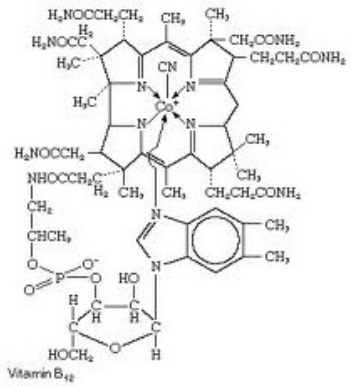


Organic Chemistry

Name:

Date:

Lewis Structure for Carbon:

A carbon atom has ____ valence electrons.

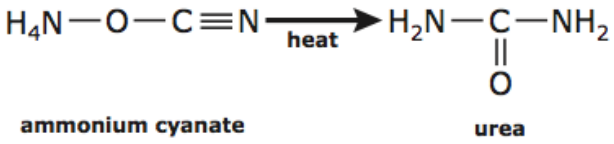
Organic Compounds

- Contain carbon atoms usually bonded to other carbon atoms and hydrogen atoms.
    - Called _____
- Organic compounds may also contain: _____

Examples of organic compounds:

1.	2.
3.	4.
5.	6.

- *Scientists thought that organic compounds contained a "life force" or "vitality.*
- *Was proved incorrect in 1828 when an inorganic salt was heated to produce an organic compound.*



Inorganic Carbon Compounds
• Even if a compound contains carbon, it may not be classified as an organic compound. ❖ ❖

Simple Hydrocarbons

- Recall that a carbon has ____ valence electrons.
- Each carbon atom can form ____ covalent bonds.
- With so many different ways that a carbon can bond…
  - There are _____of known organic compounds
  - There is an almost _____ of unknown organic compounds

Alkanes

- Hydrocarbons containing only _____.
- They are saturated – there is no room for other atoms to bond to the _____.
- Chemical Formula:

# of C Atoms	Prefix	Alkane
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Problem Set:

1. Write out the condensed structural formula for all 10 straight-chain alkanes.

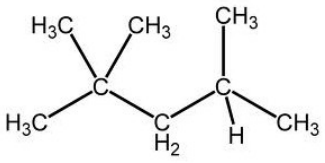
2. Draw the carbon skeleton formula for all 10 straight-chain alkanes. (You cannot draw methane.)

3. Draw a structural formula, condensed structural formula, and carbon skeletal formula for C_6H_{14}.

4. Octane, a constituent of gasoline, has the molecular formula C_8H_{18}. Draw a structural formula, condensed structural formula and carbon skeleton formula for octane. Assume that the carbons are all bonded in a single chain to each other.

5. What would the formula be for a straight chain alkane that had the following number of carbon or hydrogen atoms?

    a. 6 carbon atoms
    b. 12 carbon atoms
    c. 14 carbon atoms
    d. 29 carbon atoms
    e. 98 carbon atoms
    f. 102 hydrogen atoms
    g. 54 hydrogen atoms
    h. 84 hydrogen atoms
    i. 16 hydrogen atoms
    j. 4 hydrogen atoms



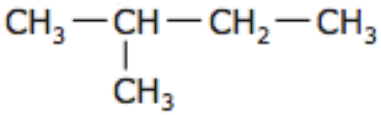
Naming Simple Hydrocarbons

Name:

Date:

Steps to Naming Simple Alkanes:

1. Find the _____ of carbon atoms. It does ***NOT*** have to be in a straight line. This is called the _____ chain.



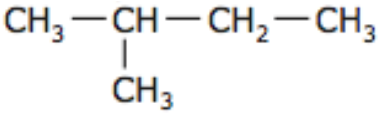
The longest continuous chain of carbon atoms contains ____ carbon atoms

State the number of catbon atoms using the appropriate prefix and the ending "ane."

The appropriate prefix would be _____ and with the ending "ane" would be _____.

