

Organiska ämnen

(organisk kemi) Ke2

Repetition Ke1

Organisk ämnen en översikt.

Organisk kemi ett mycket stort område inom kemin

90% av alla kända ämnen är organiska ämnen.

*Syntetiserade (tillverkade) ämnen som:
lösningsmedel, bränslen, plast, mediciner*

*Naturliga ämnen i naturen som:
kolhydrater, proteiner, fetter*

Organic matter and materials



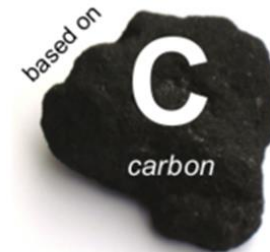
Plants



Food



Pharmaceuticals



Combustibles
Fuels
fossil and
renewable



Animals



Textiles



Dyes



Plastics and Synthetics

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Exempel på några organiska ämnen, naturliga och tillverkade

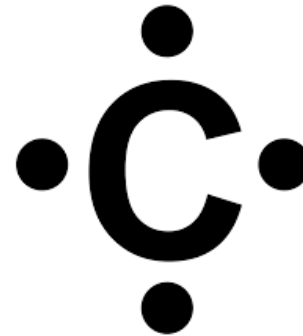
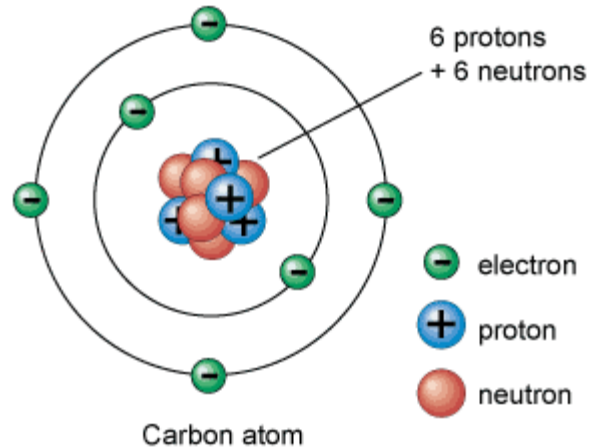
Biokemi
(naturliga ämnen)



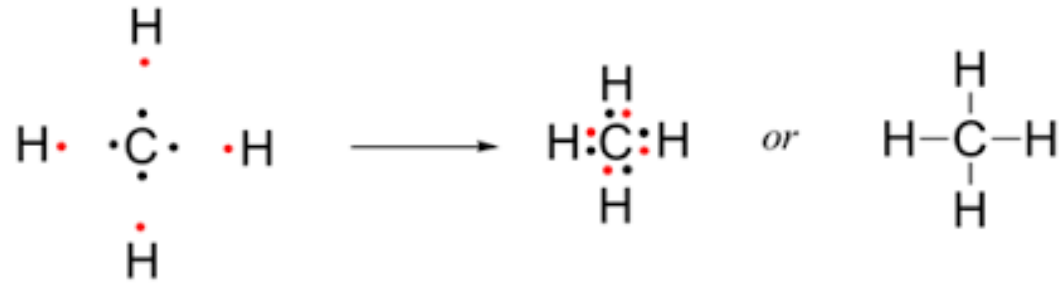
Organisk kemi
(syntetiserade
ämnen)

Organiska ämne (molekyler) innehåller alltid kolatomer

Kolatomen är speciell - *fyra valenselektroner*.



Fyra valenselektroner ger möjlighet att binda fyra andra atomer:



Binder till andra atomer (kol-, väte-, syre-, kväveatomer mfl.)

(kovalentbindning/elektronparbindning)

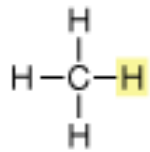
Olika organiska molekyler/föreningar

Delas in (systematiseras) i grupper efter utseende och funktion.

Kemi 1

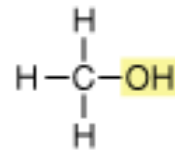
The leading families of organic compounds

Hydrocarbon



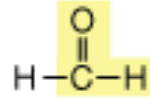
methane
(CH₄)

Alcohol



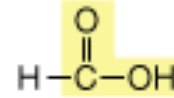
methyl alcohol
(CH₃OH)

Aldehyde



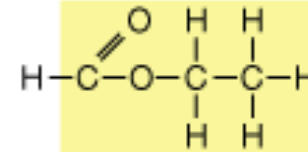
formaldehyde
(HCHO)

Acid



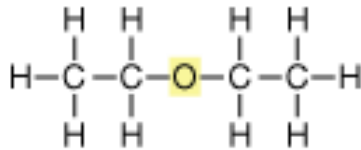
formic acid
(HCOOH)

