

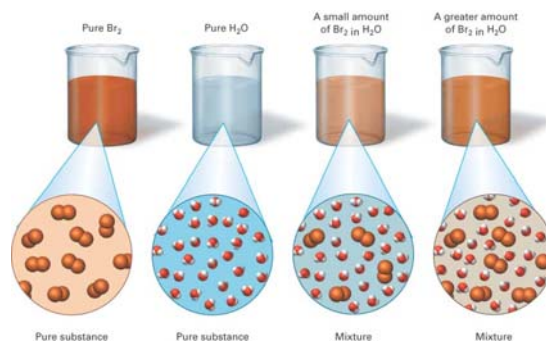
Chapter 3

Matter and Energy



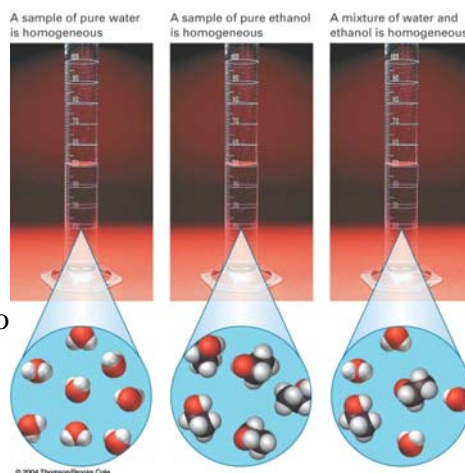
Classifications of Matter

- Matter can be subdivided into two classes:
 - **Mixtures** are composed of more than one chemical substance and can be *physically* separated into its component chemical substances.
 - **Pure Substances** are composed of a single chemical substance.



Mixtures

- There are two types of mixtures:
 - **Homogeneous mixtures** have uniform properties throughout
 - Saltwater is a homogeneous mixture
 - **Heterogeneous mixtures** do not have uniform properties throughout
 - Sand and water is a heterogeneous mixture

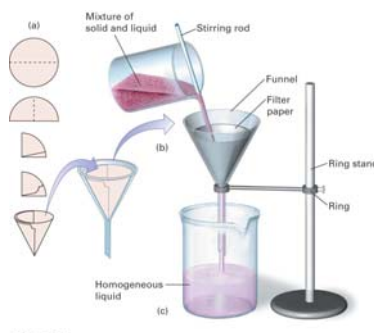
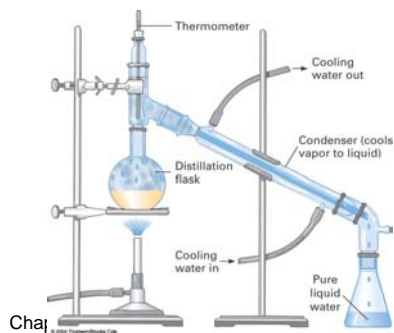


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Separation of Mixtures

- Methods for separating mixtures into their component chemical substances takes advantage of the differences in physical properties of those components.
 - **Distillation** takes advantage of differences in the boiling point of the mixture components
 - **Filtration** takes advantage of differences in the physical size of the mixture components



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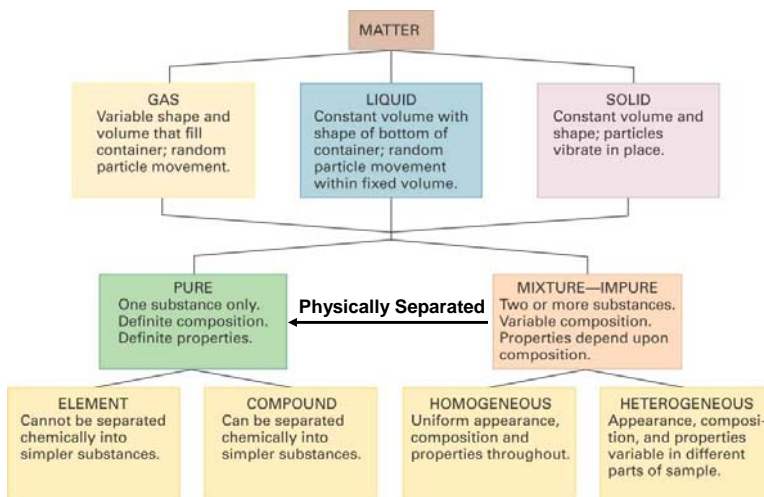
Pure Substances

