

Naming Organic Molecules (Nomenclature)

- **Hydrocarbons** are organic compounds that contain only carbon atoms and hydrogen atoms

ALKANES

- * • **Alkanes** are the simplest hydrocarbons that contain only single covalent bonds between carbon atoms
- * • Alkanes are also known as a **saturated hydrocarbons** because with only single bonds between carbon atoms, the carbon atoms are bonded to as many hydrogen atoms as possible
- Every organic compound has an IUPAC name that contains three basic parts:
prefix + **root** + **suffix**

gives the position and names of any side groups/branches coming off the main chain

indicates the number of carbons in the longest, continuous chain

indicates the **functional group** to which the molecule belongs

- A **functional group** is the category/type of group the organic molecule belongs to (ie. alkane, alkene, carboxylic acid, alcohol, etc.)

- Steps in Naming Simple Organic Molecules

1. Identify the root

- The root identifies the longest, continuous carbon chain in the molecule

# OF CARBON ATOMS	ROOT NAME
1	meth
2	eth
3	prop
4	but
5	pent
6	hex
7	hept
8	oct
9	non
10	dec

Memorize!

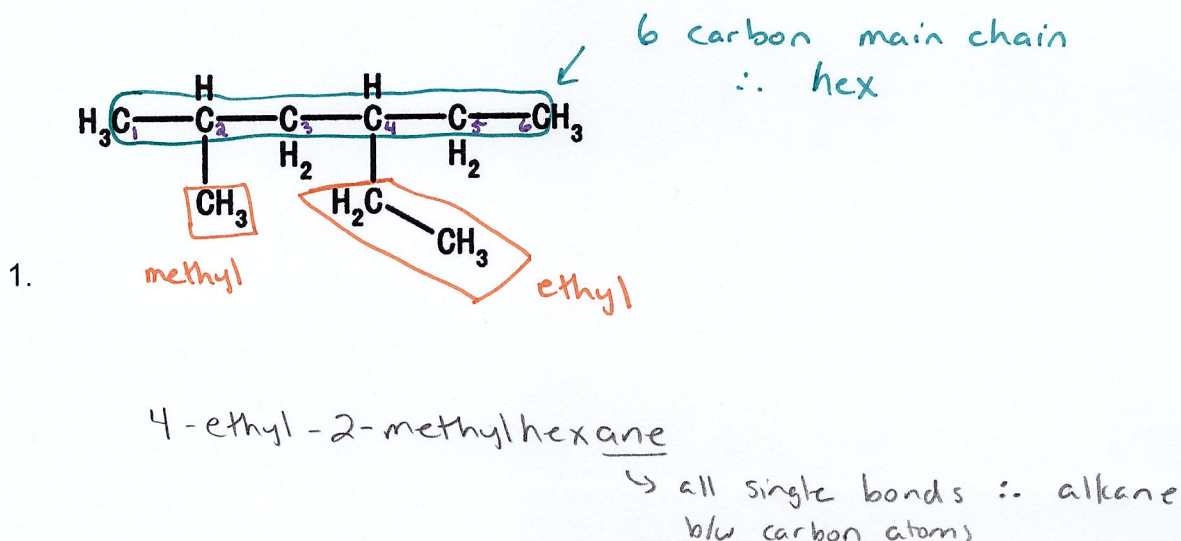
2. Identify the suffix

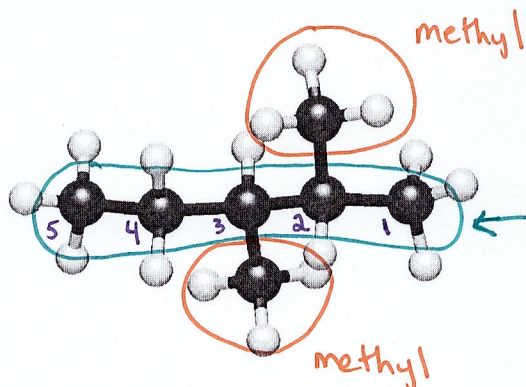
- If only single bonds exist between carbon atoms, the molecule is an alkane and has an "-ane" ending

3. Identify the prefix

- The prefix indicates the location and type of any side groups/branches (or **substituent groups** or **alkyl groups**) coming off the main/parent carbon chain
- Side groups of hydrocarbons are indicated by an “-yl” ending. For example, if -CH₃ was a side group it would be called “*methyl*” and if -CH₂CH₂CH₃ was a side group it would be called “*propyl*”
- Side groups can also include halogens (any group 17 elements). Organic molecules that contain at least one halogen atom are called **alkyl halides**. When a halogen is present as a side group, they are simply labeled “*bromo*” for bromine, “*chloro*” for chlorine, “*iodo*” for iodine, etc.
- The position of where the side chain is located on the main parent carbon chain must be indicated by counting the carbons in the parent chain. Numbering the carbons in the main chain must begin at the end of the chain that will give the side groups positions the lowest number combination possible. If a halogen is present, the halogen must always be given priority and be placed on the lower numbered carbon possible.
- List side groups alphabetically
- If there is more than one of the same side groups, you need to indicate that with di, tri, or tetra. These prefixes **do not** count as alphabetical!
- “-” go in between numbers and letters and “,” go in between numbers

EXAMPLES: Name the following organic compounds.





