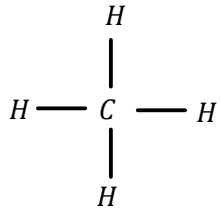
C11 - 5.1 - Alkane Notes

Alkane: *A Hydrocarbon where Carbon is attaced by single bonds.*

HydroCarbon
C_nH_{2n+2}
$H = 2C + 2$

Methane:

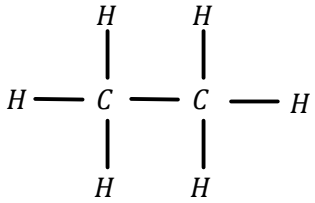
CH_4



CH_4

Ethane:

C_2H_6

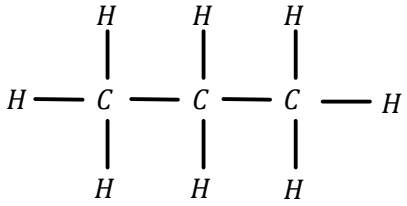


$CH_3 - CH_3$

Prefix	# of C
Meth	1
Eth	2
Prop	3
But	4
Pent	5
Hex	6
Hept	7
Oct	8
Non	9
Dec	10

Propane:

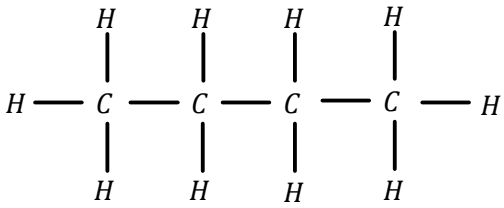
C_3H_8



$CH_3 - CH_2 - CH_3$

Butane:

C_4H_{10}



$CH_3 - CH_2 - CH_2 - CH_3$

Pentane: C_5H_{12}

$CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

Hexane: C_6H_{12}

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

Heptane: C_7H_{14}

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

Octane: C_8H_{18}

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

Nonane: C_9H_{20}

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

Decane: $C_{10}H_{22}$

C11 - 5.1 - Alkane/Ethyl Notes

Alkyl: *An Alkane that has lost a Hydrogen Atom*

Naming: *Ane* $\longrightarrow$ *yl*

Methane: $CH_4 \longrightarrow CH_3$ *Methyl*

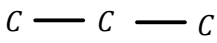
Ethane: $CH_3 - CH_3 \longrightarrow CH_3 - CH_2 -$ *Ethyl*

Propane: $CH_3 - CH_2 - CH_3 \longrightarrow CH_3 - CH_2 - CH_2 -$ *Propyl*

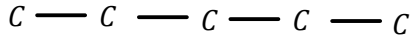
Or

$$CH_3 - CH_2 - CH_3 \longrightarrow CH_3 - \underset{|}{CH} - CH_3$$

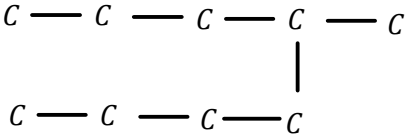
Parent: *Longest Chain*



3 *Carbons* $\longrightarrow$ *Propane*



5 *Carbons* $\longrightarrow$ *Pentane*



8 *Carbons* $\longrightarrow$ *Octane*

Each Carbon needs a combination of dashes and H's attched to add to 4!

$$\overset{1}{CH_3} - \overset{2}{\underset{|}{CH}} - \overset{3}{CH_2} - \overset{4}{CH_3}$$
$$CH_3$$

2 – *Methylbutane*

Butane: *Longest Chain*

Methly: *Attached Alkyl*

2: *Location of attached Methly*

$$\overset{6}{CH_3} - \overset{5}{CH_2} - \overset{4}{CH_2} - \overset{3}{\underset{|}{CH}} - \overset{2}{CH_2} - \overset{1}{CH_3}$$
$$CH_3$$

3 – *Methylhexane*

$$CH_3 - CH_2 - \underset{|}{CH} - CH_2 - CH_3$$
$$CH_2 - CH_3$$

3 – *Ethylpentane*

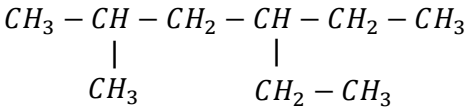
$$CH_3 - CH_2 - \underset{|}{CH} - CH_2 - CH_2 - CH_2 - CH_3$$
$$CH_2 - CH_2 - CH_3$$

