

VII. FORMAT FOR NAMING COMPOUNDS BEARING A FUNCTIONAL GROUP

The guidelines we have established for hydrocarbons are the foundations for naming other functionalities. When you have finished the chapter you will be able to name nearly all the compounds you will encounter in this text. The strategy for naming organic compounds with functional groups, is shown in the text box. The family endings for common parent functional groups, the prefixes for substituent functionalities, and the order of priority for functional groups are listed in Table 4, which you can download from your CD. The functional group with the highest order of priority (class 1 being highest) will be the parent group.

Guidelines for Naming Organic Compounds Bearing Functional Groups

1. **Read the structure carefully and identify ALL the functional groups present.**
2. **Redraw the structure.**
3. **Define the parent functional group.** This is the group which is given highest priority (class 1 is highest) from IUPAC rules, see Table 4. This group will give us the third syllable of the last 'word' in the name.
4. **Identify the longest chain bearing the parent functional group and name appropriately.** This gives the first syllable on the last 'word'.
5. **Number the longest chain that bears the parent functional group so that the group attains the minimum number possible.**
6. **Identify all carbon-carbon π bonds in the longest chain to obtain the second syllable in the last 'word'.**
 - a. **If there are no C=C or C \equiv C's** \Rightarrow **second syllable is an(e)**
 - b. **If there is a C=C** \Rightarrow **second syllable is en(e)**
 - c. **If there is a C \equiv C** \Rightarrow **second syllable is yn(e)**
7. **Based on step 5, number the sites of the carbon-carbon π bonds (if any) and place the number BEFORE the first syllable of the final word, e.g., 2-hexenoic acid is correct. You should not use hex-2-enoic acid.**
8. **Number and name the substituents on the molecule (the numbering is based on step 4).** Use the prefix column in Table 4 to obtain the correct designation for the substituents. Prefixes for carboxylic acids and their derivatives are omitted.
9. **Place the substituents in alphabetical order.**
10. **Name the compound.**

VII.A THE PHONETIC 'e' [an or ane; en or ene; yn or yne] AND 'a' [hex or hexa, etc.]

An 'e' is added to the second syllable ('an', 'en' or 'yn') of the final 'word' if the final syllable (suffix) begins with a consonant. Thus, the 'e' is included in 1,6-hexanediol, but not in 3-hexanol. Similarly, an 'a' is added to the end of the first syllable, if the second syllable starts with a consonant, other than 'y'. For example the 'a' is included in 1,3-butadiene, but not in 2-butene.

TABLE 4. FAMILY ENDINGS, PREFIXES AND PRIORITIES OF FUNCTIONAL GROUPS

Functional Group	Structure	Family Ending	Second Syllable	Prefix	Priority (1 is high)
Carboxylic Acid	$\begin{array}{c} \text{-C=O} \\ \\ \text{OH} \end{array}$	-oic acid	n.a.	carboxy	1
Acid Anhydride	$\begin{array}{c} \text{-C-O-C-} \\ \quad \\ \text{O} \quad \text{O} \end{array}$	-oic anhydride	n.a.		2
Ester	$\begin{array}{c} \text{-C=O} \\ \\ \text{OR}^1 \end{array}$	-oate*	n.a.	alkoxycarbonyl**	3
Acid Chloride	$\begin{array}{c} \text{-C=O} \\ \\ \text{Cl} \end{array}$	-oyl chloride	n.a.	chlorocarbonyl formyl chloride if it is a substituent on the longest carbon chain	4
Amide	$\begin{array}{c} \text{-C=O} \\ \\ \text{NR}_2 \quad (\text{R} = \text{H/Alkyl}) \end{array}$	-amide*	n.a.	carbamoyl or amido	5
Nitrile	-CN	-nitrile	n.a.	cyano	6
Aldehyde	$\begin{array}{c} \text{-C=O} \\ \\ \text{H} \end{array}$	-al	n.a.	oxo if <u>part of</u> longest chain formyl if <u>it is a</u> <u>substituent attached</u> <u>to</u> longest chain	7
Ketone	$\begin{array}{c} \text{R-C=O} \\ \\ \text{R}^1 \quad (\text{R}, \text{R}^1 = \text{Alkyl}) \end{array}$	-one	n.a.	oxo	8
Alcohol	-OH	-ol	n.a.	hydroxy	9
Amine	R-N-R ¹ ₂ (R ¹ = H/ Alkyl)	amine*	n.a.	amino	10
Alkene	-C=C-	ene	-en(e)-*	alkenyl	11
Alkyne	-C≡C-	yne	-yn(e)-*	alkynyl	12
Alkane	n.a.	ane	-an(e)-*	alkyl	n.a.
Ether	R-O-R ¹ (R, R ¹ = Alkyl)	ether*	n.a.	alkoxy**	n.a.
Halogens	-F, -Cl, -Br, -I	n.a.	n.a.	halo***	n.a.
Nitro	-NO ₂	n.a.	n.a.	nitro	n.a.

n.a. = not applicable. *This will be discussed below. **The term alkoxy is generic. Substitute the appropriate the name of the alkyl group for 'alk'. Thus, CH₃O is methoxy. Similarly, substitute the appropriate halogen for halo.