---

2. Branches are called _____ groups. Number the carbon atoms in the parent chain starting at the _____.



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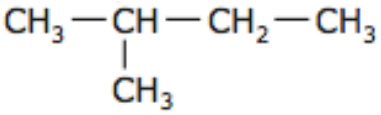
3. **Name each branch**.

Give a prefix according to the number of carbon atoms it contains. Branch names end in ____ instead of _____.



List the branches in _____. If more than one branch has the same number of carbon atoms use the prefixes _____.

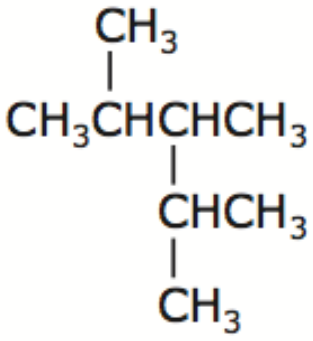
---

4. **Name each branch**.

State the name of the alkane by naming each branch, then naming the parent. Use commas between numbers and hyphens between numbers and branches.

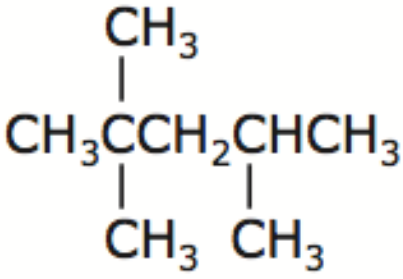
Practice #1.

1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound



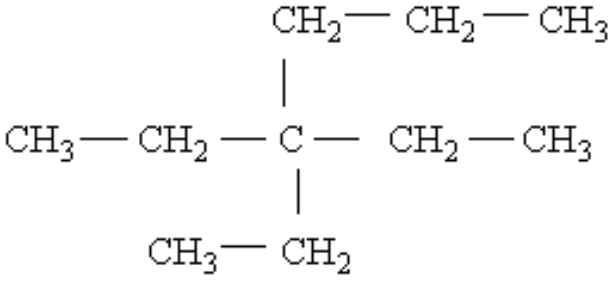
Practice #2.

1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound



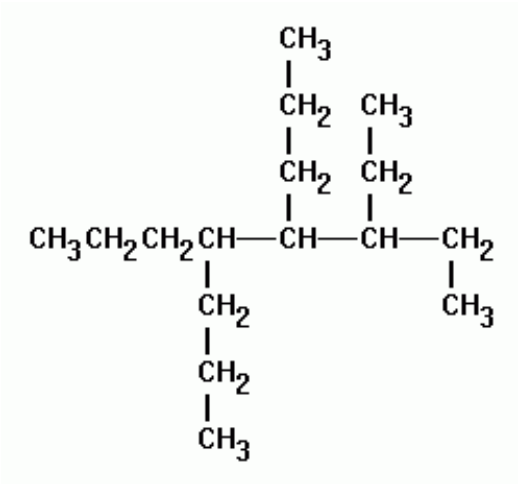
Practice #3.

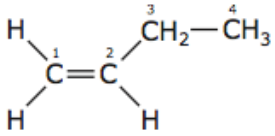
1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound



Practice #4.

1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound





Alkenes and Alkynes

Name:

Date:

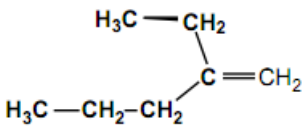
Alkenes

- Hydrocarbons containing _____ bonds.
- General Formula: _____
- They are unsaturated – the double bond is a _____ for other atoms to bond to the carbon atom.

# of C Atoms	Prefix	Alkene
2		
3		
4		
5		
6		
7		
8		
9		
10		

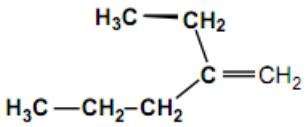
Steps to Naming Alkenes:

1. The _____ must contain the double bond. (*even if it is not the longest chain*)



The longest continuous chain of carbon atoms including the double bond contains ____ carbon atoms

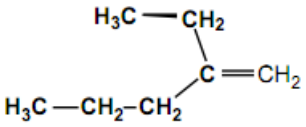
2. The parent chain carbon atoms are numbered….._____



The double bond follows carbon #_____.

