

Notes – Acids, Bases, and the pH scale

An **ion** is an atom or molecule with an electrical charge. The electrical charge is the result of the atom or molecule having a different number of electrons (which have a negative charge) and protons (which have a positive charge). Atoms can gain or lose electrons in chemical reactions.

Certain substances called **acids** will lose one hydrogen atom, minus its one electron, when mixed with water. This hydrogen ion, because it has no electron, is simply a proton with a single positive charge. Acids react with most materials because of its free H^+ ions. They taste sour. Hydrochloric acid (HCl), the acetic acid ($HC_2H_3O_2$) found in vinegar, and the citric acid () found in lemon juice are examples of acids.

Other substances called **bases** or alkalis will lose one OH^- ion when mixed with water. Bases generally do not react with metals, but do react with most biologic substances such as skin and hair. Strong bases such as sodium hydroxide (NaOH) can be used to clean drains of hair and fat. Bases taste bitter.

Scientists have a scale to measure how acid and basic (alkaline) a substance is, called the **pH scale**. The scale extends from 0 to 14, with 0 being the strongest acid and 14 being the strongest base. A pH of 7 is neither acid nor base, which is called neutral. Thus, a pH from 0 to 6.9 is acid, and a pH of 7.1 – 14 is basic.

Water molecules can split apart into H^+ and OH^- ions, but because they are created in equal parts, the acid ions and basic ions cancel each other out. This is why water has a pH of 7.

Combining a strong acid and strong base in a chemical reaction makes a **salt**. A salt is an ionic compound that has a metal ion combined with a non-metal ion. Table salt, sodium chloride (NaCl), can be made by reacting hydrochloric acid (HCl) with sodium hydroxide (NaOH) as follows: $HCl + NaOH \rightarrow NaCl + H_2O$.