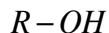


## Alcohols

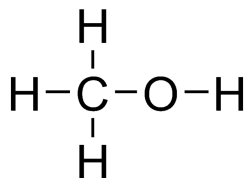
An alcohol is a hydrocarbon where one or more hydrogen atoms are replaced by a hydroxyl group ( $-OH$ ). The general formula for an alcohol is



where  $R$  represents the hydrocarbon portion, and  $OH$  represents the hydroxyl group.

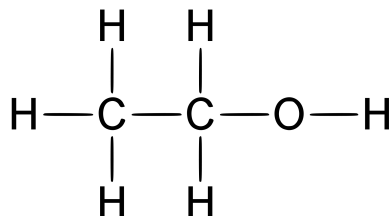
### Naming Alcohols

Alcohols are named by adding the suffix  $-ol$  to the root of the hydrocarbon name. For example, the alcohol with 1 carbon atom is called methanol. Its structure is shown below.

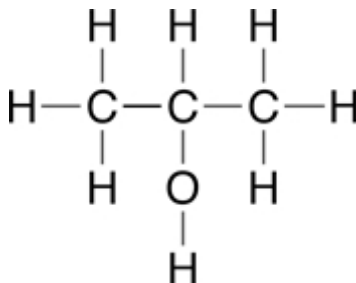


#### Example 1

Name the alcohol shown below.

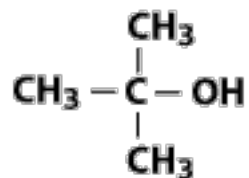


When a hydroxyl is added to a longer hydrocarbon chain, the hydroxyl group may be attached to any of the carbon atoms, forming several different isomers. To identify a particular isomer, the name of the compound includes a number prefix to indicate the location of the hydroxyl group on the parent chain. For example, the compound shown below is called 2-propanol because the parent hydrocarbon is propane and the hydroxyl group is located on the second carbon.



### Example 2

Name the alcohol shown below.



### Example 3

Draw the structural formula for 3,5,5-trimethyl-2-hexanol.

## Some Common Alcohols

### Methanol

- aka methyl alcohol, wood alcohol
- used as an antifreeze, solvent
- cannot be used as a normal fuel for cars because it corrodes aluminum and steel very quickly
  - Formula 1 race cars that burn pure methanol have engine parts made of Teflon®
- ingestion of even a small amount can cause blindness

### Ethanol

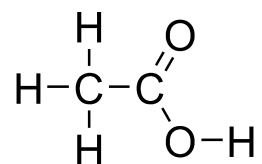
- aka ethyl alcohol, grain alcohol
- used in alcoholic beverages
- used in modern thermometers
- used as a fuel additive (up to 10% in Manitoba)
  - has a lower fuel density than gasoline, meaning you need more of it to travel the same distance
- used as a solvent in many consumer products
  - mouthwash, cosmetics

## 2-Propanol

- aka isopropyl alcohol, rubbing alcohol
- used as an antiseptic
- used as a cleaning fluid
  - electronics, LCD screens, eye glasses, whiteboards, most fabrics
- used to preserve biological specimens

## Carboxylic Acids

Consider the structural formula shown below.



The carbon atom in the middle is connected to a hydroxyl group with a single bond and to an oxygen atom with a double bond. Together, this structure of one carbon atom, two oxygen atoms, and one hydrogen atom is called a **carboxyl group**. It is abbreviated  $-\text{COOH}$ .

Hydrocarbons that contain a carboxyl group are known as **carboxylic acids**. The general formula for a carboxylic acid is



where  $R$  represents the hydrocarbon portion, and  $-\text{COOH}$  represents the carboxyl group.

### Naming Carboxylic Acids

In naming carboxylic acids, the suffix *-oic acid* is added to the root name of the parent chain. Thus, a simple 6 carbon carboxylic acid would be called hexanoic acid.

**Note:** The carbon in the carboxyl group is counted in the chain.

#### Example 4

Name the acid with the condensed formula  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ .

## Some Common Acids

### Methanoic Acid ( $CHOOH$ )

- found in the venom of bee and ant stings
- used as a preservative and antibacterial in livestock feed
- used to process organic latex (sap) into raw rubber
- of minor importance in the textile industry and for the tanning of leather
- is the active ingredient in some brands of household lime scale remover

### Ethanoic Acid ( $CH_2COOH$ )

- aka acetic acid
- the major use of acetic acid is in the production of vinyl acetate monomer (VAM)
- vinegar is a weak solution of acetic acid (typically 5 to 18% by mass)
- used as a solvent
- used in a stop bath during development of photographic film
- used as a descaling agent to remove lime scale from taps and kettles
- used to treat the sting of certain jellyfish

### Citric Acid ( $C_6H_8O_7$ )

- occurs naturally in citrus fruits
- used as a flavoring and preservative in food and drinks
- used in soaps and laundry detergents
  - allows the soap to foam and work better without a water softener
- used in shampoo
  - when applied to hair, citric acid opens up the cuticle
  - while the cuticle is open, it allows for deeper penetration of the cleaning agents

### Lactic Acid ( $C_3H_6O_3$ )

- primarily found in sour milk products
  - yogurt and some cottage cheeses
- found in various processed foods
  - usually either as a pH adjusting ingredient, or as a preservative
- used to reduce the number of pathogenic bacteria on animal carcasses during the slaughtering process

### Ascorbic Acid ( $C_6H_8O_6$ )

- used in photographic developer solutions
- used as a preservative
- is the active ingredient in vitamin C

Acetylsalicylic Acid ( $C_9H_8O_4$ )

- aka Aspirin®
- used as a non-steroidal anti-inflammatory drug (NSAID)
  - pain killer
  - reduces fever and pain without impairing consciousness
  - reduces inflammation