- There are two types of pure substances:
 - **Elements** cannot be broken down further by chemical reactions.
 - Iron (Fe) is composed of a single element and cannot be broken down further!
 - **Compounds** can be *chemically* separated into individual elements.
 - Water (H₂O) is a compound that can be separated into hydrogen and oxygen.
 - The **Law of Definite Composition** states that any compound is always made up of elements in the same proportion by mass (or weight)

Chapter 3 – So water is always H₂O no matter what the source!

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Summary of Classification of Matter

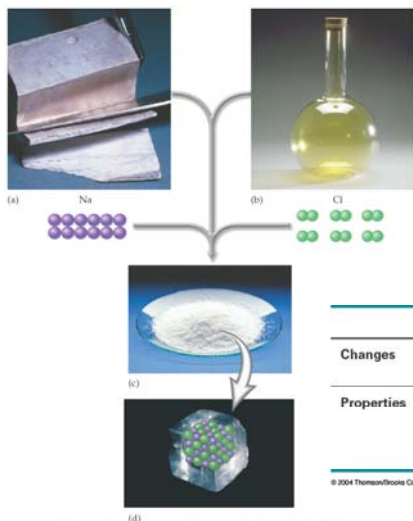


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Physical & Chemical Properties



- No two substances have the same physical or chemical properties
- The physical and chemical properties of a compound, such as table salt (NaCl), are never the same as the properties of the elements that make it up (Na and Cl).

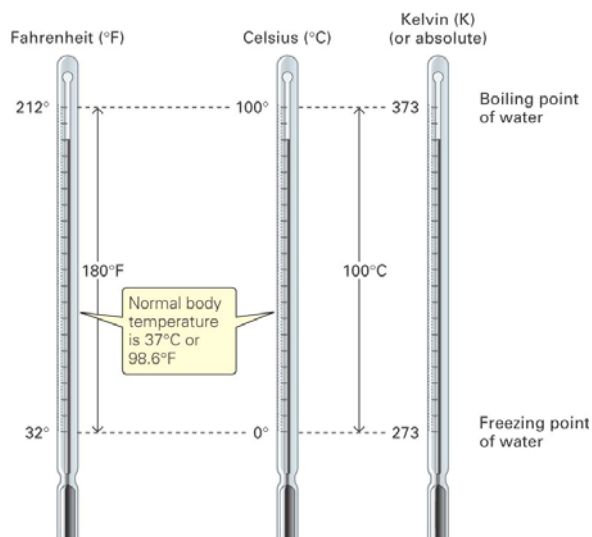
	Chemical	Physical
Changes	Old substances destroyed New substances formed	New form of old substance No new substances formed
Properties	Properties defined by types of chemical changes possible	Description by senses—color, shape, odor, and others Measurable properties—density, boiling point, and others

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Temperature Scales



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Temperature Conversions

- Conversion of °C to °F:

$$^{\circ}\text{C} \times \left(\frac{1.80^{\circ}\text{F}}{1.00^{\circ}\text{C}} \right) + 32.0^{\circ}\text{F} = ^{\circ}\text{F}$$

- Conversion of °F to °C:

$$(^{\circ}\text{F} - 32.0^{\circ}\text{F}) \times \left(\frac{1.00^{\circ}\text{C}}{1.80^{\circ}\text{F}} \right) = ^{\circ}\text{C}$$

- Conversion of °C to K:

$$^{\circ}\text{C} + 273 = \text{K}$$

You **do not** have to
memorize these
formulas!

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Fahrenheit-Celsius Conversions

- Body temperature is 98.6°F. What is body temperature in Celsius?

$$(^{\circ}\text{F} - 32.0^{\circ}\text{F}) \times \left(\frac{1.00^{\circ}\text{C}}{1.80^{\circ}\text{F}} \right) = ^{\circ}\text{C}$$

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