

4U Chemistry:

Notes, Drawings, Examples

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1 Organic Chemistry

1.1 Reactions of Hydrocarbons

There are several reactions of hydrocarbons (20 I think?) and this is too low of a level to logic it out, so it will all be memorization, get ready.

1.2 Alkane Reactions

In general, alkanes are fairly unreactive, however, they burn very easily in combustion reactions, releasing a lot of energy.

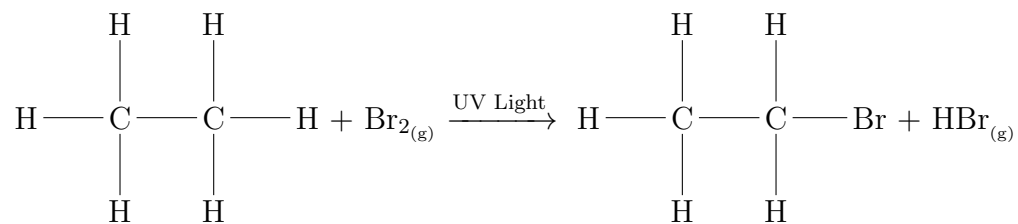
Reactants of the reaction will be the hydrocarbon and $O_{2(g)}$ with the products of a complete combustion being $CO_{2(g)} + H_2O_{(g)}$

1.2.1 Alkane Reactions - Substitution Reaction

During a substitution replaced a H atom with a halogen to make an alkyl halide. This reaction only occurs with three halogen gases F_2 , Cl_2 , and Br_2 .

This reaction can create a mixture of different isomers and can occur in multiple phases, making multiple substitutions if needed.

NOTE: This reaction required UV light to occur



1.3 Alcohols

An alcohol group is an organic compound that contains the hydroxyl -OH functional group the “alcohol” in beer and wine is really “ethanol”

CH_3OH	$\text{CH}_3\text{CH}_2\text{OH}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
methanol	ethanol	propan-1-ol	butan-1-ol

Some Important Alcohols:

- Methanol - produced from wood, often used as a solvent but is toxic
- Isopropanol (propan-2-ol) - Rubbing alcohol, used as an antiseptic
- Glycerol - Used to make fats in the body. (propan-1,2,3-ol)

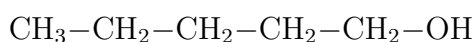
1.4 Naming Alcohols

When naming alcohol, the following rules need to be followed in this exact order:

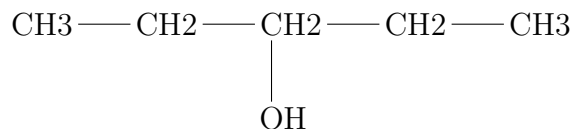
1. Identify the longest chain of C that contains the -OH (hydroxyl) group
2. Number the C atoms with the #1 closest to the -OH . It has priority over the alkyl groups and halogens
3. Drop the -e ending (if two vowels are present) on alkane and add -ol. Use a number if needed before the -ol
4. Name any side branches

Examples:

- pentan-1-ol



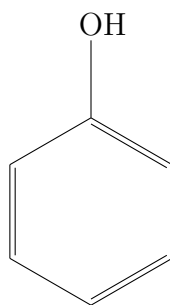
- pentan-3-ol



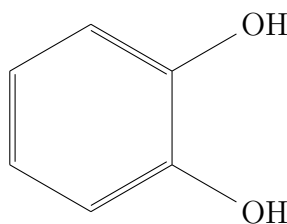
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1.4.1 Aromatic Alcohols

The simplest aromatic alcohol is a benzene ring with one hydroxyl group bonded to it. Its IUPAC name is phenol



If the benzene ring has two -OH groups attached, the name is based on benzene and includes numbers for the -OH groups



1.5 Primary, Secondary, and Tertiary Alcohols

Alcohols are classified according to where the -OH is attached. They are classified as primary, secondary, and tertiary alcohols as stated below:

- 1° (Primary Alcohol) - Hydroxyl group attached to the end

- 2° (Secondary Alcohol) - Hydroxyl group attached to a C that is attached to two other C
- 3° (Tertiary Alcohol) - Hydroxyl group attached to a C that is attached to three other C

1.6 Polyalcohols

Polyalcohols are just alcohols with more than one hydroxyl. For Nomenclature, use suffixes (di, tri, etc.) and numbers. The -e is kept if it followed by a consonant but is dropped if followed by a vowel

1.7 Properties of Alcohols

The presence of -OH group makes the molecule polar that can form hydrogen bonds. The longer the Carbon (C) the less polar it is. Small alcohols are completely soluble in water, but the solubility decreases as the length of the carbon chain increases.

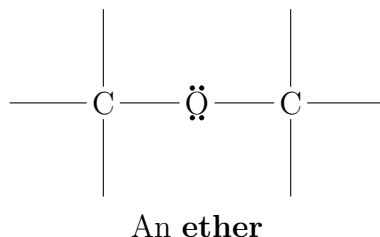
1.7.1 BP and MP

Alcohols can hydrogen bond and have higher MP and BP than hydrocarbons of similar sizes

Molecule	Molar Mass	Boiling Point
Propane	44 g/mol	-42.1°C
Ethanol	46 g/mol	78.3°C

1.8 Ethers

In an ether, the functional group consists of two C atoms connected to a single O atom. The C – O bond is polar and the shape is bent, making it a polar molecule. Ethers are also known to be good solvents



Some Important Ethers

- Ethylene Oxide - Used in Epoxy
- MBTE - A gasoline additive that helps gasoline burn better
- 18-crown-6 - Built by Pedersen and Cram (Nobel Prize 1987, capable of building metal ions)

1.9 N

aming Ethers

When naming ethers you need to follow a set of rules as you do alcohols and other substances, although, keep in mind that ethers are made up of two parts. The rules are as follows

1. Name the smallest alkyl group 1st, drop the -yl, and add oxy. This will be named as a side chain
2. End with the longest alkyl group last named as an alkane. This is the parent chain