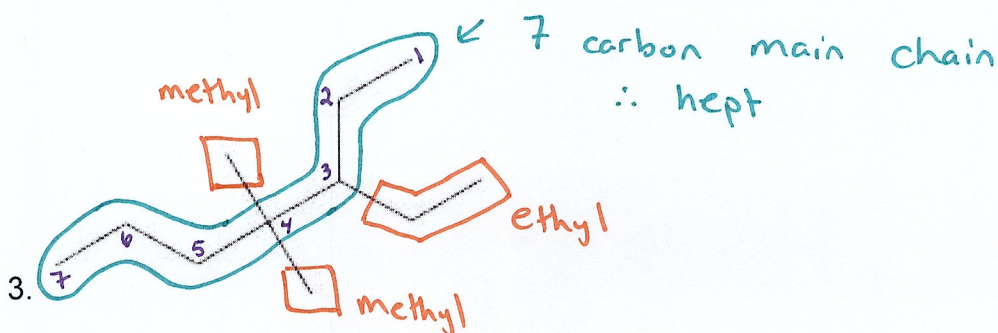
Dark spheres = carbon
Light spheres = hydrogen

← 5 carbon main chain
∴ pent

2.

2,3-dimethylpentane

↳ all single bonds ∴ alkane
b/w carbon atoms



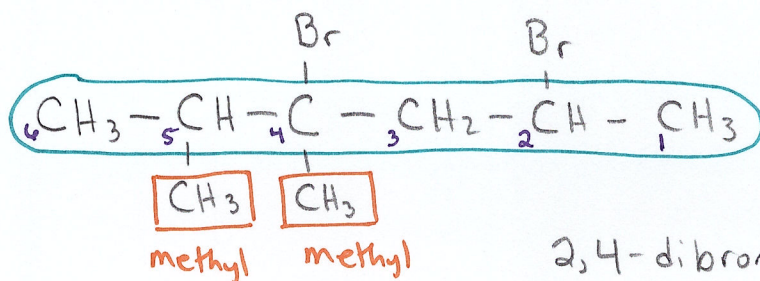
← 7 carbon main chain
∴ hept

3.

3-ethyl-4,4-dimethylheptane

↳ all single bonds ∴ alkane
b/w carbon atoms

4. $\text{CH}_3\text{CH}(\text{CH}_3)\text{CBr}(\text{CH}_3)\text{CH}_2\text{CHBrCH}_3$



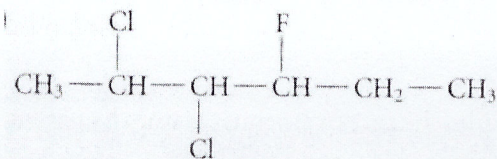
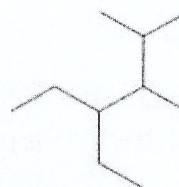
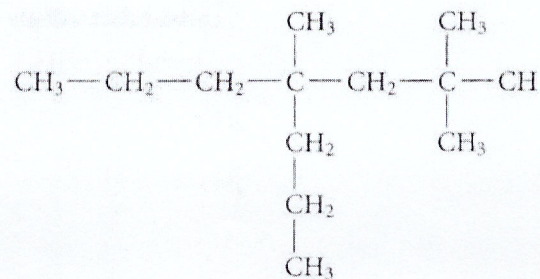
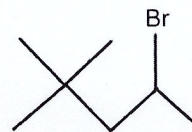
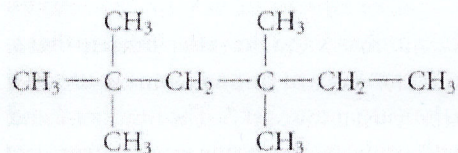
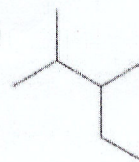
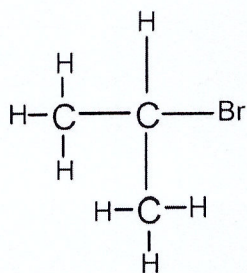
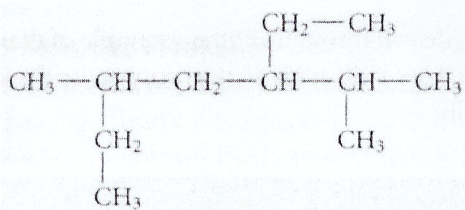
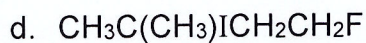
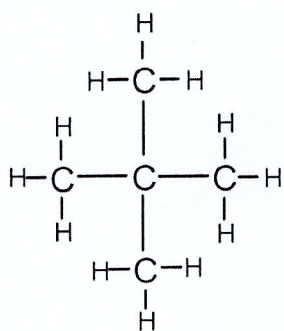
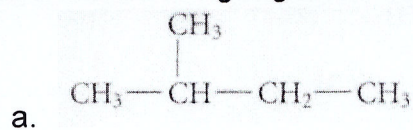
← 6 carbon main chain
∴ hex