The parent chain is called _____.

3. The position of the double bond is indicated in the name by stating the _____ of the carbon atom in the parent chain that the double bond follows.

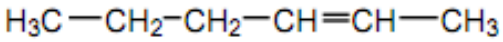


Name the branches!

---

4. Name the compound.

Practice #1.



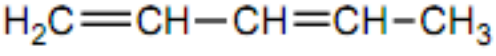
5. Parent Chain.

6. Number the parent chain.

7. Name the branches.

8. Name the compound

Practice #2.



5. Parent Chain.

6. Number the parent chain.

7. Name the branches.

8. Name the compound

Alkynes

- Hydrocarbons containing _____ bonds.
- General Formula: _____
- They are ***unsaturated*** – the double bond is a reactive site for other atoms to bond to the carbon atom.

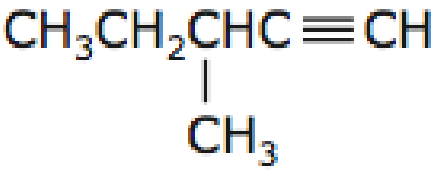
Steps to Naming Alkynes:

- The same rules for naming an alkene apply; however the ending is "_____" instead of "_____."

# of C Atoms	Prefix	Alkyne
2		
3		
4		
5		
6		
7		
8		
9		
10		

Practice #1.

1. Parent Chain.



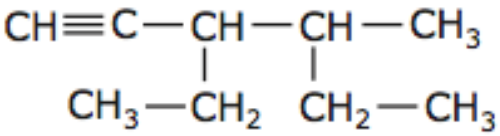
2. Number the parent chain.

3. Name the branches.

4. Name the compound

Practice #2.

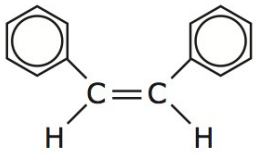
1. Parent Chain.



2. Number the parent chain.

3. Name the branches.

4. Name the compound

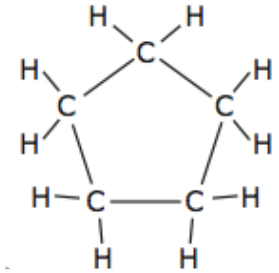


Cyclic Structures

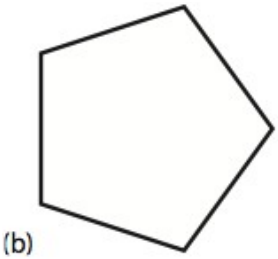
Name:

Date:

- Carbon atoms may bond to each other and form a _____

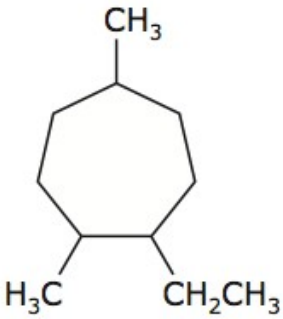


Becomes…

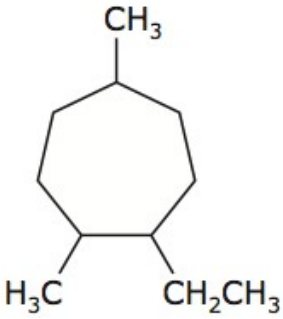


Steps to Naming Cyclic Structures:

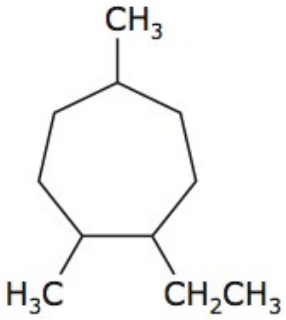
- The ring that contains the greater number of carbon atoms is the _____
- The prefix "_____" is placed before the parent chain name.
- Parent Chain = _____



- The carbon atoms are numbered either clockwise or _____.
- The _____ are used to identify the placement of the branches.