Ester



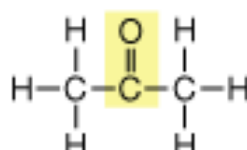
ethyl formate
(C₂H₅COOH)

Ether



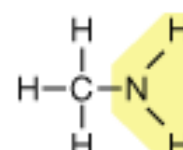
diethyl ether
(C₂H₅OC₂H₅)

Ketone



acetone
(CH₃COCH₃)

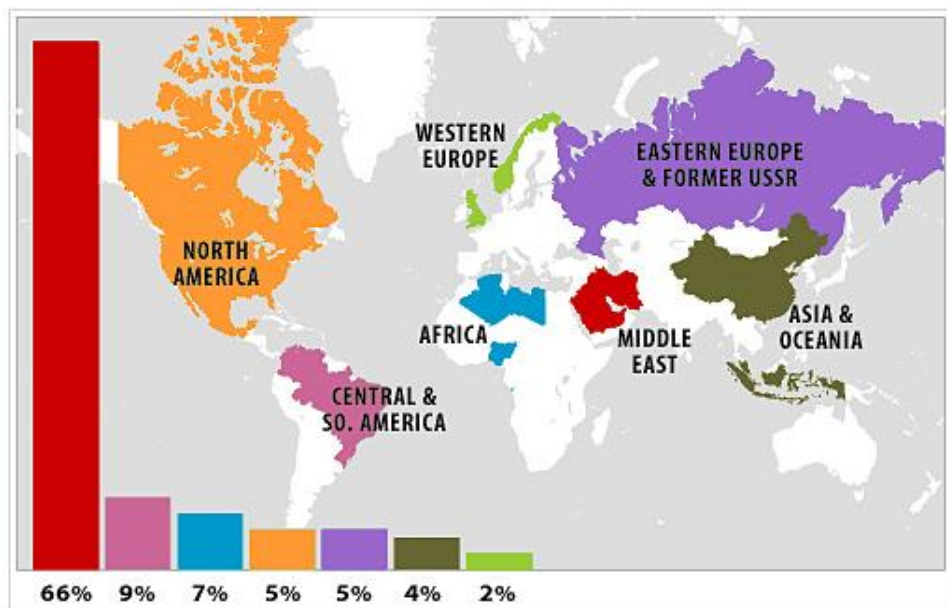
Amine



