Office Hours: M 1:30pm - 3:00pm
(in Park 169) W 11:00am - 12:00pm
or by appointment (email me)
or just email me with questions!

TA Hours w/ Sodtugs: T&Th 7:00pm - 8:00pm
(in Park 273)

Q-center: https://www.brynmawr.edu/inside/offices-services/q-center/q-center-schedule

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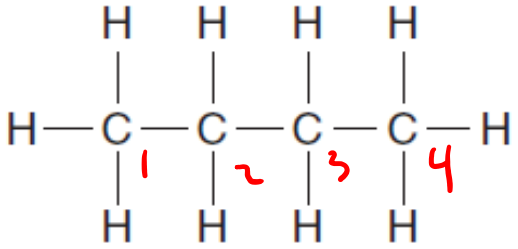
Drawing and Naming Organic Molecules

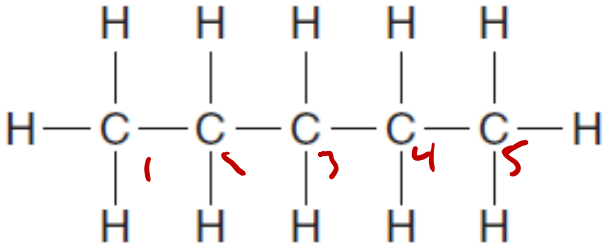
9/9/2026

Quiz 1 in Recitation on Friday

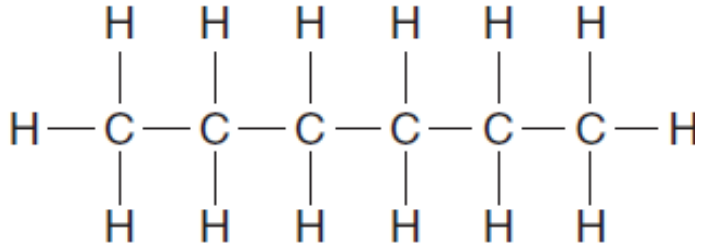
Drawing Molecules: Bond-Line Structures



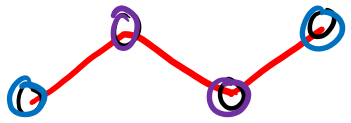
Butane
(C_4H_{10})



Pentane
(C_5H_{12})



Hexane
(C_6H_{14})



The longest Carbon chain is drawn in a "zig-zag" format

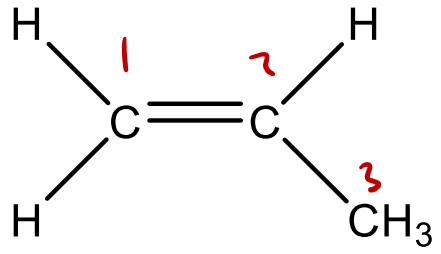
C never makes more than 4 bonds!

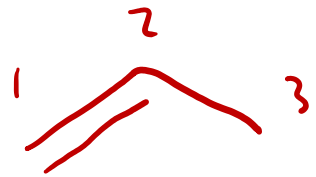
Carbons are represented as endpoints or corners of lines.

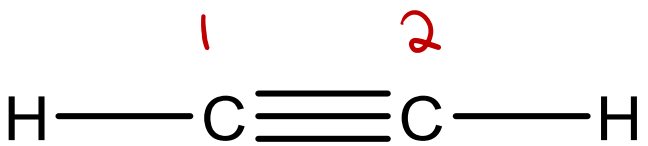
Hydrogens attached to Carbons are not shown.

