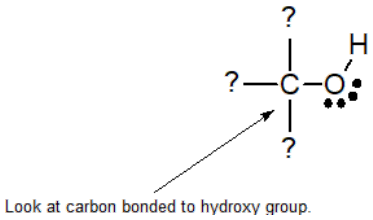
13.2: CLASSIFICATION OF ALCOHOLS

Alcohol classification is an application of the neutral bonding patterns for organic compounds. Oxygen can only form two bonds. The alcohol functional group requires that one of these bonds form with hydrogen to create the hydroxyl group and the other bond needs to be with carbon to create an alcohol. All of the oxygen atoms of all the alcohols look the same, so a different distinction is needed. To classify alcohols, we look at the carbon atom bonded to the hydroxyl group.



methyl alcohol = no (0) other carbon atoms (CH_3OH)

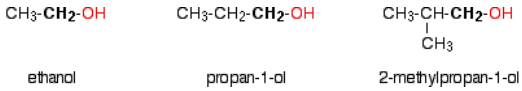
primary alcohols (1°) = 1 other carbon atoms

secondary alcohols (2°) = 2 other carbon atom

tertiary alcohols (3°) = 3 other carbon atoms

PRIMARY ALCOHOLS

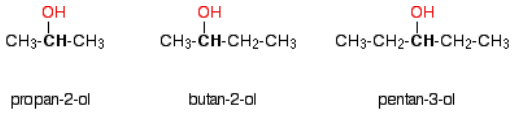
In a primary (1°) alcohol, the carbon which carries the -OH group is only attached to one alkyl group. Some examples of primary alcohols include:



Notice that it doesn't matter how complicated the attached alkyl group is. In each case there is only one linkage to an alkyl group from the CH_2 group holding the -OH group. There is an exception to this. Methanol, CH_3OH, is counted as a primary alcohol even though there are no alkyl groups attached to the carbon with the -OH group on it.

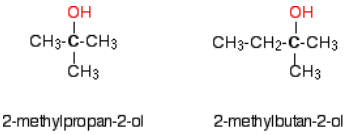
SECONDARY ALCOHOLS

In a secondary (2°) alcohol, the carbon with the -OH group attached is joined directly to two alkyl groups, which may be the same or different. Examples:



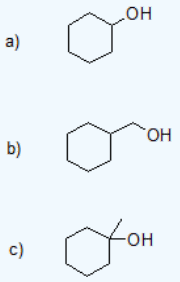
TERTIARY ALCOHOLS

In a tertiary (3°) alcohol, the carbon atom holding the -OH group is attached directly to three alkyl groups, which may be any combination of same or different. Examples:



Exercise

2. Classify the following alcohols as primary, secondary, or tertiary.



Answer

2.

a) secondary

b) primary

c) tertiary

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- Prof. Steven Farmer (Sonoma State University)
- William Reusch, Professor Emeritus (Michigan State U.), Virtual Textbook of Organic Chemistry
- Jim Clark (Chemguide.co.uk)