3. **Name the branches.**



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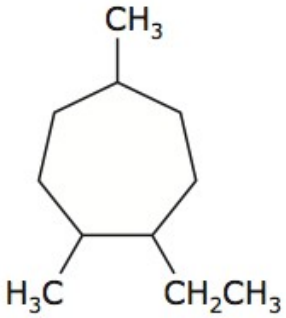
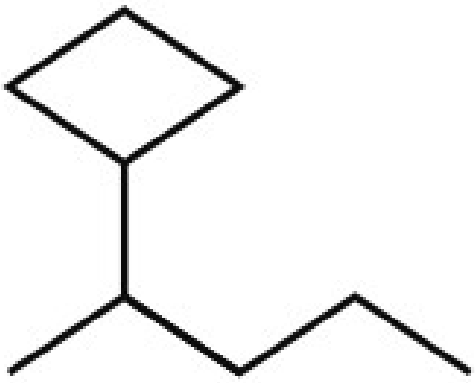
4. **Name the compound.**



If the ring structure is not the longest continuous carbon chain, then it is named as a branch with prefix "cyclo" and ends in "yl."



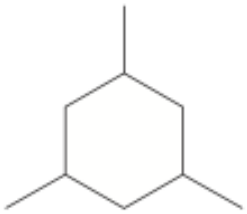
Parent: _____

Branch: _____

Compound: _____

Practice #1

1. Parent Chain.

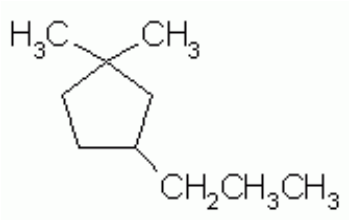


2. Number the parent chain.

3. Name the branches.

4. Name the compound

Practice #2



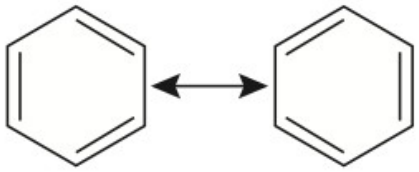
1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

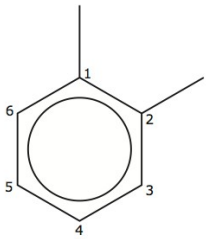
Practice #3

1. Parent Chain
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Aromatic Hydrocarbons

- Benzene is a hydrocarbon with _____ atoms in a ring.
- It has the molecular formula _____
- There is _____ than one way of drawing its Lewis structure.
- Equivalent Lewis structures are called _____ structures.



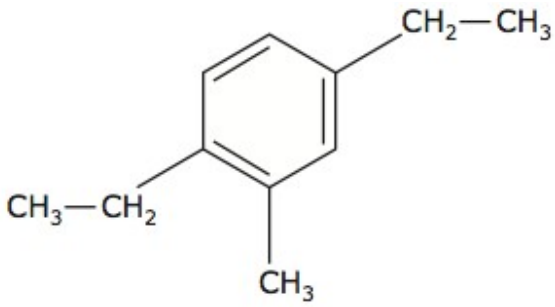


Name: _____

- Some organic compounds have benzene as a branch. In this case, the branch name is "_____"

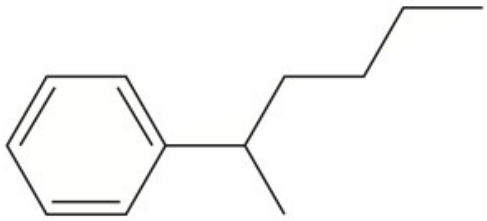
Practice #4

1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound



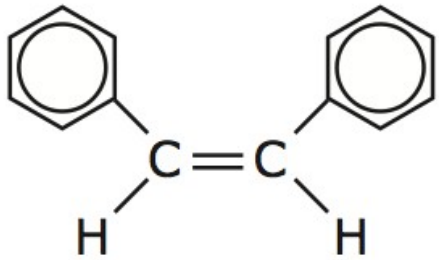
Practice #5

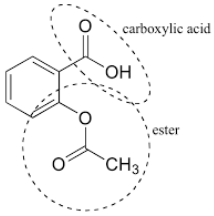
1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound



Practice #6

1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound





acetylsalicylic acid
(aspirin)

Functional Groups

Name:

Date:

Isomers

Draw the structure for C_5H_{12}

- Structures that have the same _____ but different chemical properties
- As the number of _____ increases, the number of _____ increases.
- *Pentane and 2-methylbutane are structural isomers. There is one more structural isomer. Can you find it?*

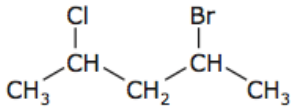
Functional Groups

- An atom, group of atoms or type of bond in an organic molecule that react in a predictable manner.
- Symbol "R" is used to represent the _____ of the organic molecule.

Alkyl Halide

- X = _____
- Organic compounds containing _____ are called alkyl halides
- The prefixes are:
- F= _____ Cl = _____ Br = _____ I = _____

Practice #1.



1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Practice #2.

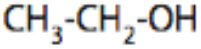
1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Alcohols: R-Oh

Naming alcohols:

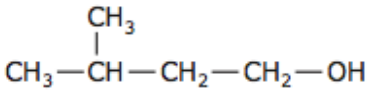
1. The parent chain ***must*** contain the atom attached to the –OH group. Number the carbon atoms in the parent chain so that the –OH group is given the lowest number.
2. The name of the parent chain ends with "-ol" instead of "-e".
3. Name and identify positions of the branches.
4. Name the compound.

Practice #1.



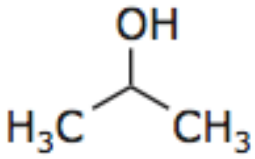
1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Practice #2.

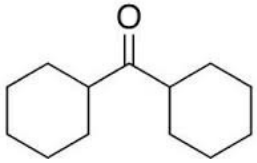


1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Practice #3.



1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound



Functional Groups II

Name:

Date:

Cis - Trans Isomerism

Draw the structure for **2-butene**	Is there any other way to show this structure?

The double bond "_____" the molecule in place and changes the _____ of the compound.

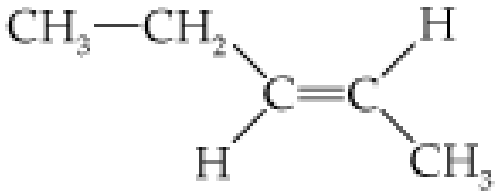
Naming Cis-Trans Alkene's:

1. The parent chain must contain the _____.
2. The name of the parent chain ends with "_____" instead of "_____".
3. Determine if the molecule is "cis" (_____) or "trans" (_____) *AT* the double bond and include it at the front of the parent chain
4. Include the _____ where the double bond starts before the parent chain

And as always…

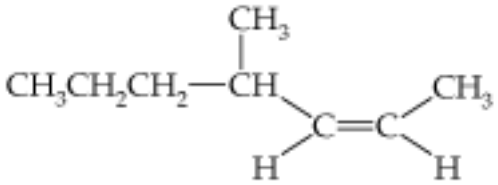
5. Name and identify positions of the branches.
6. Name the compound.

Practice #1.



1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Practice #2.



1. Parent Chain.
2. Number the parent chain.
3. Name the branches.

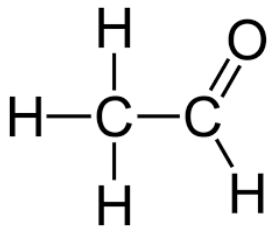
4. Name the compound.

Aldehydes

Naming aldehydes:

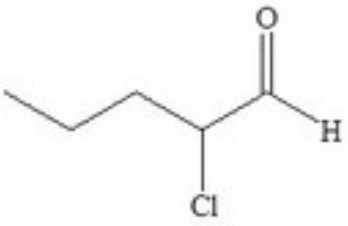
1. Organic compounds containing an oxygen at the _____ of a parent chain double bonded to a carbon.
2. To name aldehydes remove the "_____" from the end of the parent chain and replace it with "_____"

Practice #3.