4 – *Ethyloctane*

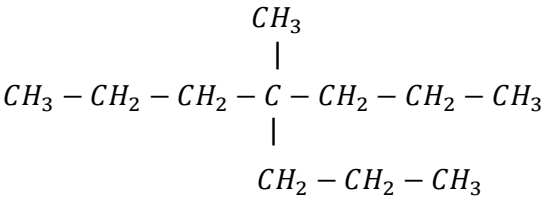
Smallest Number

C11 - 5.1 - Alkane/Ethyl Notes

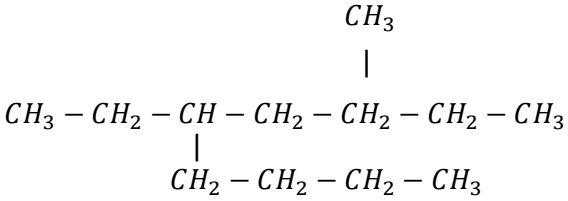
Alphabetical



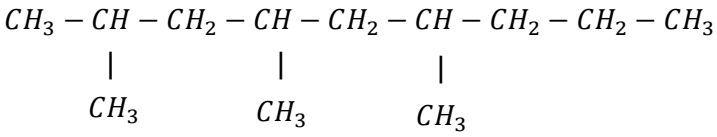
$4-ethyl-2-methylhexane$



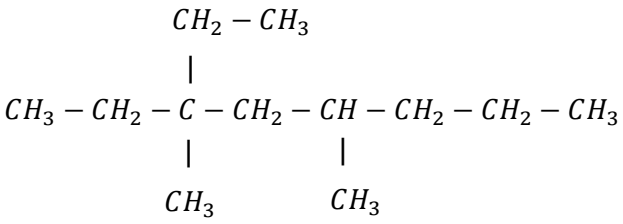
$4-Methyl-4-Propylheptane$



$5-Ethyl-3-Methylnonane$



$2,4,6-Trimethylnonane$



$2,5\ Dimethyl-2\ ethyloctane$

1	Mono
2	Di
3	Tri
4	Tetra
5	Penta
6	Hexa
7	Hepta
8	Octa
9	Nona
10	Deca

$2-ethyl-5\ ethyl = 2,5\ Diethyl$

C11 - 5.1 - Structural Isomers Notes

Structural Isomers:

C_4H_{10} $CH_3 - CH_2 - CH_2 - CH_3$ Or $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_3$

C11 - 5.2 - Cycloalkanes Notes

The bond is with te Carbon

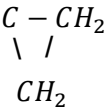
Cycloalkanes

C_nH_{2n}

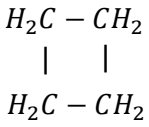
$H = 2C$

Cycloalkanes: *Hydrocarbon chains in a circle*

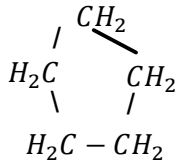
Cyclopropane: $C_3H_6 \longrightarrow$



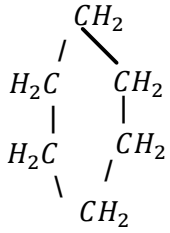
Cyclobutane: $C_4H_8 \longrightarrow$

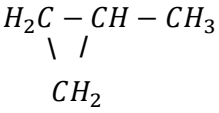


Cyclopentane: $C_5H_{10} \longrightarrow$

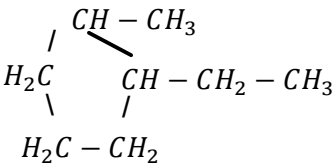


Cyclohexane: $C_6H_{12} \longrightarrow$





Methylcyclopropane



$1 - ethyl - 2 - methylcyclopentane$

C11 - 5.3 - Alkyl Halides Notes

Alkly Halides: Halogens attached to Alkanes

Naming: ine $\longrightarrow$ *o*

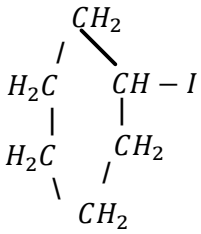
$CH_3 - Br$ *Bromomethane*

$CH_3 - CH_2 - I$ *Iodoethane*

$CH_3 - CH(F) - CH_2 - CH_3$ $2 - Flourobutane$ $CH_3 - CHF - CH_2 - CH_3$

$Br-C(Br)(Br)-C(Cl)(Cl)-Cl$ 1,1,1 $Tribromo - 2,2,2\ Trichloroethane$ $CBr_3 - CCl_3$

$CH_3 - CH(I) - CH(CH_3) - CH_2 - CH_3$ $2 - Iodo - 3 - methylpentane$



Iodocyclohexane

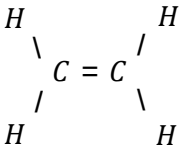
C11 - 5.3 - Alkene= BondsNotes

Double Bond Overrides Ethyl!

