

- single bond -  
 \* ~~Alkanes~~ (saturated hydrocarbons)

- double bond -  
 \* ~~Alkenes~~ (unsaturated) IUPAC

→ formula:  $C_n H_{2n+2}$

$C_1 H_4$	Methane
$C_2 H_6$	Ethane
$C_3 H_8$	Propane
$C_4 H_{10}$	Butane
$C_5 H_{12}$	Pentane
$C_6 H_{14}$	Hexane
$C_7 H_{16}$	Heptane
$C_8 H_{18}$	Octane
$C_9 H_{20}$	Nonane
$C_{10} H_{22}$	Decane

→ formula:  $C_n H_{2n}$

$C_2 H_4$	Ethylene	→	Ethene
$C_3 H_6$	Propylene	→	Propene
$C_4 H_8$	Butylene	→	Butene
$C_5 H_{10}$	Pentylene	→	Pentene
$C_6 H_{12}$	Hexylene	→	Hexene
$C_7 H_{14}$	Heptylene	→	Heptene
$C_8 H_{16}$	Octylene	→	Octene
$C_9 H_{18}$	Nonylene	→	Nonene
$C_{10} H_{20}$	Decylene	→	Decene

- triple bond -  
 \* ~~Alkynes~~ (unsaturated)

\* ~~Alcohols~~

Skip #1 > only 1 Carbon (no triple bond)

→ formula:  $C_n H_{2n-2}$

$C_2 H_2$	Ethyne
$C_3 H_4$	Propyne
$C_4 H_6$	Butyne
$C_5 H_8$	Pentyne
$C_6 H_{10}$	Hexyne
$C_7 H_{12}$	Heptyne
$C_8 H_{14}$	Octyne
$C_9 H_{16}$	Nonyne
$C_{10} H_{18}$	Decyne


$CH_3 OH$	Methyl Alcohol	→	Methanol
$CH_3 CH_2 OH$	Ethyl Alcohol	→	Ethanol
$CH_3 CH_2 CH_2 OH$	n-Propyl Alcohol	→	Propanol
$\begin{matrix} CH_3 \\   \\ CH-OH \end{matrix}$	Isopropyl Alcohol	→	2-Propanol
$CH_3 (CH_2)_2 CH_2 OH$		→	n-Butanol

bio

$\begin{matrix} \text{CH}_3 \\ | \\ \text{NH} \\ | \\ \text{CH}_3 \end{matrix}$  (weak base):  
 $\text{CH}_3\text{NH}_2$  Methyl Amine  
 $\text{CH}_3\text{CH}_2\text{NH}_2$  Ethylamine

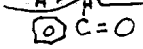
stink!

~~Thiols~~ IUPAC methyl  
 $\text{CH}_3\text{SH}$  Methanethiol Mercaptan  
 $\text{CH}_3\text{CH}_2\text{SH}$  Ethanethiol Ethyl Mercaptan  
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{SH}$  Propanethiol Propyl Mercaptan  
 ↳ \*active ing of onions!  
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{SH}$  Butyl Mercaptan  
 (smell of a skunk)


 Benzyl Mercaptan  
 or Phenol Mercaptan  
 (papermill smell)

Know!

~~Carboxylic Acids~~ ( $\text{HCOOH}$ )  
 $\text{HCOOH}$  Methanoic Acid  $\text{H}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$   
 $\text{CH}_3\text{COOH}$  Acetic Acid Vinegar [Know! ( $\text{HC}_2\text{H}_3\text{O}_2$ )  
 $\text{CH}_3\text{CH}_2\text{COOH}$  Propionic ~~Acetic~~ ( $\text{HAc}$ ) all  
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$  Butyric Acid (butter)

~~Aldehydes~~  
 $\text{H}-\overset{\text{H}}{\underset{\text{H}}{\text{C}}}-\overset{\text{O}}{\parallel}{\text{C}}$  Formaldehyde (embalming fluid) → Methanal  
 Benzaldehyde (art. cherry flavoring)

