

## Notes: Changes in Matter

### Physical Change

A physical change, changes the form or appearance of a substance, but does not change its chemical make up.

#### Changes of State

There are three basic states of nature a substance can be found in. It may be in the form of a solid, liquid, or gas. As a substance changes from one state to another, it is undergoing a physical change, its chemical composition remains the same.

#### Changes in Shape or Form

A substance may change its shape or form by other means...  
dissolving, bending, crushing, breaking, chopping, etc.

### Chemical Change

A chemical change occurs when there is a chemical change in matter when two or more new substances are formed. These new substances have different properties than the original substances.

Example: When Methane ( $\text{CH}_4$ ) is burned it combines with oxygen ( $\text{O}_2$ ) to form water ( $\text{H}_2\text{O}$ ) and carbon dioxide ( $\text{CO}_2$ ).

Some processes that lead to chemical change include combustion, electrolysis, oxidation, and tarnishing.

### Conservation of Mass

The law of conservation of matter states that matter is neither created nor destroyed in any physical or chemical change.

If we measured the mass of the methane ( $\text{CH}_4$ ) before it burns and the oxygen ( $\text{O}_2$ ) it combines with, then compare that with the mass of the water ( $\text{H}_2\text{O}$ ) and carbon dioxide ( $\text{CO}_2$ ) that is formed, their mass would be equal to one another.

## Matter and Thermal Energy

Energy is the ability to do work or cause change.

Every physical and chemical change in matter includes a change in energy.

### Temperature and Thermal Energy

Temperature is a measure of the average energy of random motion of particles of matter.

Ex: Warm air particles move faster and have a higher temperature than the particles in cold air.

Thermal energy is a measure of the total energy of all the particles in an object.

### Thermal Energy and Changes in Matter

An endothermic change occurs when energy is taken in.

Example: the melting of an ice cube

An exothermic change occurs when energy is given off.

Examples: the freezing of liquid water, heat from a fire.