**Podcast 16.1 Organic Chemistry –Naming Hydrocarbons**

Straight-Chain Hydrocarbons: The Backbone of Organic Molecules

Modifying the Straight Chain: Double Bonds

1. Change ending from –\_\_\_\_\_\_\_\_\_ to –\_\_\_\_\_\_\_\_\_\_\_
2. Specify the location of the bond using number
3. Count carbons to get the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ number in the name

Examples of Double-Bonded Hydrocarbons

1. CH3CH=CHCH2CH3
2. n-propene
3. 3-octene
4. 1,3-butadiene

Triple Bonds

1. Change ending from –\_\_\_\_\_\_\_\_\_\_\_\_ to –\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Specify the location of the bond using number
3. Count carbons to get the LOWEST number in the name

Examples of Triple-Bonded Hydrocarbons

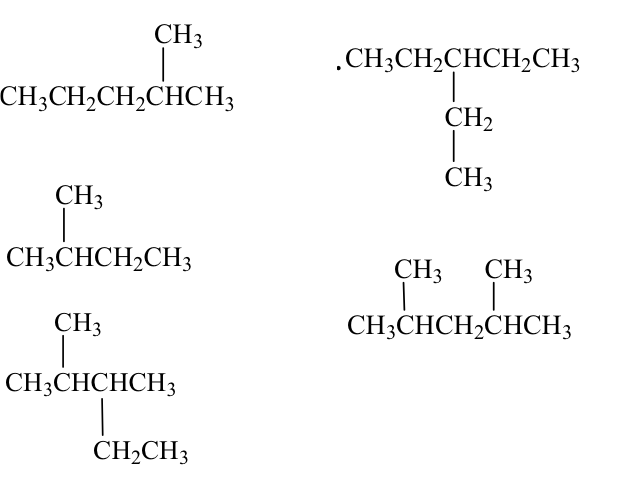
1. n-butyne
2. CH Ξ CCH3
3. 3-heptyne

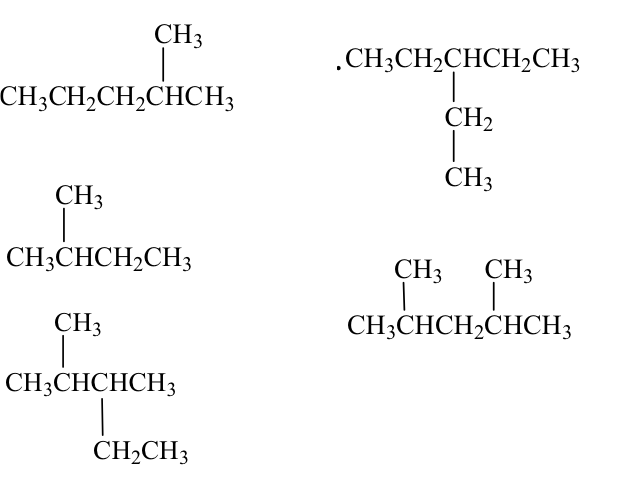
Branching Hydrocarbons

1. Name the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chain as the backbone
2. Identify branches by number of Carbons (methyl, ethyl, etc.)
3. Locate each branch using numbers on the backbone
4. List multiple branches in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ order

* “Iso-” and “Tert-”

Draw the Structural Formula

2,2,4-Trimethylpentane, also called *isooctane*. This compound is the reference for octane ratings for gasoline

Examples of Branched Hydrocarbons

Cyclic Hydrocarbons

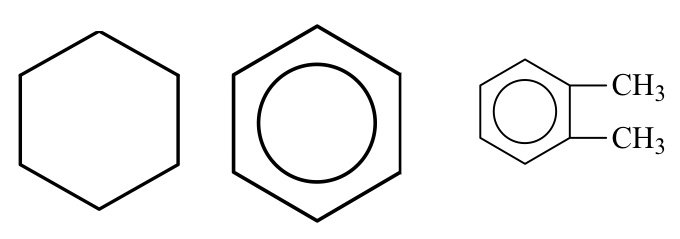
1. Use the prefix \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-
2. Name the hydrocarbon
3. Use counting for any branches off the cyclical hydrocarbon

Examples

cyclopentene

Benzene: A Special Cyclo-Alkene

* 6-carbons
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ double and single bonds
* Particularly stable configuration