~~ketones~~  
 $\begin{matrix} \text{CH}_3 \\ | \\ \text{C}=\text{O} \\ | \\ \text{CH}_3 \end{matrix}$  Acetone Propanone → IUPAC = Acetone

GROUP NAME: Alkanes

Description: Saturated hydrocarbons

Bond Type: SINGLE

FORMULA:  $C_n H_{2n+2}$

Structure	Group
$CH_4$	Methane
$C_2H_6$	Ethane
$C_3H_8$	Propane
$C_4H_{10}$	Butane
$C_5H_{12}$	Pentane
$C_6H_{14}$	Hexane
$C_7H_{16}$	Heptane
$C_8H_{18}$	Octane
$C_9H_{20}$	Nonane
$C_{10}H_{22}$	Decane

GROUP NAME: Alkenes

Description: unsaturated

Bond Type: DOUBLE

FORMULA:  $C_nH_{2n}$

\*principal source: petroleum/natural gas!

Structure	Group
	None <IUPAC>
$C_2H_4$	Ethene
$C_3H_6$	Propene
$C_4H_8$	Butene
$C_5H_{10}$	Pentene
$C_6H_{12}$	Hexene
$C_7H_{14}$	Heptene
$C_8H_{16}$	Octene
$C_9H_{18}$	Nonene
$C_{10}H_{20}$	Decene

GROUP NAME: Alcohols

Description: \_\_\_\_\_

Bond Type: \_\_\_\_\_

FORMULA: (OH)

Structure	Group	IUPAC
$\text{CH}_3\text{OH}$	methyl Alcohol	→ methanol
$\text{CH}_3\text{CH}_2\text{OH}$	Ethyl Alcohol	→ Ethanol
$\text{CH}_3(\text{CH}_2)_2\text{OH}$	Propyl Alcohol	→ Propanol
* $\begin{array}{l} \text{CH}_3 \\ \diagdown \\ \text{CH}_3 \rightarrow \text{CH-OH} \end{array}$	Isopropyl Alcohol	→ 2 Propanol
$\text{CH}_3(\text{CH}_2)_3\text{OH}$	n-Butanol	

GROUP NAME: Alkynes

Description: unsaturated

Bond Type: TRIPLE

FORMULA:  $C_n H_{2n-2}$

Structure	Group
None	
$C_2 H_2$	Ethyne
$C_3 H_4$	Propyne
$C_4 H_6$	Butyne
$C_5 H_8$	Pentyne
$C_6 H_{10}$	Hexyne
$C_7 H_{12}$	Heptyne
$C_8 H_{14}$	Octyne
$C_9 H_{16}$	Nonyne
$C_{10} H_{18}$	Decyne

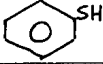


GROUP NAME: Thiols

Description: Smell Badly!

Bond Type: \_\_\_\_\_

FORMULA: (SH)

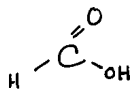
Structure	Group	IUPAC
$\text{CH}_3\text{SH}$	methyl Mercaptan	methanethiol
$\text{CH}_3\text{CH}_2\text{SH}$	Ethyl Mercaptan (smell of propane)	Ethanthiol
$\text{CH}_3(\text{CH}_2)_2\text{SH}$	Propyl Mercaptan (active ingred. of onion)	Propanethiol
$\text{CH}_3(\text{CH}_2)_3\text{SH}$	Butyl Mercaptan (smell of a skunk)	-
	Benzyl Mercaptan or Phenyl Mercaptan (papermill smell)	-

GROUP NAME: Carboxylic Acids

Description: HCOOH

Bond Type: \_\_\_\_\_

FORMULA: \_\_\_\_\_



Structure	Group
HCOOH	methanoic Acid (Formic)
CH <sub>3</sub> COOH	Acetic Acid Vinegar (Acetic)
CH <sub>3</sub> CH <sub>2</sub> COOH	Propionic
CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> COOH	Butyric Acid (butter)
cis-9-Octadecenoic	Oleic (virgin olive oil)

→ HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>  
weak acid-



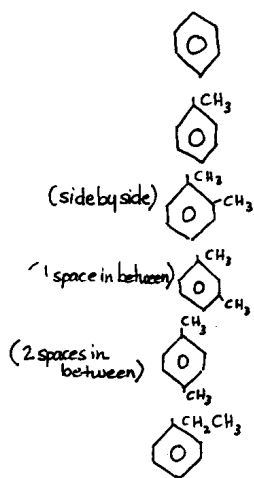


GROUP NAME: Arines

Description: \_\_\_\_\_

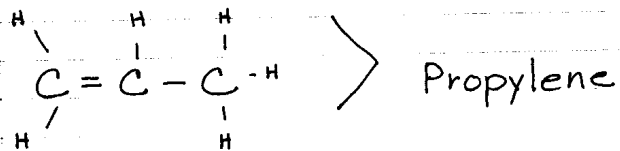
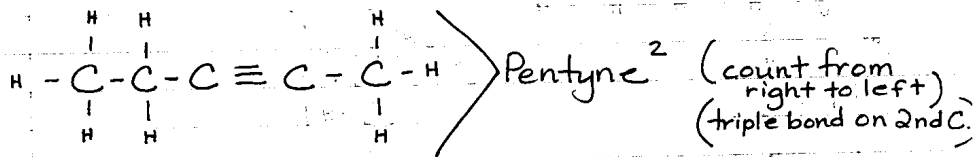
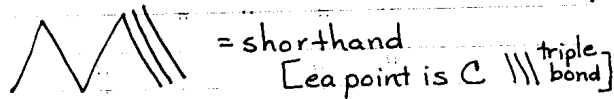
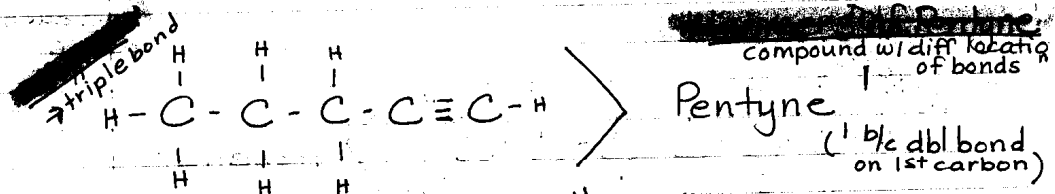
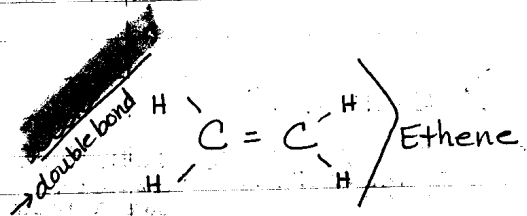
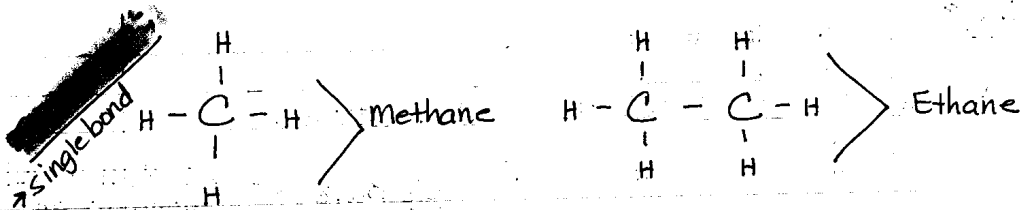
Bond Type: \_\_\_\_\_

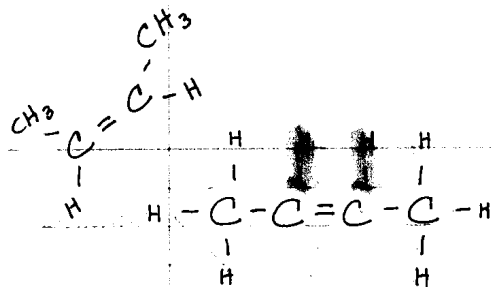
FORMULA: \_\_\_\_\_



Structure	Group
$C_6H_6$	Benzene
$C_6H_5CH_3$	Toluene (methyl Benzene)
$1,2-C_6H_4(CH_3)_2$	o-Xylene (ortho)
$1,3-C_6H_4(CH_3)_2$	m-Xylene (metta)
$1,4-C_6H_4(CH_3)_2$	p-Xylene (para)
$C_6H_5C_2H_5$	Ethylbenzene