1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Practice #4.



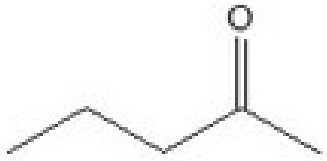
1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Ketones

Naming Ketones:

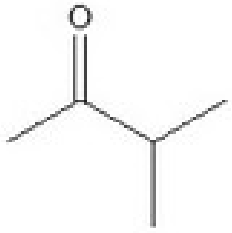
1. Organic compounds containing an oxygen in the _____of a parent chain double bonded to a carbon.
2. To name ketones remove the "_____" from the end of the parent chain and replace it with "_____"

Practice #5.



1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Practice #6.



1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Ethers

Naming Ethers:

1. Recognise that the molecule is an ether because it has the general form:

$$R_1\text{-}O\text{-}R_2$$

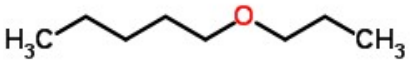
2. Identify the _____ labelled "R_1" and "R_2". ***Standard system of labelling carbon chains as used for alkanes***.

3. The shorter of the two chains "R_1" and "R_2" becomes the _____of the name **with the "_____"** **suffix**, and the name of the longer alkane chain forming the suffix of the name of the ether.

Practice #8.

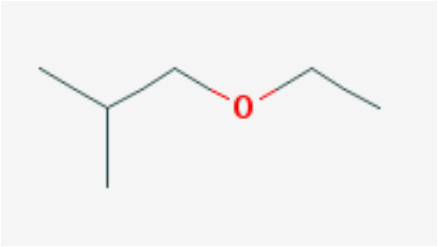
1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Practice #9.



1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

Practice #10.

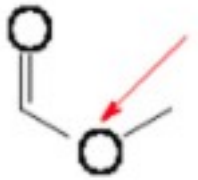


1. Parent Chain.
2. Number the parent chain.
3. Name the branches.
4. Name the compound

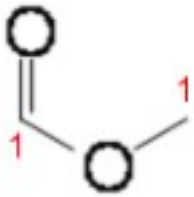
Esters

Naming Esters:

1. First, identify the _____ that is part of the continuous chain and bonded to carbon on both sides. (***On one side of this _____ there will be a carbonyl present but on the other side there won't be***.)



2. Second, begin numbering the _____ on either side of the _____ identified in step 1.

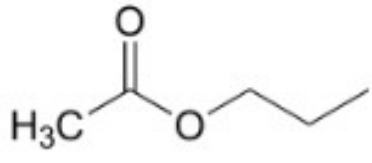


3. Next, use this format: [alkyl on side _____ from the carbonyl] (space) [alkane on the _____ with the carbonyl] - (<u>In this case</u>: [methyl] [methane])

4. Finally, change the ending of the alkane on the same side as the carbonyl from _____. (<u>In this case</u>: methyl methanoate)

Practice #11.

1. Parent Chain.



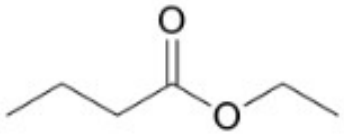
2. Number the parent chain.

3. Name the branches.

4. Name the compound

Practice #12.

1. Parent Chain.



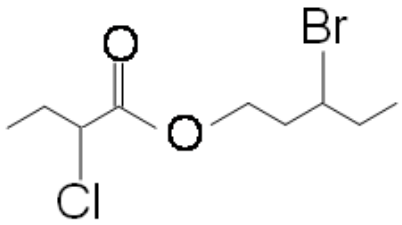
2. Number the parent chain.

3. Name the branches.

4. Name the compound

Practice #13.

1. Parent Chain.



2. Number the parent chain.

3. Name the branches.

4. Name the compound