



Acid, Base, Neutral

One of the most basic concepts in science is whether substances are acidic, basic or neutral. This can be a pretty abstract concept for children so the sooner we can approach this topic with them the better. Many of you may have already begun this with your children using cabbage juice. But for those of you who don't understand let me take a moment to explain. Most of you know that things can be acidic. The opposite of acidic is alkaline. We sometimes call it basic. We have a scale to measure acidity and alkalinity (basicity) of substances. We call it the pH scale. (Just as a factoid, it gets its name from "proton of Hydrogen"). The pH scale ranges from 1 to 14 with neutral being the middle 7. Acids are the lower numbers and bases are the higher numbers. This scale sometimes confuses people because acid seems like a really strong thing while basic seems weak. So people think acids should be higher. This is a common problem. In reality, both ends of the scale are strong, capable of extreme damage on the wrong surfaces and cause strong chemical reactions. The kinder gentler part of the scale is in the middle or neutral. When I was first learning this concept I pictured a scale like a thermometer, dipping into an acid, the lower I went on the scale closer I got to the acid. Acids and bases have some characteristics that scientists use to classify them.

Bases

Bases range on the pH scale from 7.1 to 14. In the 8 to 9, mild range they are good soaps for our skin. Bases are slippery feeling. Bases have a bitter taste. Strong bases are also potentially harmful. Bleach is a strong base, so is ammonia. Strong bases cause skin burns but most people don't realize it at first. The burn takes a little while to be felt. Strong bases give off noxious fumes that are harmful and can even be fatal.

Acids

Acids range on the pH scale from 6.9 to 1. Acids tend to break substances down so they are often used to clean metals or to dissolve them. Acids taste sour. The citrus fruits are acidic and have citric acid in them. Think lemon, very acidic. Sodas have carbonic acid in them, so not all acids are harmful, just like not all bases are. It depends on their number on the pH scale.

Neutral

Neutral substances have a pH of 7. The closer you get to 7, the less harmful a substance is to our tissues. Our bodies have an average pH of 7, give or take a decimal on either side. Some parts of our bodies are lower pH, like in our saliva. Our stomachs are very low in pH and host several very strong acids. Substances like water and milk are a pH of 7.

There are many things to teach our babies about this scale. We can start small with the information above with our kids who are ready for this. The younger ones will still enjoy watching and helping to test these substances even if they don't really understand yet.

Scientists use pH paper or litmus paper to test the pH of substances. You can order litmus paper from any science supply company. Home Training Tools has it here for a couple of bucks:

<http://www.hometrainingtools.com/catalog/psearch?q=litmus+paper&t=p>

You'll have to make sure you buy broad range paper that tests 1- 14.

Any lab you do must be testable, where you gather data and make comparisons. Simply testing stuff and saying "cool" isn't real science although it is fun. To teach our babies the science in it, we use a lab report and set up an experiment with a hypothesis and data and conclusions.

I have created a lab report for you and you can get it here:

Lab Report

In this lab you will test different substances to determine whether they are acids and bases and how strong of an acid or base they are. So your children would predict this information before testing anything. To get an idea of what to guess, inform them that strong acids like sulfuric acid or hydrochloric acid tests at .1 (point one) and stomach acids are between 1 and 3. And Lye (drain opener) is 12 to 14.

My suggestions for substances to test are:

Ketchup

Soda

Milk

Lemon juice

Bleach

Water

Liquid dish soap mixed with a little water

Brewed coffee

Hot sauce

Ammonia

Milk of Magnesia

Raw eggs

Grapes

Saliva

After predictions, test each substance and place data in the table. The rest of the process is to analyze your data and draw conclusions and that's what the suggested questions on the lab report will lead your children to do.

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