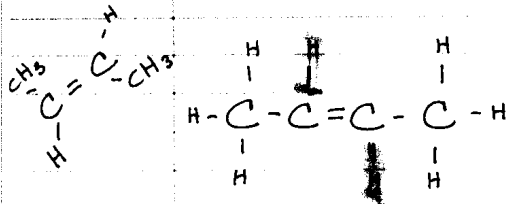
# Handwritten Formulas





Butene<sup>2</sup>

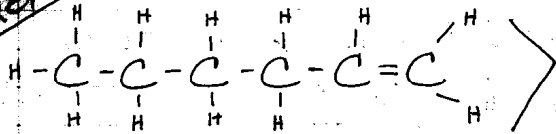
cis Butene<sup>2</sup> = both H on dbl bond are on same side



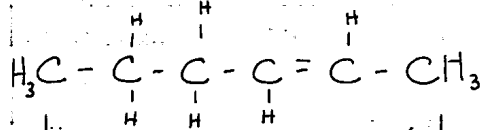
Butene<sup>2</sup>

trans Butene<sup>2</sup> = both H on dbl bond are on opposite sides

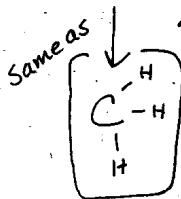
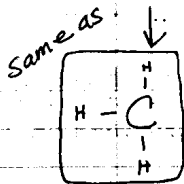
~~Isomers of Hexene~~



Hexene<sup>1</sup>



Hexene<sup>2</sup>



\*  
(Actual GROUP NAME: Applications)