[Assume each Carbon makes a total of 4 bonds to determine the number of implied Hydrogens]

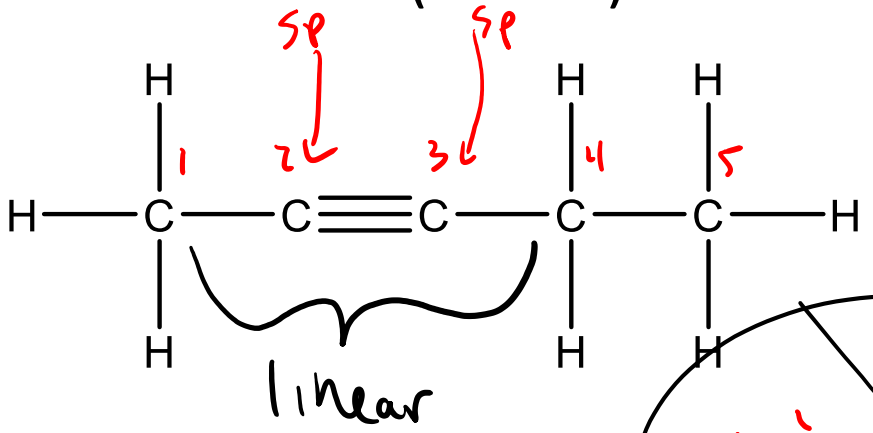
Carbon-Carbon multiple bonds are shown with multiple lines

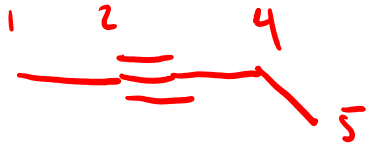


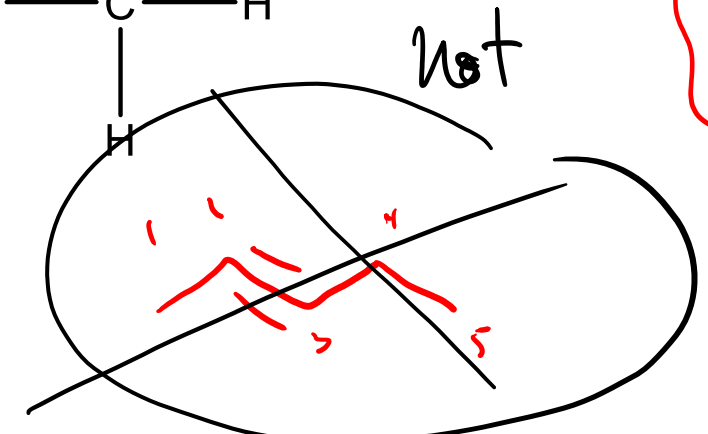


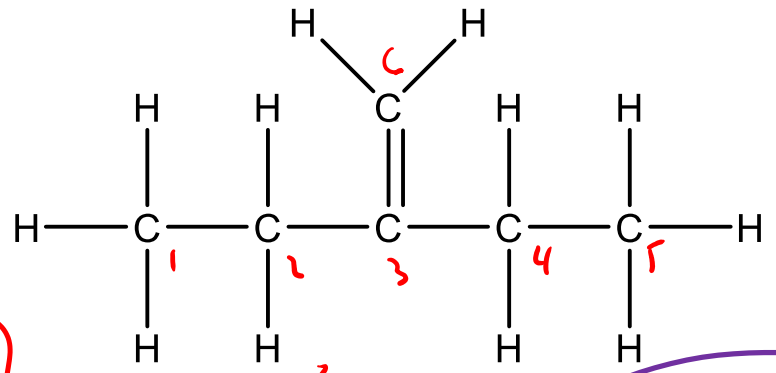


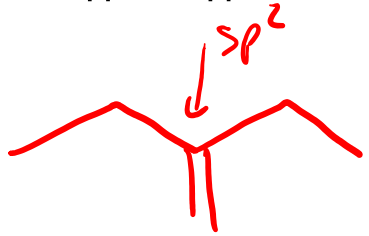
The geometry of the bond-line structure should reflect the hybridization of each carbon! (VSEPR)

