

Structural Models and Diagrams

A variety of models exist to communicate how atoms are bonded to form molecules. These types of models include:

Molecular formula - works well for small, simple molecules.

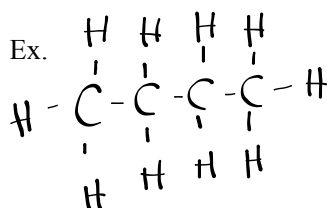
As the number of atoms increase, less is known about the structure of the molecule.

Ex. H_2O , CH_4 , C_2H_6 **Count the atoms!**

Expanded molecular formula - shows the arrangement of atoms within a molecule

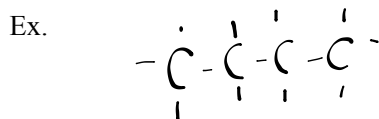
Ex. CH_3CH_3

Complete structural diagram - shows all atoms and bonds



[Bonding Capacity Review](#)

Condensed structural diagram - shows the C-C bonds, but omits the C-H bonds



Line Diagram - shows bonds, but no atoms. The end of each line segment represent a C atom.

Ex.

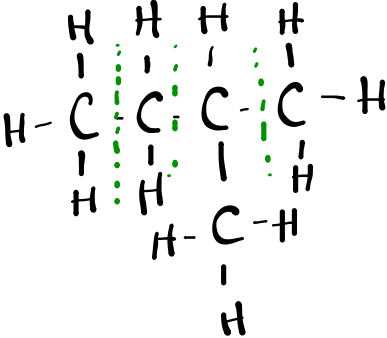
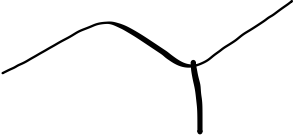


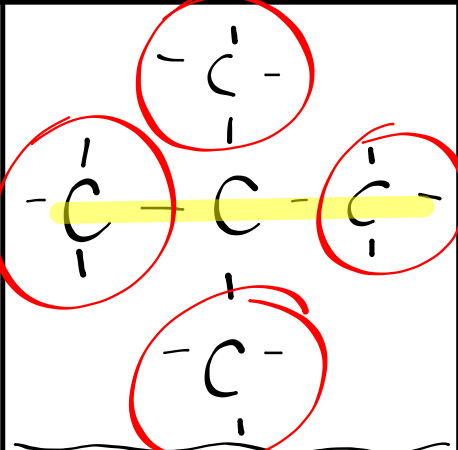
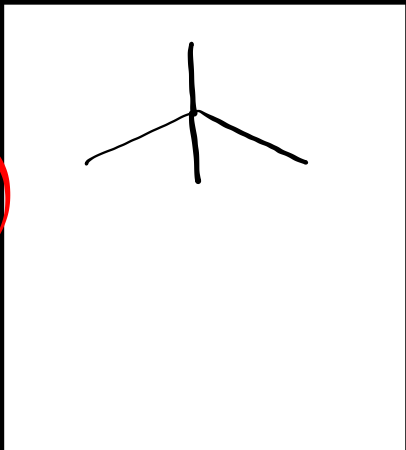
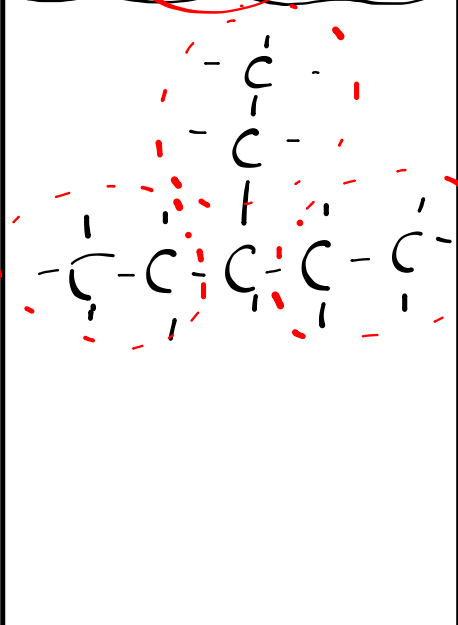
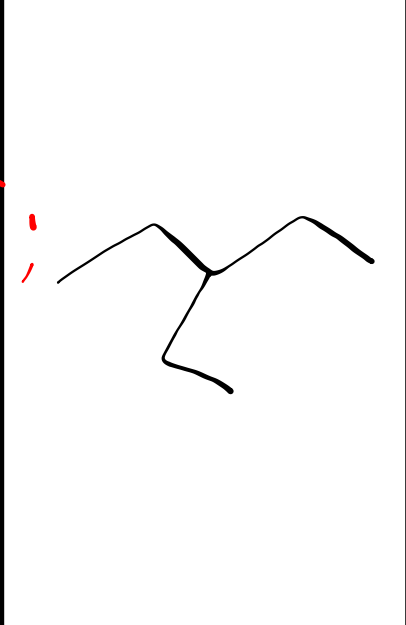
**** Isomers - compounds with the same molecular formula, but different structures****