Description: \_\_\_\_\_

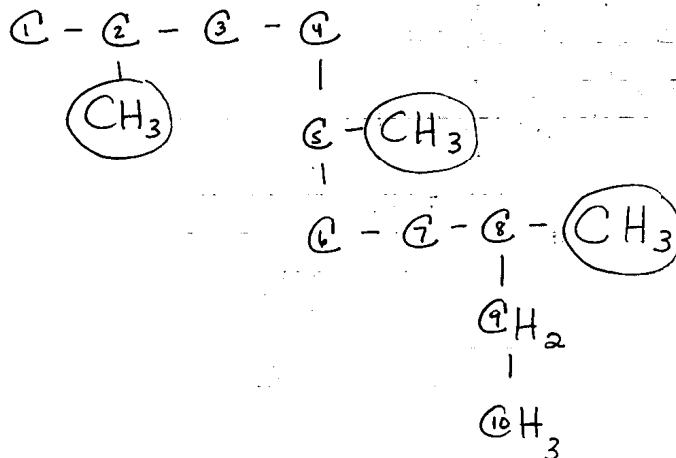
Bond Type: \_\_\_\_\_

FORMULA: \_\_\_\_\_

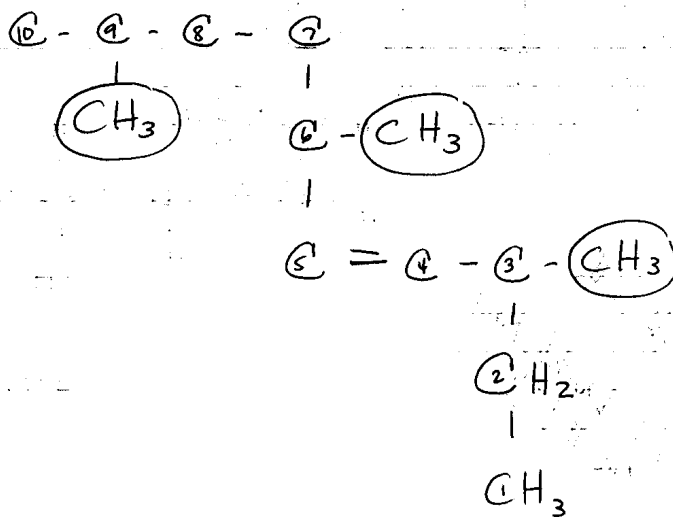
Structure	Group
$\text{CH}_3$	methyl
$\text{CH}_3\text{CH}_2$	Ethyl
$\text{CH}_3(\text{CH}_2)_2$	Propyl
$\text{CH}_3(\text{CH}_2)_3$	Butyl
$\text{CH}_3(\text{CH}_2)_4$	Pentyl
$\text{CH}_3(\text{CH}_2)_5$	Hexyl
$\text{CH}_3(\text{CH}_2)_6$	Heptyl
$\text{CH}_3(\text{CH}_2)_7$	Octyl
$\text{CH}_3(\text{CH}_2)_8$	Nonyl
$\text{CH}_3(\text{CH}_2)_9$	Decyl

want #'s in lowest possible form: so counted from top to bottom. (if bottom to top = 3, 6, 9)

**2,5,8-Trimethyldecane**



**3,6,9-Trimethyldecene**



~~\* Know!~~

Actual Group!

\* Groups for Naming -

Methyl	$\text{CH}_3$
Ethyl	$\text{CH}_3 \text{CH}_2$
Propyl	$\text{CH}_3 \text{CH}_2 \text{CH}_2$
Butyl	$\text{CH}_3 \text{CH}_2 \text{CH}_2 \text{CH}_2$
Pentyl	$\text{CH}_3 \text{CH}_2 \text{CH}_2 \text{CH}_2 \text{CH}_2$
Hexyl	$\text{CH}_3 \text{CH}_2 \text{CH}_2 \text{CH}_2 \text{CH}_2 \text{CH}_2$
Heptyl	$\text{C}_7 \text{H}_{15} -$
Octyl	$\text{C}_8 \text{H}_{17} -$
Nonyl	$\text{C}_9 \text{H}_{19} -$
Decyl	$\text{C}_{10} \text{H}_{21} -$

~~ICAC~~ - International Union Pure And Applied Chemistry

~~isomers~~ (Pentyne<sup>1</sup>, Pentyne<sup>2</sup> ect) =  
same compound but w/ diff structure  
based on location of bond!

GROUP NAME: Numbers

Description: \_\_\_\_\_

Bond Type: \_\_\_\_\_

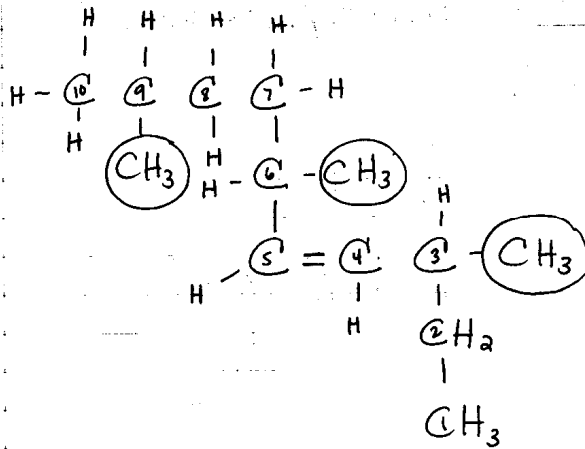
FORMULA: \_\_\_\_\_

Structure	Group
(1)	mono
(2)	Di
(3)	Tri
(4)	Tetra
(5)	Penta
(6)	Hexane
(7)	Hepta
(8)	Octa
(9)	Nona
(10)	Deca

CH<sub>3</sub> (methyl)