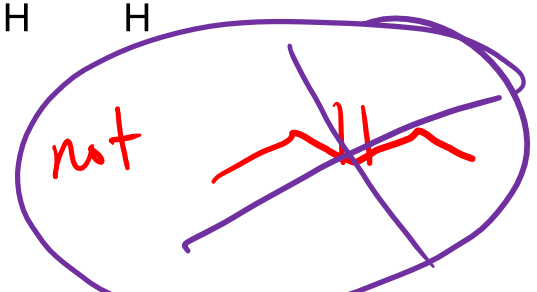






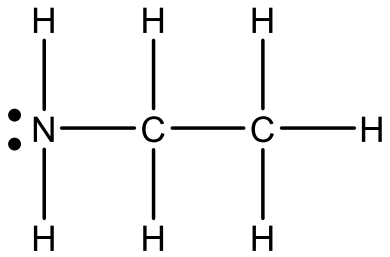


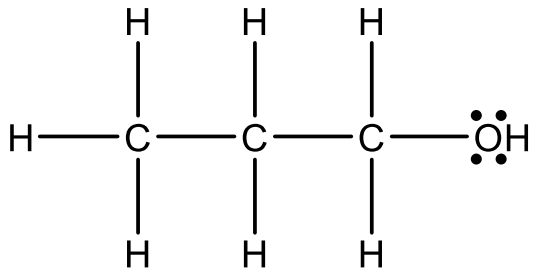




Heteroatoms (not C or H) are <u>always drawn</u>

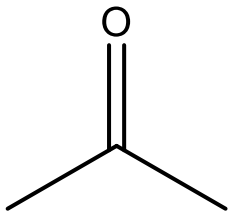
Heteroatoms <u>always</u> have their number of H's labeled clearly

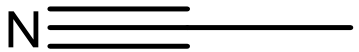


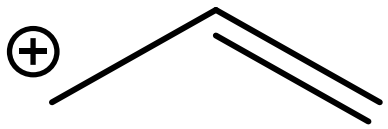


Lone pairs are *<u>not shown</u>* in bond-line structures, but

Formal charges are **<u>always shown</u>.**







Nonzero formal charges: Carbon

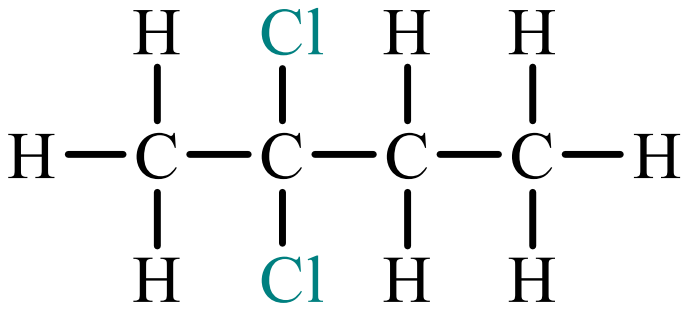
Carbon never makes more than 4 bonds, but sometimes it makes fewer:

Nonzero formal charges: Nitrogen

Nonzero formal charges: Oxygen

Bond-line structures and 3D geometry

The longest chain of Carbons is drawn as a zig-zagging line



Substituents of **sp^3** carbons are often (but not always*) drawn with:

Wedges (bond is coming out of the plane of the paper, toward you)

&

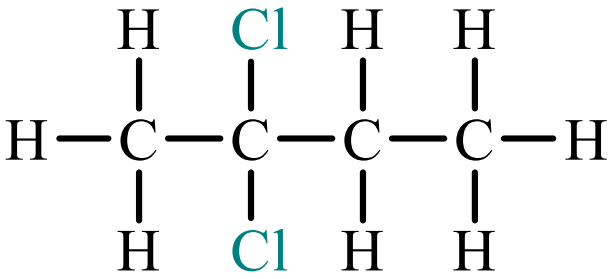
Dashes (bond is going into the plane of the paper, away from you)

