

Three States of Matter: Solid, Liquid and Gas

Matter can be converted between these three states. The theory behind these state changes is called the Kinetic Molecular Theory. Basically, what this says is that all matter is in constant random motion based on its internal energy, and that the state is determined by the comparison between the internal energy and the energy of attraction between substances.

1. Solids:

At low temperatures, the attractions are stronger than the energy of motion and we have a solid. The molecules are vibrating, but are staying in a fixed position. Solids have a fixed shape and volume.

2 Liquids:

At intermediate temperatures, the attractions and the energy of motion are similar and we have a liquid. The molecules may vibrate, rotate and move around, but they still remain in close contact. Liquids have a fixed volume but change to the shape of their container.

3. Gases:

At high temperatures, the energy of motion is greater than the attractions. The molecules are no longer in contact, but "fly around" freely and vibrate and rotate. Gases have a variable volume and variable shape.

Physical and Chemical Properties of Matter

The physical properties of matter describe characteristics of that matter.

Physical Properties		Physical Changes
Melting Point		Melting
Boiling Point		Freezing
Density		Evaporation
Size		Condensation
Color		Dissolving
Solubility		Bending
Hardness		Breaking

Physical Change is a change where there is no change in the composition of the substance and only the physical state of the substance takes place. In a physical change the molecular particles remain unchanged and no fragmentation of the molecules take place. Physical changes may be accompanied with energy being absorbed or given off during the physical change.

A Chemical Change is when the chemical identity of a substance is changed into a new substance. Some typical chemical changes are:

Bubbling

Cooking

Color change

Food spoilage

Burning

Corrosion

Digestion

Precipitation

Chemical change involves a change in the composition and possibly also the physical state. In a chemical change molecules fragment and recombine to form new molecules with a different composition. When we collect the list of chemical changes for a given substance, these are collectively known as its chemical properties.

Pure Substances or Mixtures?

- 1. Pure substances cannot be separated into separate parts by a physical change. Pure substances have a distinct set of physical and chemical properties.**
- 2. A mixture is two or more pure substances that can be separated by physical changes. Properties vary depending on the relative amounts of pure substances.**

Mixtures

Mixtures are physical combinations of two or more elements or compounds. Being physical combinations, mixtures can be separated by using a difference in a physical property between the pure substances in the mixture.

There are two kinds of mixtures.

1. Heterogeneous

Heterogeneous mixtures are mixtures where the components are not uniform in their distribution throughout the mixture. The division between the components in such a mixture can be easily seen. Such mixtures can often but not always be separated by filtration (solid in liquid) or the use of a separatory funnel (two immiscible liquids). If we take a sample of such a mixture the sampling will not always show the same distribution of each component in the mixture.

2. Homogeneous

Homogeneous mixtures are uniform in their distribution. If we took a sampling anywhere in the mixture, and then analyzed it as to its composition for each component we would find that the distribution was the same throughout the mixture. Solutions are said to be homogeneous mixtures - the major component of a solution is called the solvent, and the minor components are called the solutes. The amounts of these two things in a solution is expressed as concentration.