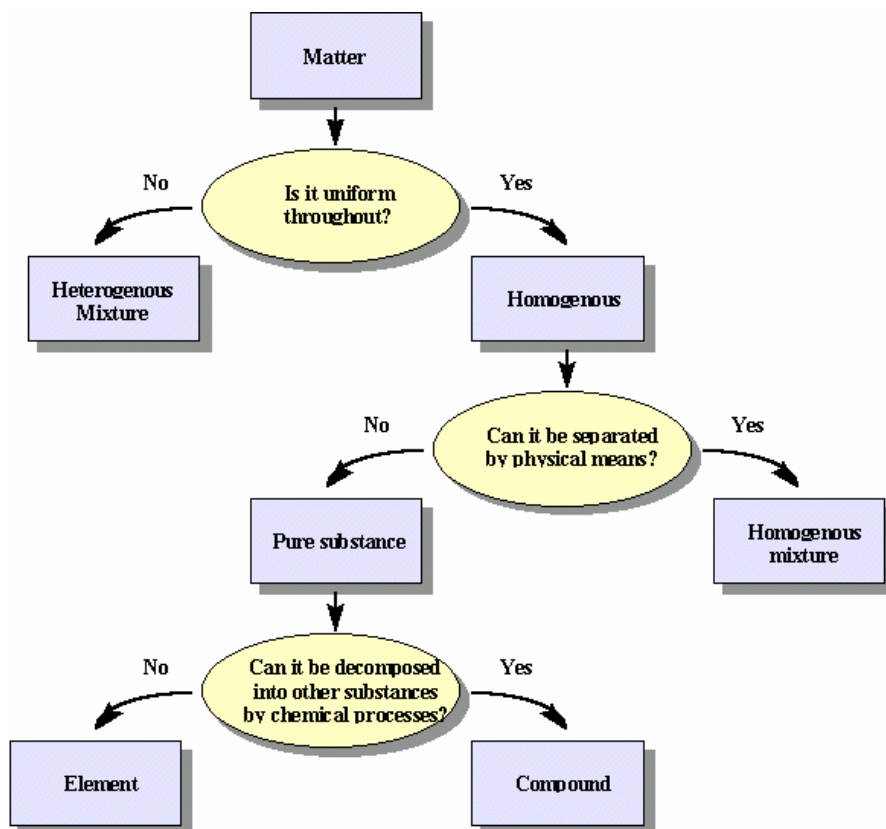


Matter can also be classified according to its composition. Most of the matter that we encounter exists in **mixtures**, which are combinations of two or more substances. Mixtures can be **homogeneous** or **heterogeneous**.

Mixtures can be separated into **pure substances**, and pure substances can be either **compounds** or **elements**.

The substances produced by the electrolysis of water cannot be further separated by any physical or chemical means. Oxygen and hydrogen are **elements**. When water is separated into its constituent elements, the relative amounts of those elements are always the same. Water is 11 percent hydrogen and 89 percent oxygen by mass. This is an example of the **law of constant composition**, also known as the **law of definite proportions**. Salt can also be separated into its constituent elements, sodium and chlorine, by **electrolysis**. Sodium chloride also has a constant composition, as do all pure substances. It is 39 percent sodium and 61 percent chlorine by mass.

Classify each of the following



Iced tea

- ☐ heterogeneous mixture
- ☐ homogeneous mixture
- ☐ pure substance
- ☐ compound
- ☐ element

Isopropyl alcohol

- ☐ heterogeneous mixture
- ☐ homogeneous mixture
- ☐ pure substance
- ☐ compound
- ☐ pure substance *and* compound

Helium

- ☐ pure substance *and* element
- ☐ homogeneous mixture
- ☐ pure substance
- ☐ compound
- ☐ element

Section 1.3 Properties of Matter

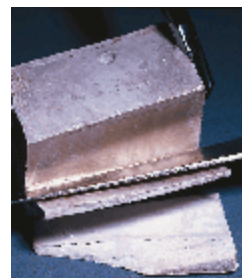
Different types of matter have different distinguishing characteristics that we can use to tell them apart. These characteristics are called **physical properties** and **chemical properties**.

Physical and chemical properties may be **intensive** or **extensive**. Intensive properties such as density, color, and boiling point do not depend on the size of the sample of matter and can be used to identify substances.

Extensive properties such as **mass** and volume do depend on the quantity of the sample.

Physical properties are those that we can determine without changing the identity of the substance we are studying. For instance, we can observe or measure the physical properties of sodium metal. It is a soft, lustrous, silver-colored metal with a relatively low melting point and low density. Hardness, color, melting point and density are all physical properties.

Figure 7.15 shows a chunk of metallic sodium, which is soft enough to be cut with a knife.



Classify each of the following as a physical or chemical change

1. Decomposition of hydrogen peroxide _____
2. Sublimation of dry CO_2 _____
3. Condensation of water vapor on the grass from a cool night _____
4. oxidation of silverware _____
5. A freshly cut surface of sodium quickly becomes dull with a film of white sodium oxide when it is exposed to air. Is this a physical change or a chemical change? _____

Another property of sodium is that it conducts electricity, as do all metals. Is electrical conductivity an intensive or extensive property of sodium metal?