**much discussion of when these must be used and why is coming soon in Chapter 5 (lectures 8-9).*

Bond-line structures and 3D geometry

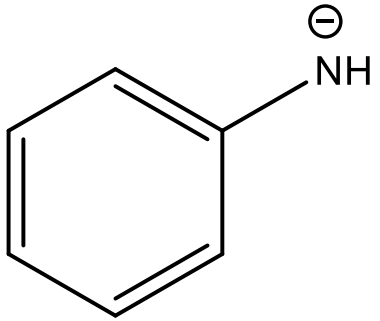
Wedges and dashes are always drawn next to each other

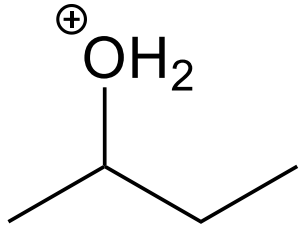
Wedges and dashes point “away from” the rest of the chain in order to represent tetrahedral geometry

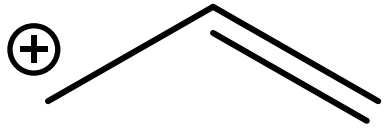


Practice (on your own – answers in annotated slides on Moodle)

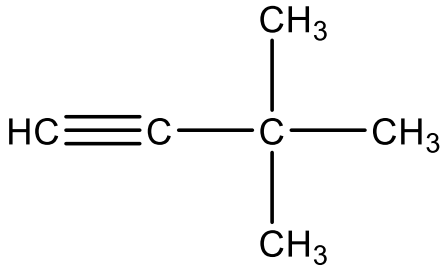
Draw full (or condensed) structures w/lone pairs

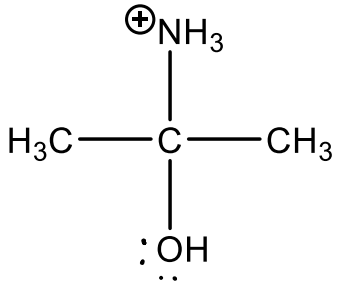


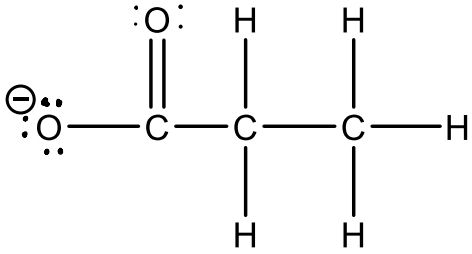




Draw bond-line structures



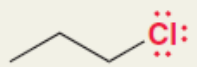
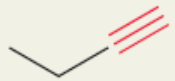




Functional groups (table 2.1 on page 56 in Klein)

- Organic molecules are classified via certain bonding motifs among Carbon & friends (C, H, O, N, P, S, X)
- Functional groups determine reactivity (in the lab & in the body)

TABLE 2.1 EXAMPLES OF COMMON FUNCTIONAL GROUPS

FUNCTIONAL GROUP*	CLASSIFICATION	EXAMPLE	CHAPTER
R—X: (X=Cl, Br, or I)	Alkyl halide	 *n*-Propyl chloride	7
	Alkene	 1-Butene	7, 8
R—C≡C—R	Alkyne	 1-Butyne	9
R—OH	Alcohol	 1-Butanol	12