HYDROCARBONS

Fill in the name or formula for the following open-chain hydrocarbons (no cycloalkanes):

|  |  |
| --- | --- |
| 1. C3H8 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  2. C5H8 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  3. C2H4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  4. C7H16 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  5. C4H10 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  6. C8H16 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  7. C9H16 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  8. C10H22 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  9. ­­­­\_\_\_\_\_\_\_\_ butene  10. \_\_\_\_\_\_\_\_ octyne  11. \_\_\_\_\_\_\_\_ propene  12. \_\_\_\_\_\_\_\_ pentane  13. \_\_\_\_\_\_\_\_ nonene  14. \_\_\_\_\_\_\_\_ ethyne  15. \_\_\_\_\_\_\_\_ hexyne | 16. – 21. Draw and name the three isomers of pentane:  22. Name the following molecule:    23. Draw the molecule:  3-ethyl-2,2,5,5-tetramethyloctane |

**16.2 Functional Groups**

Halo-carbons: Halogens and Hydrocarbons

1. Name the hydrocarbon backbone
2. Add fluoro-, chloro- , bromo- , or iodo- as a prefix
3. Locate the halogen using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Name multiple halogens in alphabetical order

Examples

1. trichloromethane
2. C6H5Cl
3. 2-bromo-3-methyl-2-butene
4. 

Isomers of C5H11Cl



Ammonia, NH3: Amines and Amides

1. Hydrocarbons can replace the hydrogen in ammonia
2. name the alkyl groups that are attached to the nitrogen
3. End with amine (no space)

Examples

1. triethylamine
2. diethylmethylamine
3. diisopropylamine
4. 

Alcohols: R-OH

1. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ group indicates an alcohol
2. Name the hydrocarbon chain
3. Change the ending to –\_\_\_\_\_\_\_\_\_\_\_\_

Examples

1. Methanol
2. Ethanol
3. Isopropyl alcohol
4. 3-ethyl-2,4-dimethyl-3-hexanol



f)



g)



Carboxylic Acids: The “Electron-hog”, Oxygen

1. Name the hydrocarbon backbone
2. The acid is always on the end, so there’s no need to use numbering to locate it
3. Change the ending to –ic, and add the word “acid”

