Chemistry is the study of the composition, properties and transformations of matter.
States of Matter

solid
liquid
gas
Volume

Definite

Indefinite
Shape

Definite

Indefinite
Particle Distance

- Very Close
- Close
- Far Far Away
States of Matter
Physical properties can be observed or measured without changing the composition.
### Physical Properties

**TABLE 3.2 Some Physical Properties of Copper**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>State at 25 °C</td>
<td>Solid</td>
</tr>
<tr>
<td>Color</td>
<td>Orange-red</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Melting Point</td>
<td>1083 °C</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>2567 °C</td>
</tr>
<tr>
<td>Luster</td>
<td>Shiny</td>
</tr>
<tr>
<td>Conduction of Electricity</td>
<td>Excellent</td>
</tr>
<tr>
<td>Conduction of Heat</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
Physical Change

Physical change alters material without changing its composition.
# Physical Change

## TABLE 3.3 Examples of Some Physical Changes

<table>
<thead>
<tr>
<th>Example Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water boils to form water vapor.</td>
</tr>
<tr>
<td>Sugar dissolves in water to form a solution.</td>
</tr>
<tr>
<td>Copper is drawn into thin copper wires.</td>
</tr>
<tr>
<td>Paper is cut into tiny pieces of confetti.</td>
</tr>
<tr>
<td>Pepper is ground into flakes.</td>
</tr>
</tbody>
</table>
Chemical properties describe reactivity. Chemical change converts one substance into another.
Label each below as a **physical** or **chemical** property:
- Rainbow shave ice is many colors
- Shave ice melts at room temperature

Label each below as a **physical** or **chemical** change:
- Too much shave ice turns to fat on your hips
- Crushing ice into shave ice
Classification of Matter

**Pure substance**
- Composed of a single component
- Constant composition

**Mixture**
- Composed of multiple components
- Variable composition
Pure Substances (two types)

An **element** is the most basic building block of matter.  
A **compound** is a pure substance containing different elements.
Mixtures

a. Two gases
b. A solid and a liquid
c. Two liquids
Classification of Matter

Matter

Pure substances

- Elements
  - Copper

- Compounds
  - Water

Mixtures

- Homogeneous
  - Brass (copper and zinc)

- Heterogeneous
  - Water and copper
Concept Check

Classify each as either a mixture, element or compound.

Ocean water
Chalk (CaCO$_3$)
Phosphorus
Battery acid (H$_2$SO$_4$)
Buckyball (C$_{60}$)
Temperature is a measurement of how hot or cold an object is.
Boiling point of water: 212°F, 100°C, 373.15 K

Freezing point of water: 32°F, 0°C, 273 K
Temperature Conversion

\[ K = ^\circ C + 273 \]

\[ ^\circ F = 1.8(^\circ C) + 32 \]

A patient has a temperature of 105°F. What is her temperature in °C?
A calorie is a unit of energy.

A nutritional Calorie = 1,000 calories or 1 kcal
Energy and Nutrition

A calorie is a unit of energy.

A nutritional Calorie = 1,000 calories or 1 kcal

![Pie chart showing the energy content of proteins per gram]
Energy and Nutrition

A calorie is a unit of energy.

A nutritional Calorie = 1,000 calories or 1 kcal

Fats per gram

4 Calories

9 Calories
Example

One tablespoon of olive oil has 14 grams of fat, how many Calories does it contain?
A Wendy’s sour cream and chive potato has 3.5 grams of fat, 8.0 grams of protein, and 63 grams of carbohydrates. How many Calories does this tasty treat contain?
Phase Changes