

Separating Mixtures

A **mixture** is a substance made by combining two or more different materials. The materials maintain their original properties when mixed in such a way that no chemical reaction occurs. A **mixture** can usually be separated back into its original components. Some examples of **mixtures** are a tossed salad, a basket of different fruits and vegetables, a toy box filled with toys, and dust in the air.

In the gold rush days in California, miners separated gold from the mixture of gold, dirt, water, and sand in streams and rivers. The gold was heavier than the sand and the dirt, so the miners developed different ways of getting the gold to settle to the bottom of their device while washing away the dirt and sand.

There are many different ways that mixtures can be separated. Three of the separation processes are filtration, distillation, and evaporation.

One method for separation is **filtration**. It uses a filter such as paper or sand to allow a liquid or gas to pass through. This traps the solids or impurities on the filter. When you make coffee in the morning, the grinds (solid) are trapped by the filter, as the water (liquid) passes through the beans to make the coffee. There are many types of filters. Some are also used to trap dust in our homes and businesses. Others remove impurities from our drinking water. Face masks filter bacteria and germs so we don't breathe them in. Even our bodies have filters—for example, the hairs in our nasal passages prevent impurities from reaching our lungs. Our kidneys and liver filter the impurities in our blood.

The **filtration process** is the process by which a mixture (small solid particles in water or air) are separated. When filtering water, the water is forced through paper or another material that is made up of a tiny fine mesh of fibers. This lets the water can pass through while trapping the small particles. The particles removed from the water by the filter are called the **residue**.

Distillation, another method for the separation process, uses boiling to separate liquid mixtures. Different substances often have different boiling points, which means they boil at different temperatures. For example, water boils at 100°C, and linseed oil boils at 287°C. If you heat saltwater to boiling, the water will turn into steam and leave the salt crystals behind. If the steam from the boiling salt water is allowed to cool, it will form droplets of fresh water, without salt. One example of distillation is converting saltwater into drinking water. Another example of distillation is heating crude oil to separate it into its many components such as jet fuel, engine oil, and gasoline.

Evaporation is the process by which a liquid changes from a liquid to a gas (vapor). Some examples of evaporation are wet clothes drying in the sun on a clothesline, drying of wet hair, and hot tea getting cold. Our bodies use the evaporation of sweat to cool us. Removing salt from ocean water can be achieved through distillation AND through the evaporation process.