

## 5<sup>th</sup> Grade - Lesson 3.4

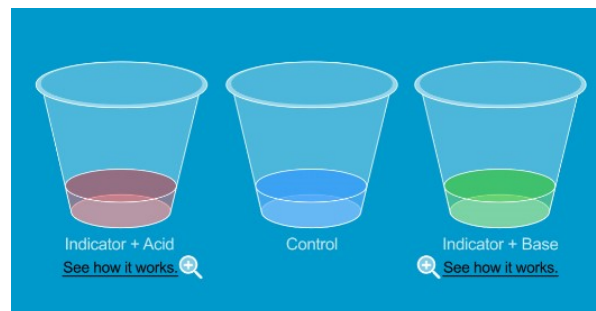
### Chemical Reactions and Color Change

#### Student Reading

Chemical reactions cause different kinds of changes in substances. A solid and a liquid might react to form a gas, like in the reaction between vinegar and baking soda. Or two liquids can mix and form a solid, like the soap scum formed when soap solution mixes with hard water. Another result of a chemical reaction can be a change in color. A common color changing reaction uses a solution called a *pH indicator* mixed with an acid or a base.

#### Indicators Change Color

Indicators can be made from different chemicals, but a common one comes from red cabbage. In plain water, cabbage will change the color of the water to blue. If you add an acid such as vinegar or cream of tartar to the indicator, the indicator will turn a pinkish color. If you add a base such as baking soda or laundry detergent, the indicator will turn a greenish color.



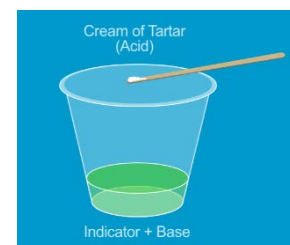
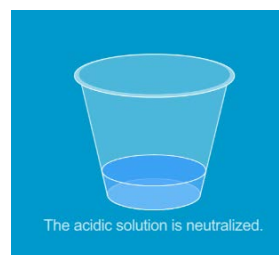
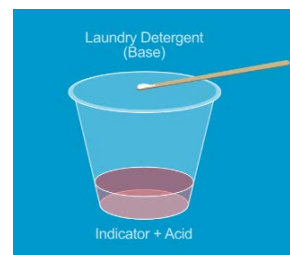
#### Acids and Bases are Like Chemical Opposites

Since acids and bases are made up of different atoms and molecules, they interact with the indicator differently. An acid and a base are kind of like chemical opposites. An acid gives a hydrogen ion (which is really just a proton) *to* water, which makes the indicator change color. A base takes a proton *from* the water, which makes the indicator turn a different color.

#### Neutralizing Acids and Bases

If you add a base to a cabbage indicator that already has an acid in it, the solution will become less acidic, and the color will also change from reddish to blue again. This is called *neutralizing* the acid.

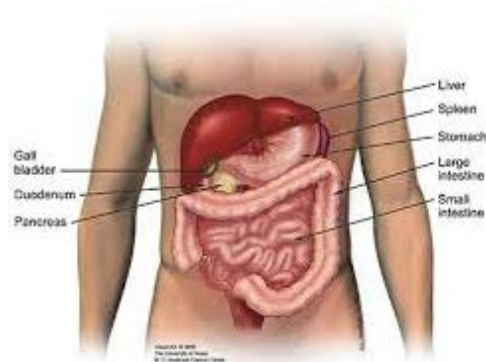
If you add an acid to a cabbage indicator indicator that already has a base in it, the solution will become less basic and the color will change from greenish toward blue again.. This is called *neutralizing* the base.



## Acids and Bases in the Body

Acids and bases are very useful ingredients in many products we use every day but they are also in your body. Special cells in your stomach lining produce an acid called *hydrochloric acid*. This acid, along with other chemicals, helps to break down and digest food in your stomach. Hydrochloric acid is a strong acid, but your stomach lining produces a substance (a base) that protects it from being damaged by the acid.

Your body produces a base from an organ called the *pancreas*. The pancreas produces a solution rich in bicarbonate ion and sends it into the small intestines. The partially digested food from the stomach that goes into the small intestine is still pretty acidic. The bicarbonate from the pancreas helps neutralize the acid so other chemicals can help continue to digest your food.



Human digestive system