$Alkene: Double\ Bond$

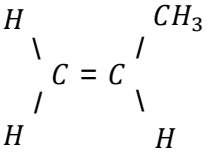
$Naming: \quad ane \longrightarrow ene$

$Ethene$



$CH_2 = CH_2$

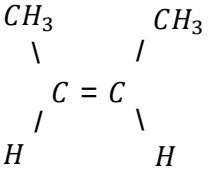
$Propene$



$CH_2 = CH - CH_3$

$2 - Butene$

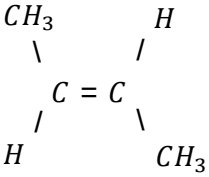
$Cis\ Isomer$ 5.9



$CH_3 - CH = CH - CH_3$

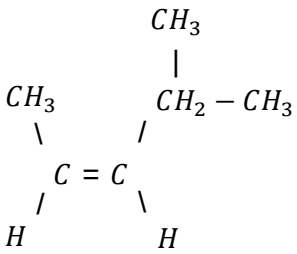
$2 - Butene$

$Trans\ Isomer$ 5.9



$CH_3 - CH = CH - CH_3$

$4{,}4\ -ethyl\ -2-Pentene$



$CH_3 - CH = CH - CH_2 - CH_3$

C11 - 5.3 - Alkyne ≡ Bonds Notes

Alkyne: Triple Bond

Naming: *ane* $\longrightarrow$ *ene*

Ethene $CH \equiv CH$

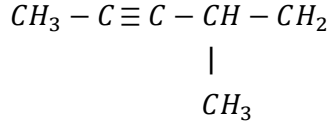
Propene $CH \equiv C - CH_3$

Why dont we label the 1*–?*

$1 - Butene$ $CH_3 \equiv C - C - CH_3$

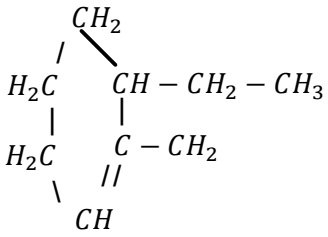
$2 - Butene$ $CH_3 - C \equiv C - CH_3$

$4 - Methyl - 2 - Pentene$



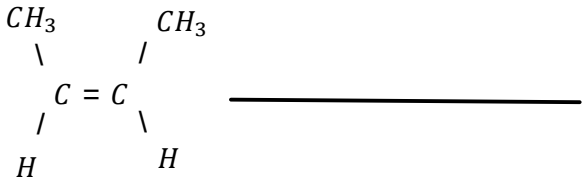
$3 - Ethyl - 2 - Methyl - 1 - Cyclohexene$

Count from before the double bond



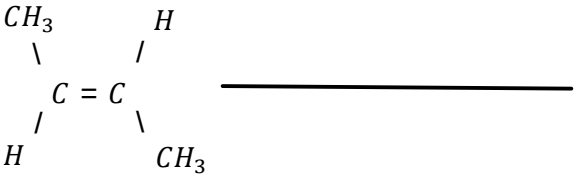
C11 - 5.4 - Geometry of Alkenes and Alkynes Notes

Cis Isomers – Alkyds on same side of Double Bond



Imagine a horizontal line

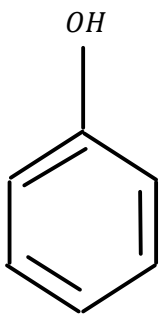
Trans Isomers: Aylkds on opposite (transverse) sides od the Double Bond



Imagine a horizontal line

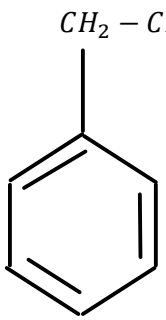
C11 - 5.5 - Aromatic Compounds Notes

Aromatic Molecule: Contains one or more Benzene Rimgs

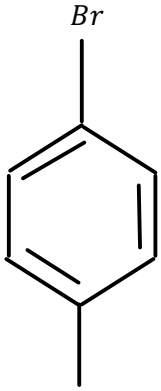


hydroxybenzene

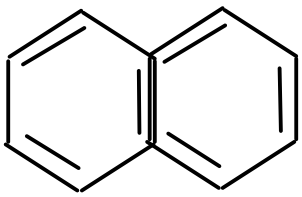
"Phenol"



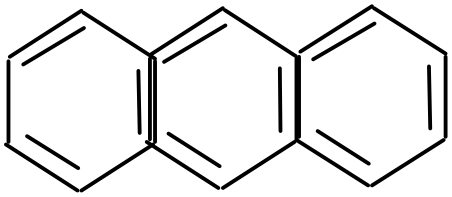
ethylbenzene



1,4 – *dibromobenzene*



napthalene



anthracene

C11 - 5.6 - Alcohols Notes

Alcohol Overrides Ethyl!

