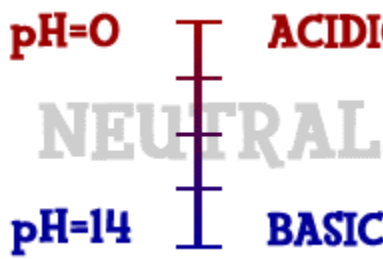


# ACIDS AND ALKALIS ARE EVERYWHERE

Every liquid you see will probably have either acidic or basic traits. One exception might be distilled water. Distilled water is just water. That's it. The positive and negative ions in distilled water are in equal amounts and cancel each other out. Most water you drink has ions in it. Those ions in solution make something acidic or basic. In your body there are small compounds called amino acids. Those are acids. In fruits there is something called citric acid. That's an acid, too. But what about baking soda? When you put that in water, it creates a basic solution. Vinegar? Acid.

**pH=0** **ACIDIC** Scientists use something called the **pH scale** to measure how acidic or basic a liquid is. Although there may be many types of ions in a solution, pH focuses on concentrations of hydrogen ions ( $H^+$ ) and hydroxide ions ( $OH^-$ ). The scale goes from values very close to 0 through 14. Distilled water is 7 (right in the middle). Acids are found between a number very close to 0 and 7. Bases are from 7 to 14. Most of the liquids you find every day have a pH near 7. They are either a little below or a little above that mark. When you start looking at the pH of chemicals, the numbers go to the extremes. If you ever go into a chemistry lab, you could find solutions with a pH of 1 and others with a pH of 14. There are also very strong acids with pH values below one such as battery acid. Bases with pH values near 14 include drain cleaner and sodium hydroxide ( $NaOH$ ). Those chemicals are very dangerous.



## NAMES TO KNOW

Here are a couple of definitions you should know:

**Acid:** A solution that has an excess of  $H^+$  ions. It comes from the Latin word acidus that means "sharp" or "sour".

**Base:** A solution that has an excess of  $OH^-$  ions. Another word for base is alkali.

**Aqueous:** A solution that is mainly water. Think about the word aquarium. AQUA means water.

**Strong Acid:** An acid that has a very low pH (0-4).

**Strong Base:** A base that has a very high pH (10-14).

**Weak Acid:** An acid that only partially ionizes in an aqueous solution. That means not every molecule breaks apart. They usually have a pH close to 7 (3-6).

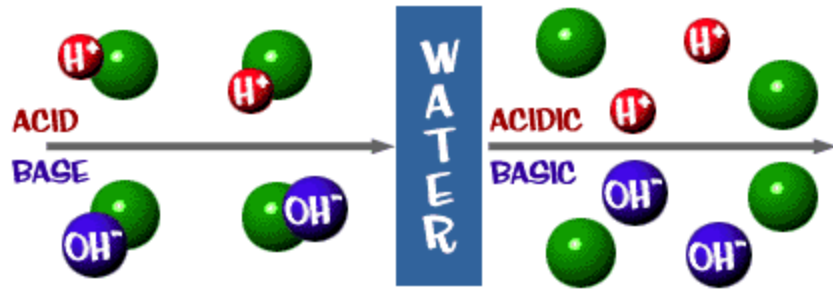
**Weak Base:** A base that only partially ionizes in an aqueous solution. That means not every molecule breaks apart. They usually have a pH close to 7 (8-10).

**Neutral:** A solution that has a pH of 7. It is neither acidic nor basic.

## WHAT REALLY HAPPENS

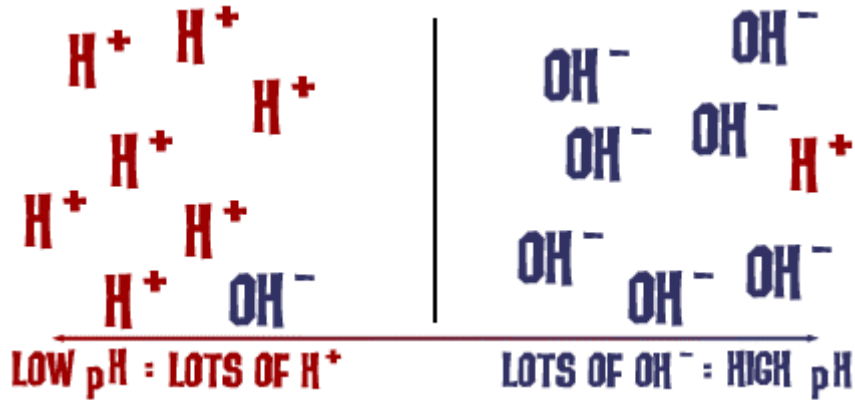
What really happens in those solutions? It gets a little tricky here. We'll give you the straight answer. Acids are compounds that break into hydrogen ( $H^+$ ) ions and another compound when placed in an aqueous solution. Bases are compounds that break up into hydroxide ( $OH^-$ ) ions and another compound when placed in an aqueous solution.

Let's change the wording a bit. If you have an ionic compound and you put it in water, it will break apart into two ions. If one of those ions is  $H^+$ , the solution is acidic. If one of the ions is  $OH^-$ , the solution is basic. There are other ions that make acidic and basic solutions, but we won't be talking about them here.



That pH scale we talked about is actually a measure of the number of  $H^+$  ions in a solution. If there are a lot of  $H^+$  ions, the pH is very low. If there are a lot of  $OH^-$  ions, that means the number of  $H^+$  ions is very low, so the pH is high.

Think about it for a second. Why would a liquid with high levels of NaOH be dangerous and very basic? The Na-OH bond breaks in solution and you have sodium ions (+) and hydroxide ions (-). The sodium ions don't really pose a danger in solution, but there are a huge number of hydroxide ions in solution compared to the hydrogen ions. All of those excess  $OH^-$  ions make the pH super-high and the solution will readily react with many compounds. The same thing happens on a less dangerous scale when you add baking soda to water.  $OH^-$  ions are released in the solution. The numbers of  $OH^-$  are greater than the  $H^+$  and the pH decreases.



That's basically it. (Ha Ha, get it?)