2,4-dibromo-4,5-dimethylhexane

Now try Practice Problems & pg.549 #2

Practice Problems

1. Name the following organic molecules.



ANSWERS

1.

- a. 2-methylbutane
- b. 2,2-dimethylpropane
- c. Heptane
- d. 1-fluoro-3-iodo-3-methylbutane
- e. 3-ethyl-2,5-dimethylheptane
- f. 2-bromopropane
- g. 2,3-dimethylpentane
- h. 2,2,4,4-tetramethylhexane
- i. 2-bromo-4,4-dimethylpentane
- j. 2,2,4-trimethyl-4-propylheptane
- k. 4-ethyl-2,3-dimethylhexane
- l. 2,3-dichloro-4-fluorohexane

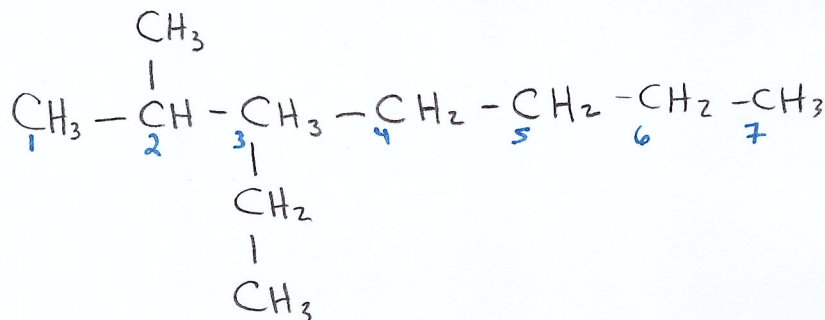
- Drawing Simple Organic Molecules

- Step 1: Identify the root and the suffix in the name
 - Root indicates the number of carbons in the longest continuous chain
 - Suffix indicates what functional group is present ("-ane" for all alkanes)
- Step 2: Draw the main parent chain (don't include the hydrogen atoms at first)
- Step 3: Label one end of the parent chain as 1 and continue to label the carbons in order. Add in the indicated side groups/branches to the appropriate carbons in the main carbon chain.
- Step 4: Complete the drawing by adding the appropriate number of hydrogen atoms to all of the carbon atoms

EXAMPLES: Draw the following compounds.

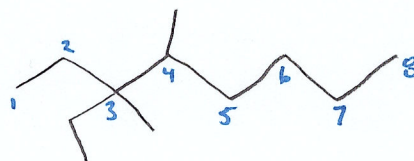
1. 3-ethyl-2-methylheptane

7 carbon main chain
all single bonds



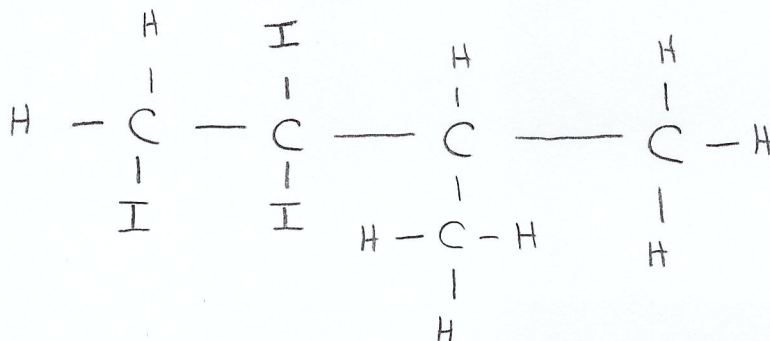
2. 3-ethyl-3,4-dimethyloctane

8 carbon main chain
all single bonds



3. 1,2,2-triiodo-3-methylbutane

4 carbon main chain
all single bonds



Now try pg. 550 #4, 5, 8b,d, 9 & pg. 569 #32