Vinegar (dilute acetic acid) is available in every grocery store in the country. The large one-gallon jugs can be found in households everywhere. One magazine published an article listing 150 ways to use vinegar, from cleaning dirt off your computer to cleaning window blinds. A mixture of vinegar and baking soda is an excellent way to clean sink drains. You can also clean your carpets and your piano keys. Not bad for something that you though of only for putting on food.

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**Carboxylic Acids**

Organic acids such as acetic acid all contain a functional group called a **carboxyl group**.

![Carboxyl Group](image)

The carboxyl group contains the \(\ce{C=O}\) of the carbonyl group, with the carbon atom also being bonded to a hydroxyl \(\left( \ce{-OH} \right)\) group. A **carboxylic acid** is an organic compound that contains the carboxyl functional group. The general formula for a carboxylic acid can be abbreviated as \(\ce{R-COOH}\). The carbon atom of the carboxyl group may be attached to a hydrogen atom or to a carbon chain. The naming of a carboxylic acid is as follows: Name the parent compound by finding the longest continuous chain that contains the carboxyl group. Change the -e at the end of the name of the alkane to -oic acid.

![Carboxylic Acids](image)

**Properties of Carboxylic Acids**

Carboxylic acids are all weak acids. In aqueous solution, the \(\ce{O-H}\) bond of the hydroxyl group can break, yielding a negative carboxylate ion and the hydrogen ion.

![Equilibrium](image)

*Figure 25.12.1: Equilibrium between carboxyl group and carboxylate ion.*

The smaller members of the aliphatic carboxylic acid series are colorless, volatile liquids with strong odors. Ethanoic acid is commonly known as acetic acid and common household vinegar is a \((5\%\) solution of acetic acid. Larger carboxylic acids are solids with low melting points. There are a great many aromatic carboxylic acids, which are all crystalline solids. Carboxylic acids can form intermolecular hydrogen bonds and thus have relatively high melting and boiling points.
compared to other organic compounds that cannot hydrogen bond. Carboxylic acids with shorter carbon chains are very soluble in water, while those with longer carbon chains are less soluble.

Many carboxylic acids occur naturally in plants and animals. Citrus fruits such as oranges and lemons contain citric acid.

Ethanoic and citric acids are frequently added to foods to give them a tart flavor. Benzoic, propanoic, and sorbic acids are used as food preservatives because of their ability to kill microorganisms that can lead to spoilage. Methanoic and ethanoic acids are widely used in industry as starting points for the manufacture of paints, adhesives, and coatings.

**Contributors**

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