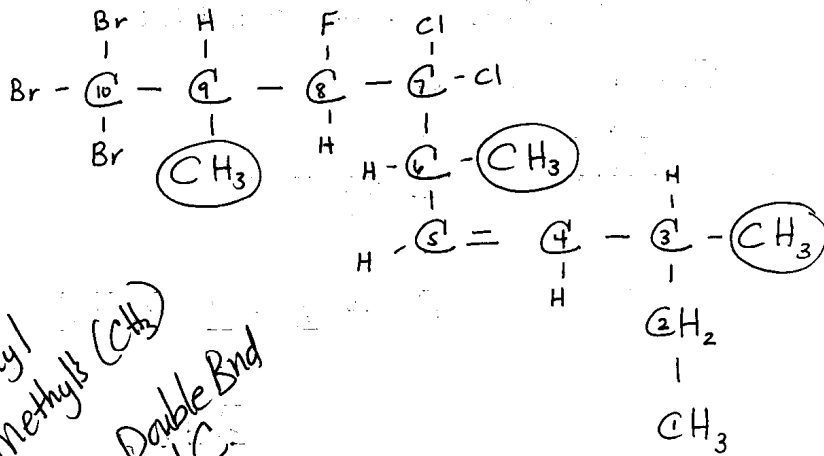
**3,6,9 Trimethyldecene-4**

double bond on 4th carbon



**10,10,10-TriBromo 7,7-Dichloro 8-MonoFluoro -  
3,6,9 - Trimethyldecene - 4**

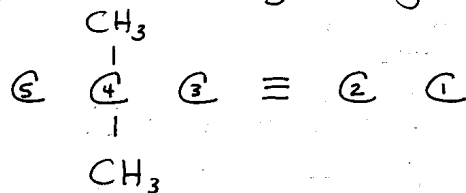
10,10,10 =  
3 Br's on 10th C  
7,7 = (2) Cl on  
7th C  
alphabetical!!



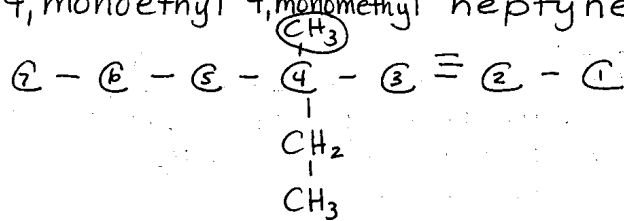
Trimethyl  
(3) methyls (CH<sub>3</sub>)  
4-b/c Double Bond  
on #4 C



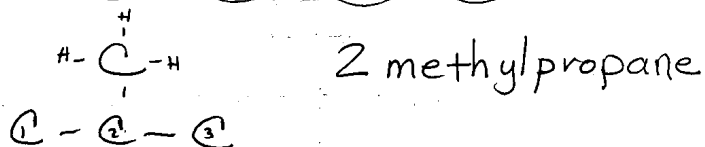
4,4-Di - methyl Pentyne - 2



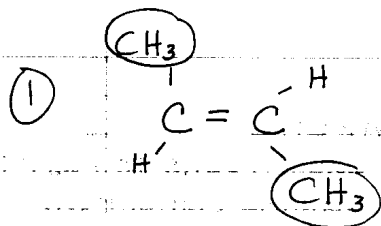
4, monoethyl 4, monomethyl heptyne - 2



Count from the shortest end of multi bond



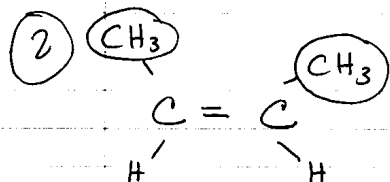




Know these 2!