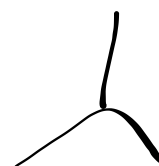
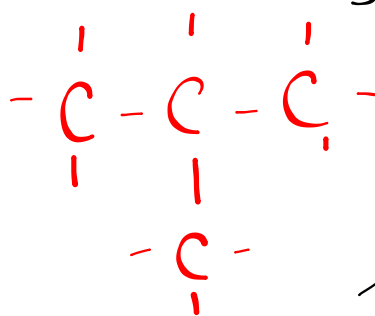
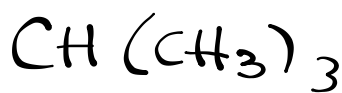
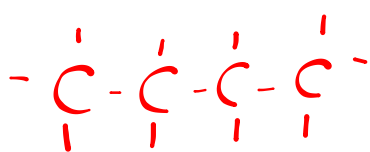
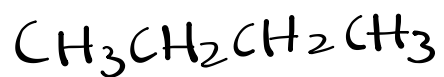
Ex. How many isomers can be drawn for C_4H_{10} ?

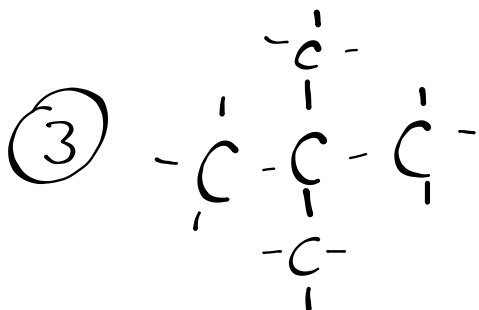
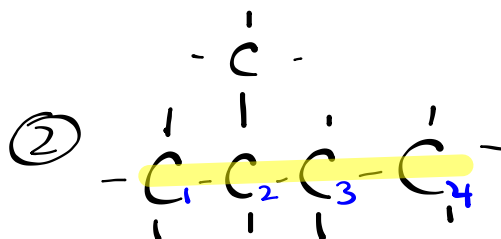
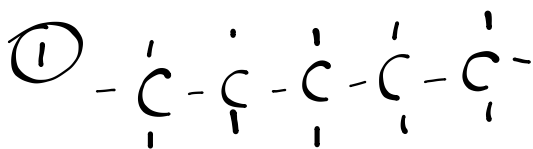
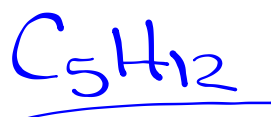
How many isomers can be drawn for C_2H_6 ?

For C_5H_{12} ?

Expanded Molecular Formula	Complete Structural Diagram	Line Diagram
CH₃CH₂C₂H₄CH₃ CH₃CH₂CHCH₃CH₃ CH ₃ CH ₂ CH(CH ₃)CH ₃		

Expanded Molecular Formula	Complete Structural Diagram	Line Diagram
CH_3C $\text{C}(\text{CH}_3)_4$		
$\text{CH}(\text{C}_2\text{H}_5)_3$ $\text{CH}(\text{CH}_2\text{CH}_3)_3$		





Organic Families

Organic families are classed according to functional groups. Functional groups are areas on a molecule that are reactive.

Hydrocarbons with general formula C_nH_{2n+2} contain all single bonds and are called **alkanes**

Ex.

Hydrocarbons with general formula C_nH_{2n} contain one double bond (**alkenes**) or are cyclic (**cycloalkanes**).


"closed ring"

Hydrocarbons with a general formula C_nH_{2n-2} have a triple bond (**alkynes**) or are cyclic with a double bond (**cycloalkenes**).

The prefixes for compounds or alkyl groups with one to 10 carbons are shown in the chart on p. 695.

<u>FORMULA</u>	<u>IUPAC</u> <u>NAME</u>	<u>ALKYL</u> <u>GROUP</u>	<u>ALKYL</u> <u>NAME</u>
CH ₄	methane	-CH ₃	methyl
C ₂ H ₆	ethane	-C ₂ H ₅	ethyl
C ₃ H ₈	propane	-C ₃ H ₇	propyl
C ₄ H ₁₀	butane	-C ₄ H ₉	butyl

The remaining 6 follow latin naming.

Bonding Capacity

An atom's bonding capacity is the maximum number of covalent bonds the atom can form.
(found by element's location in periodic table)

	IA		
1	1 H		IIA
2	3 Li		4 Be

Periodic Table of Elements

						0
	III A	I V A	V A	V I A	V I I A	2 He
5	6	7	8	9	10	
B	C	N	O	F	Ne	

Chapter 22
Hydrocarbons
p. 692

Homework

Structural Diagram worksheet