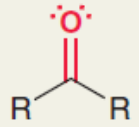
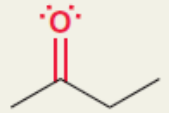
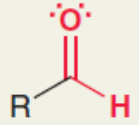
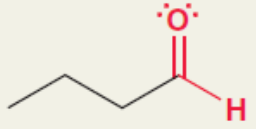
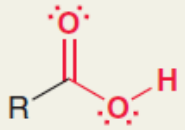
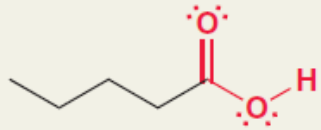
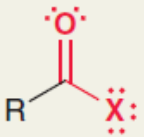
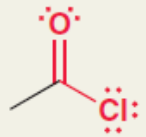
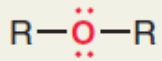
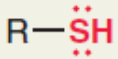
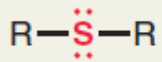
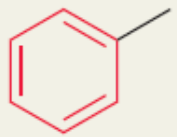
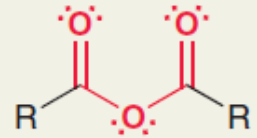
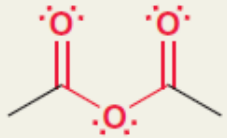
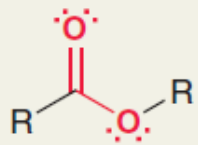
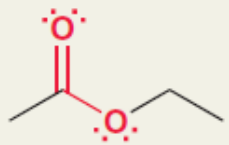
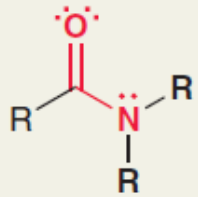
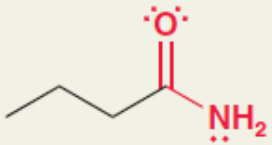
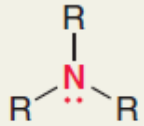
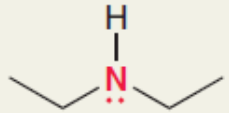
FUNCTIONAL GROUP*	CLASSIFICATION	EXAMPLE	CHAPTER
	Ketone	 2-Butanone	19
	Aldehyde	 Butanal	19
	Carboxylic acid	 Pentanoic acid	20
	Acyl halide	 Acetyl chloride	20

TABLE 2.1 EXAMPLES OF COMMON FUNCTIONAL GROUPS

FUNCTIONAL GROUP*	CLASSIFICATION	EXAMPLE	CHAPTER
	Ether	 Diethyl ether	13
	Thiol	 1-Butanethiol	13
	Sulfide	 Diethyl sulfide	13
	Aromatic (or arene)	 Methylbenzene	17, 18

FUNCTIONAL GROUP*	CLASSIFICATION	EXAMPLE	CHAPTER
	Anhydride	 Acetic anhydride	20
	Ester	 Ethyl acetate	20
	Amide	 Butanamide	20
	Amine	 Diethylamine	22

ORGANIC Chemistry

AS A SECOND LANGUAGE

Naming Alkanes

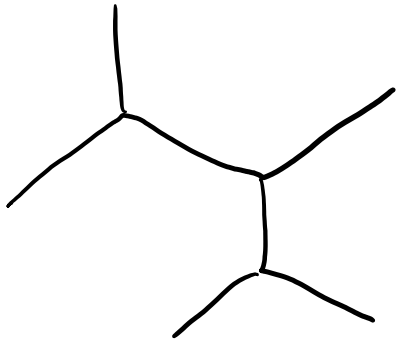
IUPAC systematic naming

1. Identify the longest carbon chain (the **"parent chain"**) in the molecule.

   a. The **prefix** denotes the **number of carbons** in the parent chain.

   b. The **suffix** for naming an **alkane is "-ane".** Other functional groups will get their own suffixes.