trans - Butene - 2

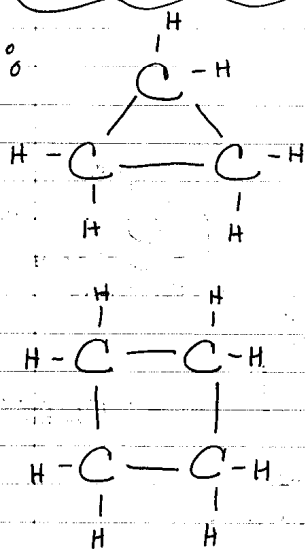
b/c CH<sub>3</sub> on either side



cis - butene - 2

b/c CH<sub>3</sub> on same side

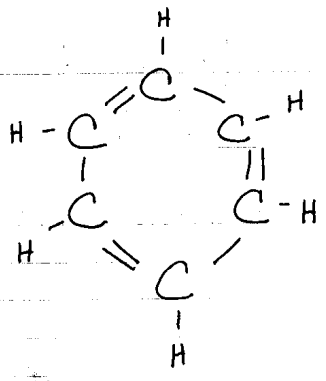
Thru  
cyclo



Cyclopropane

→ See pg 284  
in handout

==  
Cyclos  
==



**Benzene-**  
 causes cells to rust;  
 causes cancer by  
 itself- No help!

~~KNOW:~~  
~~ARISE~~

① Benzene

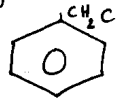


② Toluene

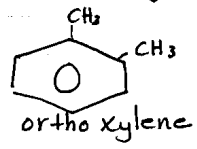


methyl Benzene

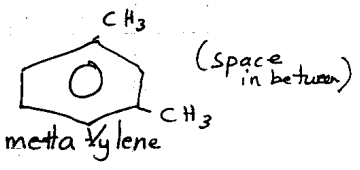
③ Ethyl Benzene



④ Xylene

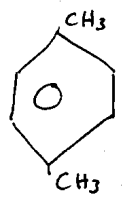


ortho xylene



meta xylene

(space in between)



para xylene

(2 spaces in between)

GROUP NAME: Alkanes

Description: Handout (p 86)

Bond Type: \* Drawout & Identify!

FORMULA:

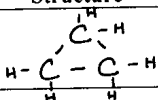

(use to drawout - * Structure ONLY!)	Group
$(\text{CH}_3)_2\text{CHCH}_3$	Isobutane
$(\text{CH}_3)_2\text{CHCH}_2\text{CH}_3$	Isopentane
$(\text{CH}_3)_4\text{C}$	Neopentane
$(\text{CH}_3)_2\text{CH}(\text{CH}_2)_2\text{CH}_3$	Isohexane
$\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$	3-Methylpentane
$(\text{CH}_3)_3\text{CCH}_2\text{CH}_3$	2,2-Dimethylbutane
$(\text{CH}_3)_2\text{CHCH}(\text{CH}_3)_2$	2,3-Dimethylbutane

GROUP NAME: "Cyclos"

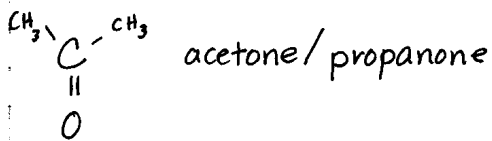
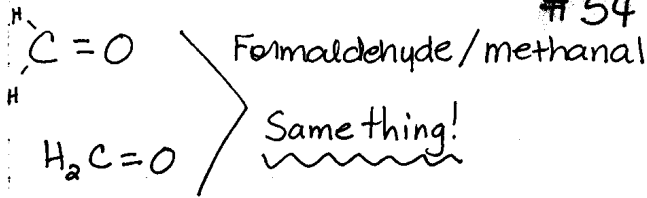
Description: pg 284 (Handout)

Bond Type: \_\_\_\_\_

FORMULA: \_\_\_\_\_

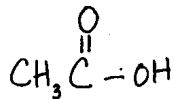
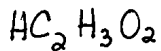
Structure	Group
	Cyclopropane
	Cyclobutane
	Cyclopentane
	Cyclohexane
	Cycloheptane
	Cyclooctane

#54 Handout Explan.



when you see a carbonyl (C=O)

Ask! Is it a → oic? acid OH  
al? aldehyde  
keytone? keytone CHO



Ethanoic Acid  $\text{C}_2\text{COOH}$   
 $\text{CH}_3\text{COOH}$

Acetic Acid  
Vinegar 3%  
HAC

**\* Know**

$\text{C} = \text{C} - \text{C}$  propene/propylene  
 $\text{AC} \equiv \text{CH}$  acetylene/ethyne