

Acids and bases

Acids are chemicals that add H^+ ions to water when you make a solution.

Bases are chemicals that add OH^- ions to water in a solution.

In other words when you put a chemical into water and stir it up, if it makes H^+ ions, it is an acid; if it makes OH^- ions: it is a base.

If an acid makes a lot of H^+ ions, we call it a strong acid, like HCl. If it makes just a few H^+ ions, we call it a weak acid (like vinegar). Strong acids can burn. Much of our food is acidic (like oranges, lemons, apples).

If an acid makes a lot of OH^- ions – strong base. If it makes a few OH^- ions: weak base. Strong acids can burn just like strong acids. Many of our cleaning supplies are bases. Some (like ammonia) are stronger. Some, like soap, are weak bases.

What are H^+ and OH^- ions? An H^+ ion is a hydrogen atom with its one electron missing. The OH^- ion is an OH with one extra electron (thus the negative).

When an acid is put in water the H^+ ion and the anion (the negative ion of the acid) separate. The H^+ ion then is attracted to the negative side of the water molecule (the oxygen) and the two make a hydronium molecule: H_3O^+ . Hydronium is positive because it has that extra proton (the H^+ ion) attached to it. Because it is an ion it will be reactive. Enough of them and they can burn you.

Likewise, when a base goes into solution (into water), it breaks apart making a cation (positive ion) and OH^- ions. These OH^- ions can react with other substances or with your skin.

pH is how we measure acids and bases. From 0 – 7 are acids, 7 is neutral, 7-14 are bases. 0 is a very strong acid (HCl). 7 is pure water or salt water. 14 is a very strong base (NaOH). Vinegar is a weak acid (pH 3). Lemon juice is pH 2. Anything stronger than lemon juice can burn. Baking soda (pH 8.5) is a weak base. Ammonia is pH 11. Anything more basic than ammonia can burn.

pH is important. Living things and living tissue (your skin, for instance) cannot survive with pH far from pH 7. Acid rain is any rain with a pH lower than 5.6. Acid rain comes from pollution. Acid rain can kill trees, animals, and destroy historical buildings. In the last century pollution in acid rain has caused more wear on the 2,000 year old Roman ruins in Italy than the previous 20 centuries! If we do not stop acid rain and the pollution that causes it we will destroy the treasures of our world before the next generation has time to enjoy them.

If you mix acids and bases together the H^+ and OH^- ions form water, which is neutral. SO, acids and bases neutralize each other! When we use an acid to neutralize a base (or vice versa) we call it a titration.