# of Carbon atoms in chain	prefix	Name of alkane	Drawing
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			



Poll

pollev.com/timcook653 or text timcook653 to 22333
Or use android/iphone app

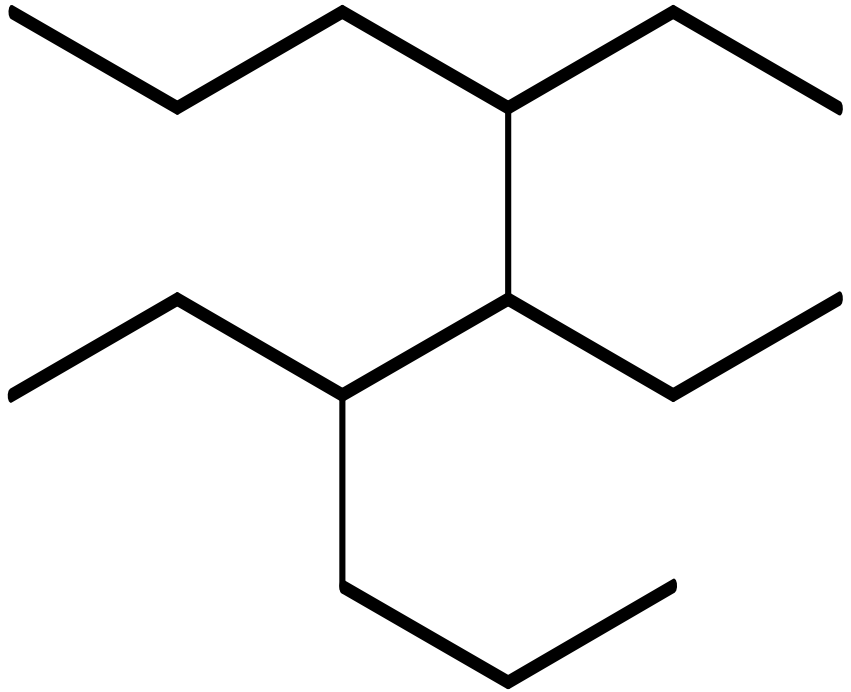
The parent chain in this molecule is

A. hexane

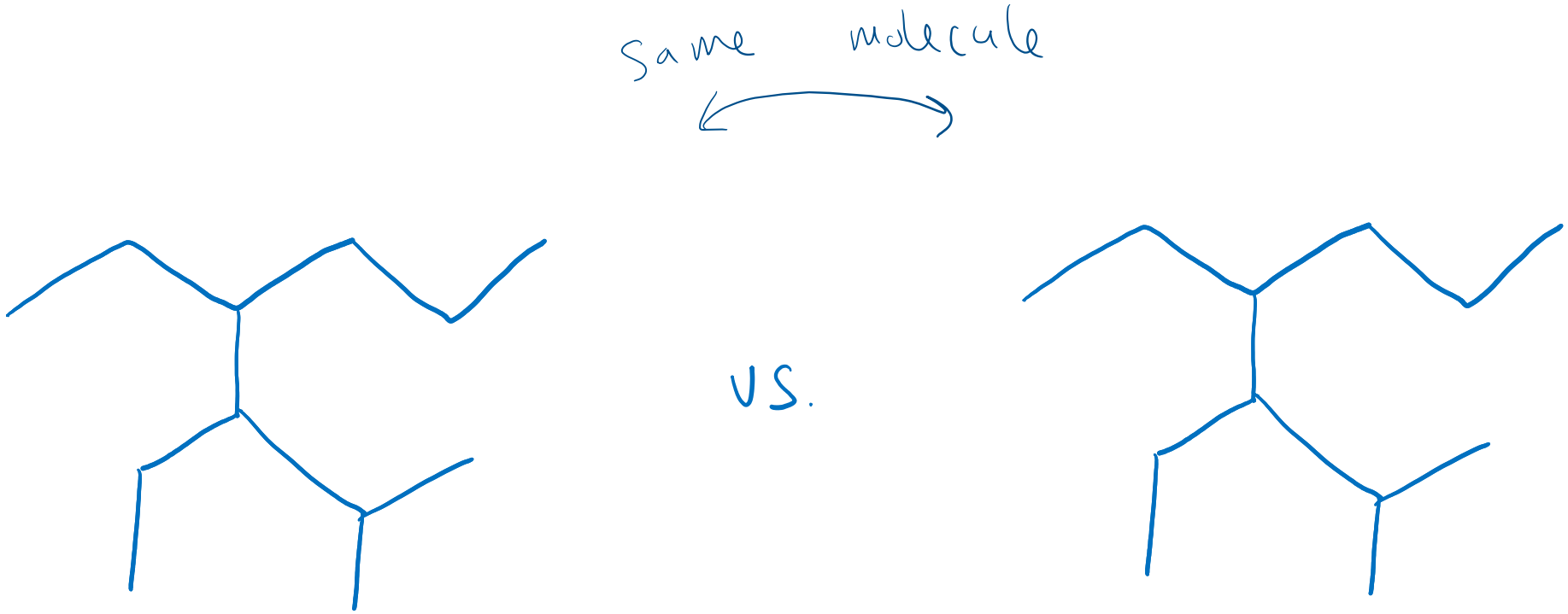
B. heptane

C. octane

D. nonane

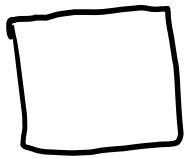


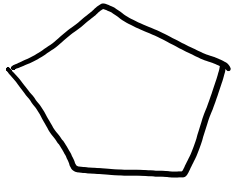
What if there are two possible “parent chains” that have the same length?

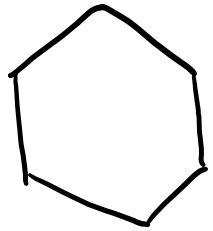


Choose the chain with the most **<u>substituents</u>** (groups that branch off the chain)

If the longest chain is a ring…