$Naming$: $ane \longrightarrow anol$

$Alcohols$: $an\ Organic\ compound\ with\ an\ OH.$

$Methanol$ $CH_3 - OH$

Ethyloxy Methanol - Ethyl Methanoate

$Ethanol$ $CH_3 - CH_2 - OH$

$2 - Pentanol$

$$CH_3 - \underset{\displaystyle |}{\underset{\displaystyle OH}{CH}} - CH_2 - CH_2 - CH_3$$

$3 - methyl - 2 - Butanol$

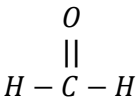
$$CH_3 - \underset{\displaystyle |}{\underset{\displaystyle CH_3}{CH}} - \underset{\displaystyle |}{\underset{\displaystyle OH}{CH}} - CH_3$$

C11 - 5.6 - Aldehydes Notes

Aldehydes: an Organic Compound with a C = O at the end

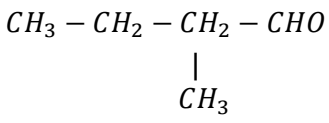
Naming: *ane* $\longrightarrow$ *anol*

Methanal
"*formaldehyde*"

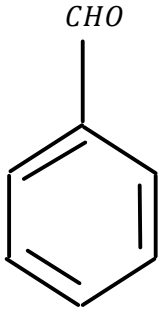


$HCHO$

$2-methylbutanal$



benzaldahyse



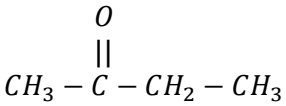
C11 - 5.6 - Ketones Notes

Not at the End

Naming: *ane* $\longrightarrow$ *anone*

Keytones: *an Organic Compound with a* $C = O$ *NOT at the end*

butanone:

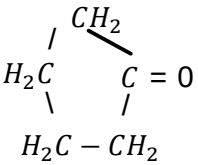


$CH_3 - C - CH_2 - CH_3$ *Or* $CH_3COCH_2CH_3$

Methyloxy Ethanone - Methyl Ethanoate

$2 - Pentanone$ $CH_3COCH_2CH_2CH_3$

cyclopentanone



$H_2C - CH_2$

C11 - 5.6 - Ethers/Esters Notes

Naming: *Smaller # side prefix 'oxy' Larger # Side ethyl*

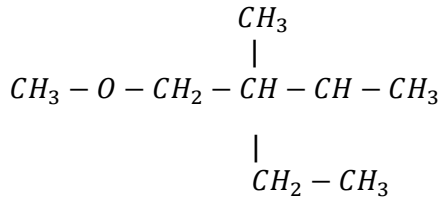
Ethers: *an Organic Compound with an 'O' attached to two hydrocarbon groups*

methoxyethane $CH_3 - O - CH_2 - CH_3$

$2 - ethoxypropane$ $CH_3 - CH_2 - CH_2 - O - CH_2 - CH_3$

Count away from the 'O"

$1 - methoxy3 - ethyl - 2\ methylpentane$



Esters: *an Organic Compound with an 'COO' attached to two hydrocarbon groups*

methl propanoate $CH_3 - COO - CH_2 - CH_3$

C11 - 5.6 - Amines/Amides/Carboxylic Acids/Esters Notes

Amines: *an Organic Compound with an* NH_2 *attached*

Naming: *amino 'ethane'*

aminopropane $CH_3 - CH_2 - CH_2 - NH_2$

1,3 – *diaminopropane* $NH_2 - CH_2 - CH_2 - CH_2 - NH_2$

2 – *aminobutane*

$$CH_3 - \underset{\displaystyle NH_2}{\underset{|}{CH}} - CH_2 - CH_3$$

Amides: *an Organic Compound with an* $CONH_2$ *attached*

Naming: *'ethyl' e –→ amide*

methamide $CH_3 - CH_2 - CONH_2$

Carboxylic Acids: *an Organic Compound with an* $COOH$ *attached*

Naming: *'ethyl' e –→ oic Acid*

Propanoic Acid $CH_3 - CH_2 - COOH$

Esters: *an Organic Compound with an* COO *attached to two hydrocarbon chains*

Naming: *Smaller # side ethyl Larger # Side (inc C in COO)ethane e –→ oate*

Methyl propanoate $CH_3 - CH_2 - CH_2 - COO - CH_3$

Ethyl Pentanoate $CH_3 - CH_2 - CH_2 - CH_2 - COO - CH_2 - CH_3$