Examples

1. Ethanoic acid
2. Butanoic acid
3. Propenoic acid

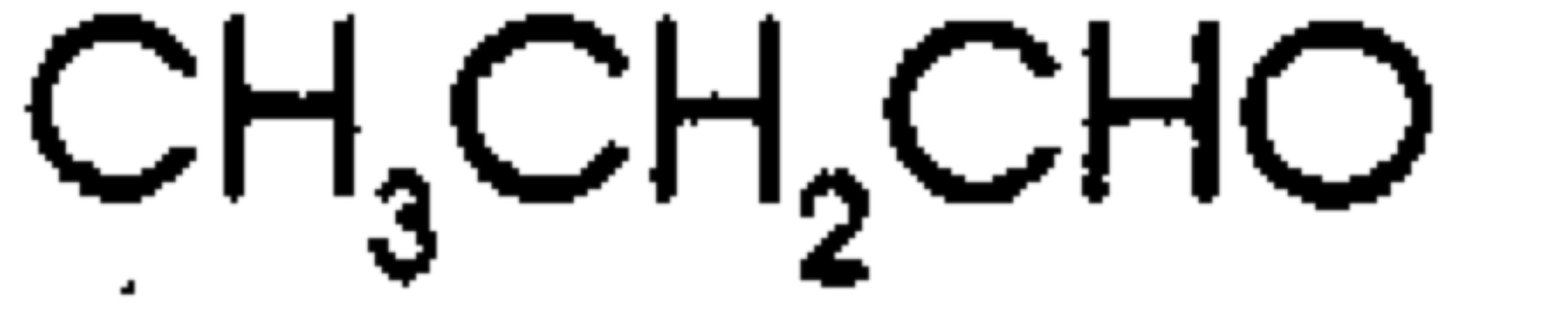
Special Challenge Organic Acid

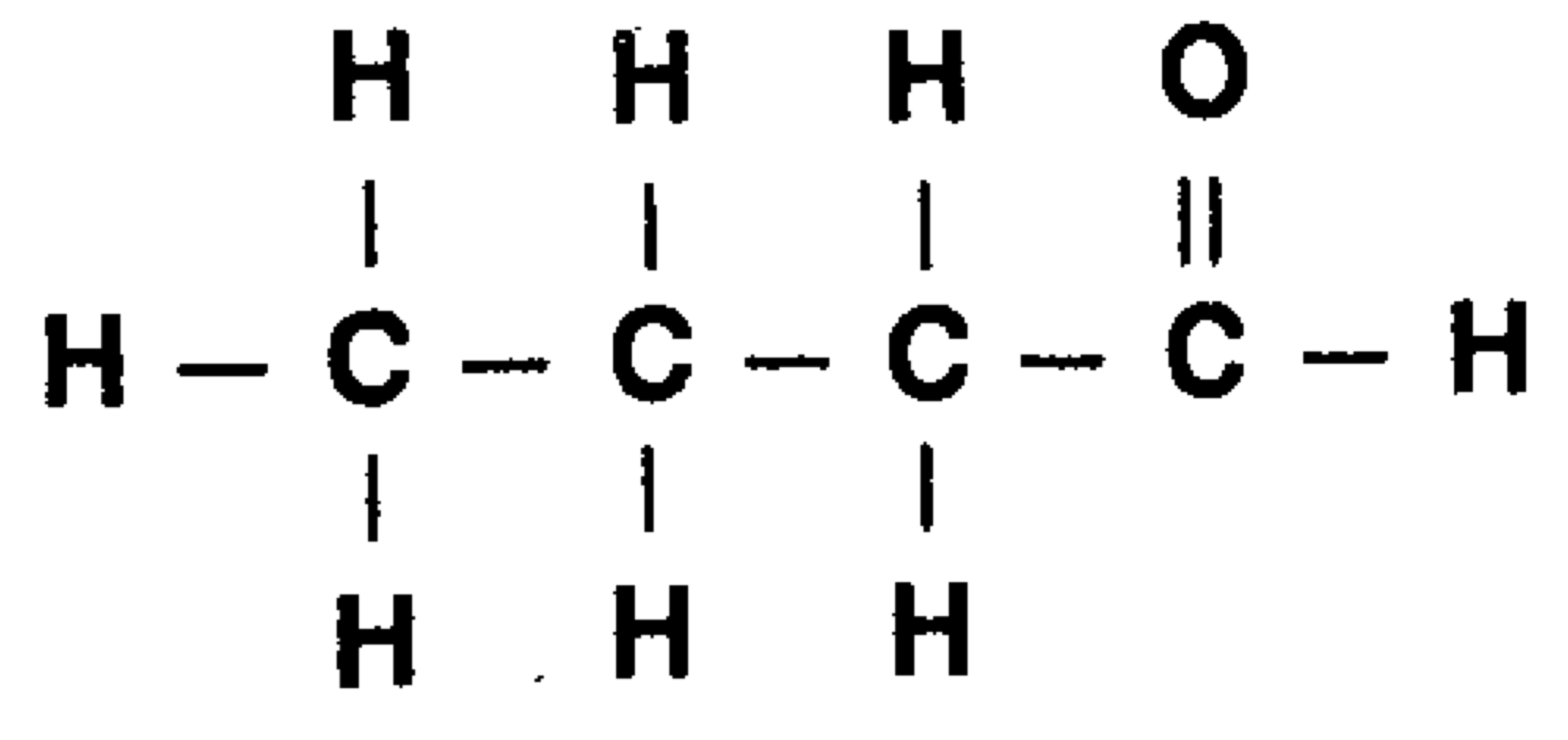
4-bromobenzoic acid

Aldehydes

1. Name the hydrocarbon backbone
2. Always at the end – no need to use numbers
3. Change the ending to –\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Examples

1. Methanal
2. Propanal
3. 

d)

Aldehyde Challenges

2-ethyl-4-methylpentanal



Ketones: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Carbons, Double-bonded O (The carbonyl group)

1. Name the hydrocarbon backbone
2. Locate the ketone group using a number right before the base name
3. Change the ending to –\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

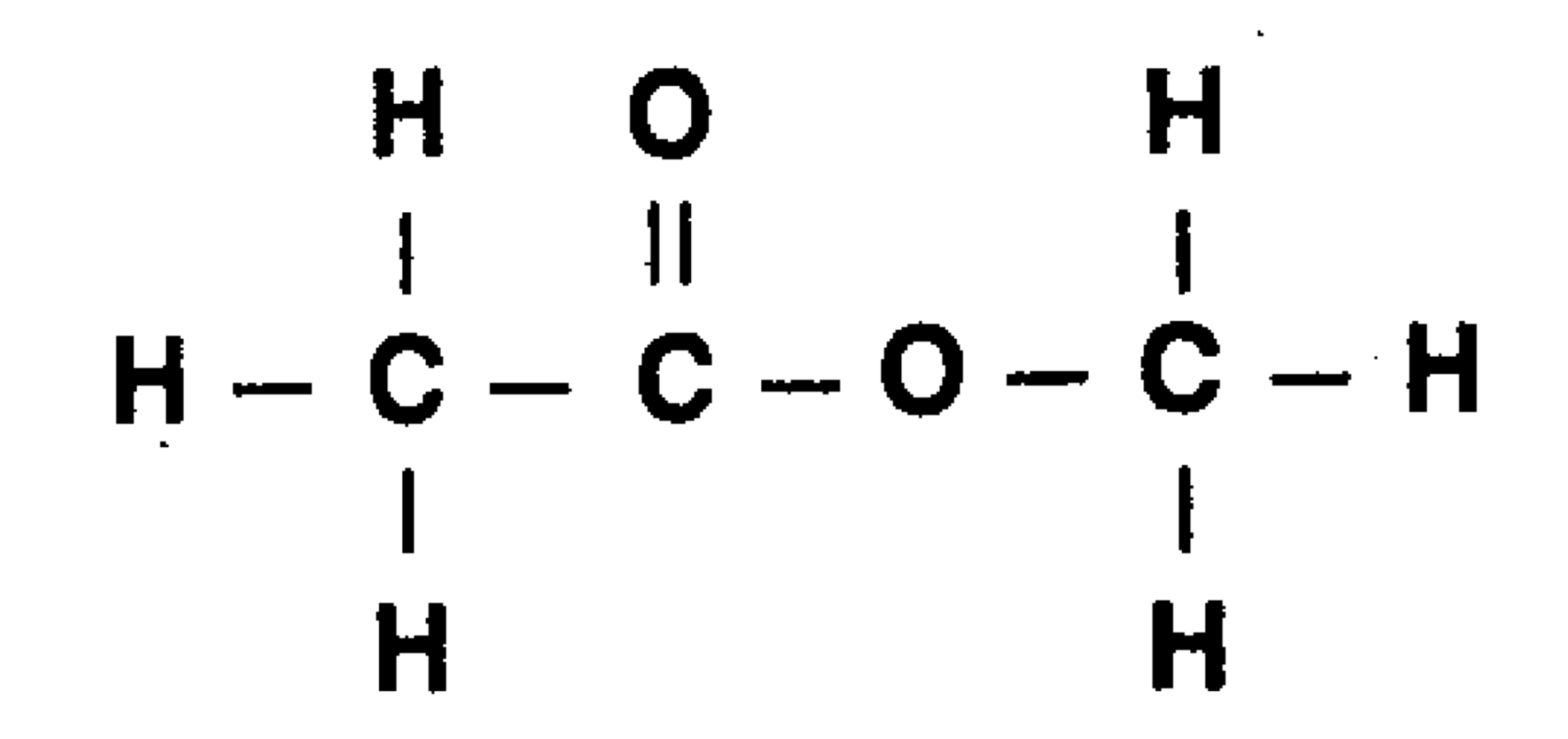
Examples

1. 3-butanone
2. 2,5,5-trimethyl-4-heptone



Esters

1. Name the group attached to the single bond oxygen as a substituent. Put this in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the name.
2. Add one space, and then name the carbon chain attached to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ carbon (double-bonded to the O)
3. Change the ending to –\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Examples:

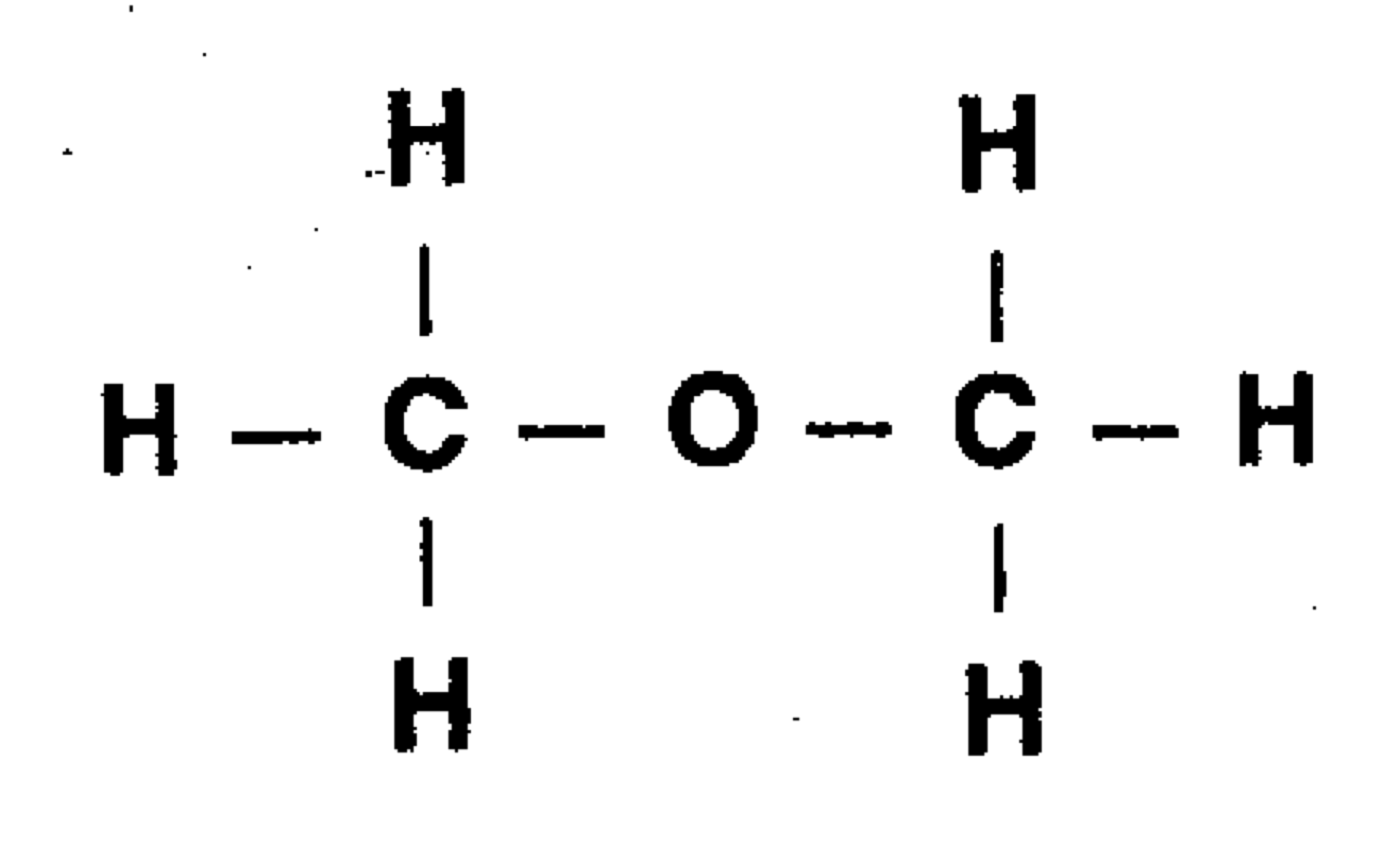
1. methyl butanoate
2. ethyl propanoate

Ethers

1. Name each hydrocarbon, changing the ending to –\_\_\_\_\_\_\_\_\_\_
2. Add one space, then the word “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”

Examples

1. Ethyl-methyl ether



“Essential” to Life: Amino Acids

* Contain both an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ group and a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Building blocks of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Do not form branching chains, but rather add together like beads on a necklace
* Folding determines shape
* Shape determines function

**Alanine**

|  |
| --- |
|  |

**Glycine**

|  |
| --- |
|  |

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_/\_\_\_/\_\_\_ Period \_\_\_\_\_\_\_\_\_

16 • Organic Chemistry

Organic Nomenclature Practice

|  |  |  |
| --- | --- | --- |
| **Name** | **Formula** | **Structural Formula** |
| **n-butane** | (1) **C4H10**  (2) **CH3CH2CH2CH3** |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

16 • Organic Chemistry

STUDY QUESTIONS

1. Draw the structural formulas for:

a. 2-methylpentane b. 2,2-dimethylpropane

2. Classify the following as alkanes, alkenes, or alkynes

C2H4 C6H10 C3H8 C4H10 C5H12

3. Organic compounds have names with characteristic endings. To what classes of organic compounds do the following endings belong?

a. -oic acid d. -one

b. -ene e. -ol

c. -al f. -oate

4. Draw:

a. an aldehyde with the molecular formula C4H8O

b. a ketone with the molecular formula C4H8O

c. an ester with the molecular formula C3H6O2

d. an ether with the molecular formula C2H6O