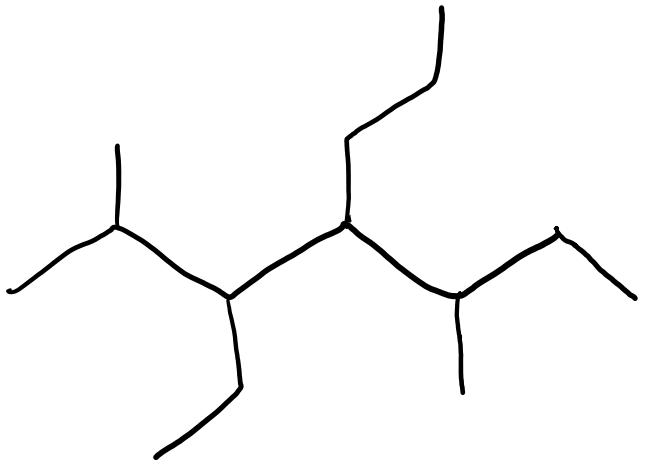






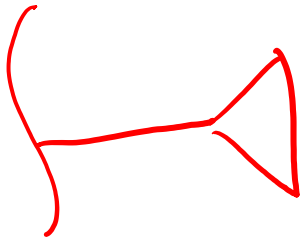
2. Name the **substituents** attached to the parent chain.

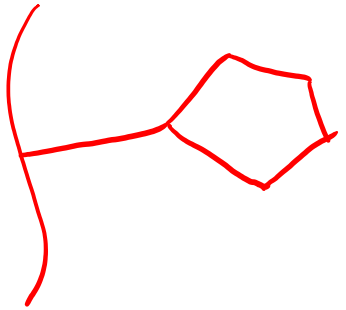
# of Carbon atoms in substituent	Name of substituent	Drawing
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		



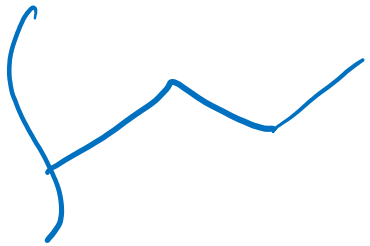
Other alkyl substituents

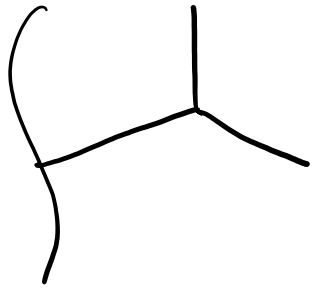
Cycloalkanes can be substituents:





The “propyl” group can have two different forms:





Other alkyl substituents

The “butyl” group has four different forms:

Other alkyl substituents

Pentyl has many different forms, but only two we will discuss: