

## Physical Properties

A **physical property** is any property of an object that can be measured without chemically changing the object (by changing its chemical or atomic structure). There are two types of physical properties: intensive and extensive.

An **intensive** physical property does not depend on how much of the object there is. For example, a small rock will be just as hard as a large rock. Thus, hardness is an intensive physical property.

An **extensive** physical property changes depending on how much of the object there is. For example, a small rock weighs less than a large rock. Thus, volume is an extensive physical property.

### Examples of Physical Properties

- area
- boiling point
- brightness
- brittleness
- color
- concentration
- density
- ductility
- electric charge
- electrical conductivity
- flexibility
- flow rate
- fluidity
- frequency
- hardness
- length
- location
- luster
- malleability
- mass
- melting point
- pressure
- solubility
- reflectivity
- state
- strength
- temperature
- thermal conductivity
- velocity
- viscosity
- volume

## Chemical Properties

A **chemical property** is any property of an object that can only be observed by means of a chemical reaction. This is different from physical properties, because these can only be observed when a substance's chemical structure is being changed.

Chemical properties can be used to identify an unknown substance or to separate it from other substances.

### Examples of Chemical Properties

- reactivity
- toxicity
- flammability

## **Characteristic Properties**

A **characteristic property** is a chemical or physical property that can be used to identify a substance.

The characteristic properties of a substance are always the same, whether the sample you are observing is large or small.

### **Examples of Characteristic Properties**

- boiling point
- condensing point
- density
- melting point
- solubility

## Physical Changes

**Physical changes** occur when an object undergoes a change that does not change their chemical nature (does not change what the substance is). A physical change involves a change in physical properties, such as shape, size, color, volume, mass, weight, taste, smell, and density.

An example of a physical change is making a baseball bat. A piece of wood is carefully crafted into a shape that will allow the batter to best apply force on the ball. Even though the wood has changed shape, it is still wood. Its chemical nature has not changed.

## Chemical Changes

**Chemical changes** occur when an object or substance is changed in such a way that it becomes a different substance. These types of changes typically occur during chemical reactions. When a chemical reaction occurs, the atoms are rearranged and combine to form new substances.

Chemical changes happen all the time.

### Examples of Chemical Changes

- burning
- decomposition
- neutralization (mixing an acid and a base)
- photosynthesis
- cooking
- oxidation (rusting or tarnishing)
- ripening

### Evidence of a Chemical Change

- production of an odor
- change of color
- change in temperature
- change of form (e.g. burning paper)
- light, heat, or sound is given off
- formation of a gas (often appearing as bubbles)
- formation of a precipitate (mixing 2 liquids and a solid is produced)
- decomposition of organic matter