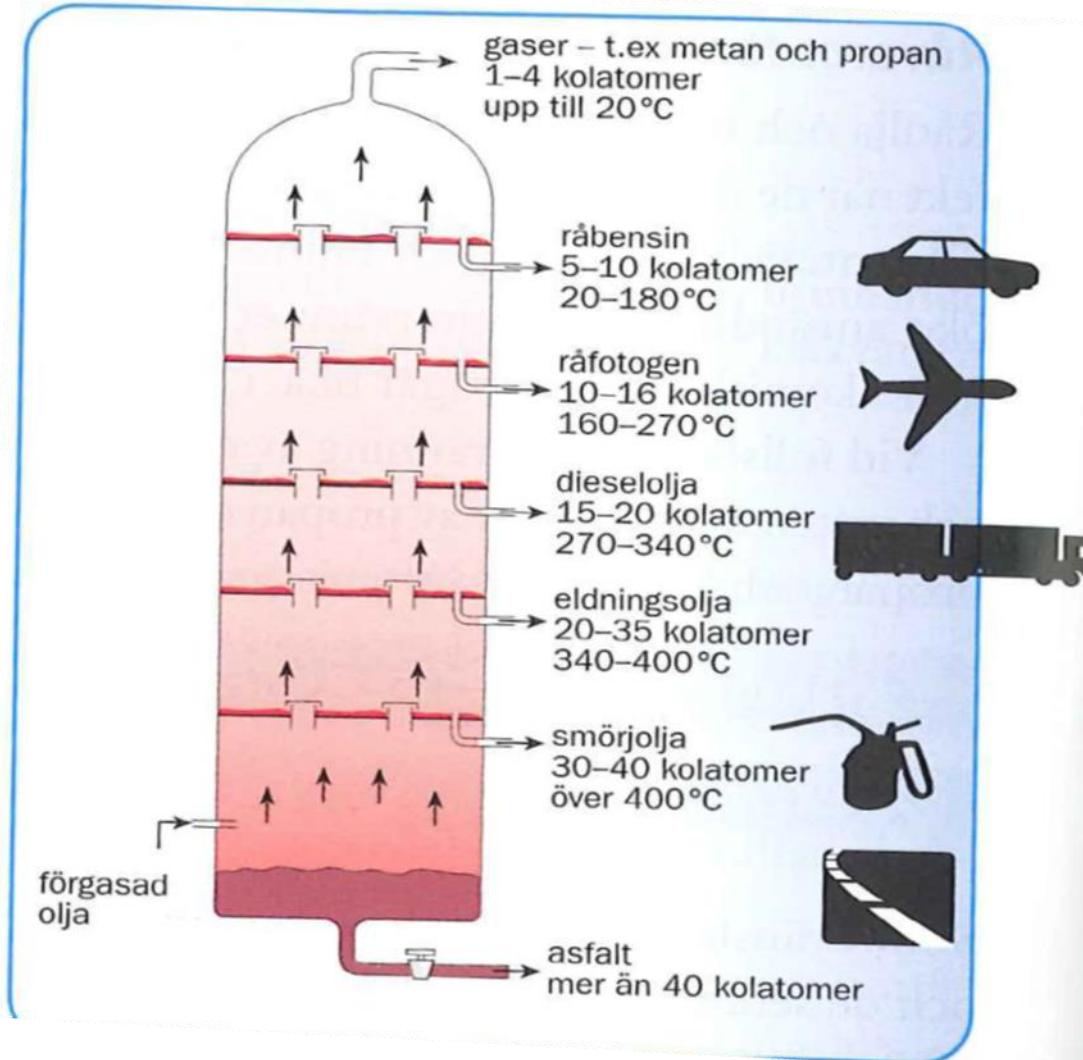
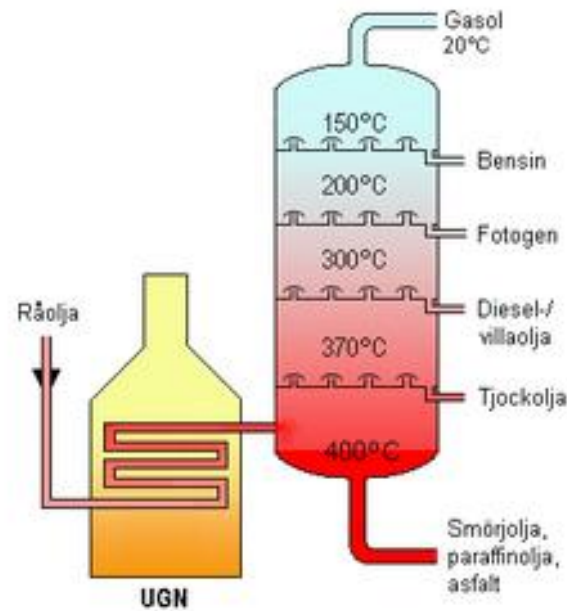
methyl amine
(CH₃NH₂)

Kommersiellt är gruppen *kolväten* viktigast (*bränslen mm*)

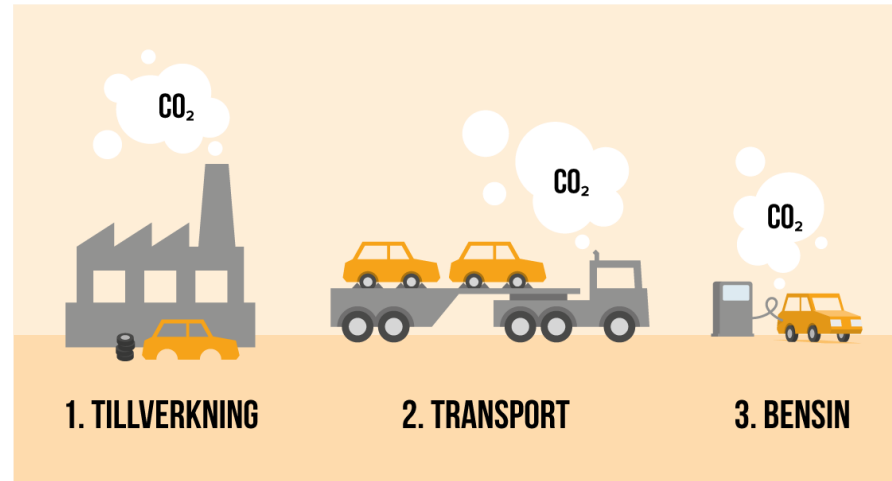
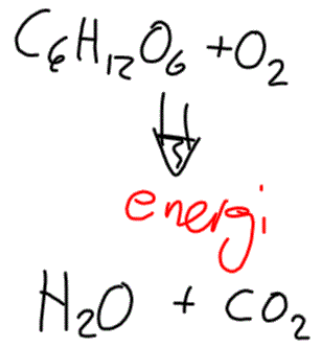
Råolja (kolväten)



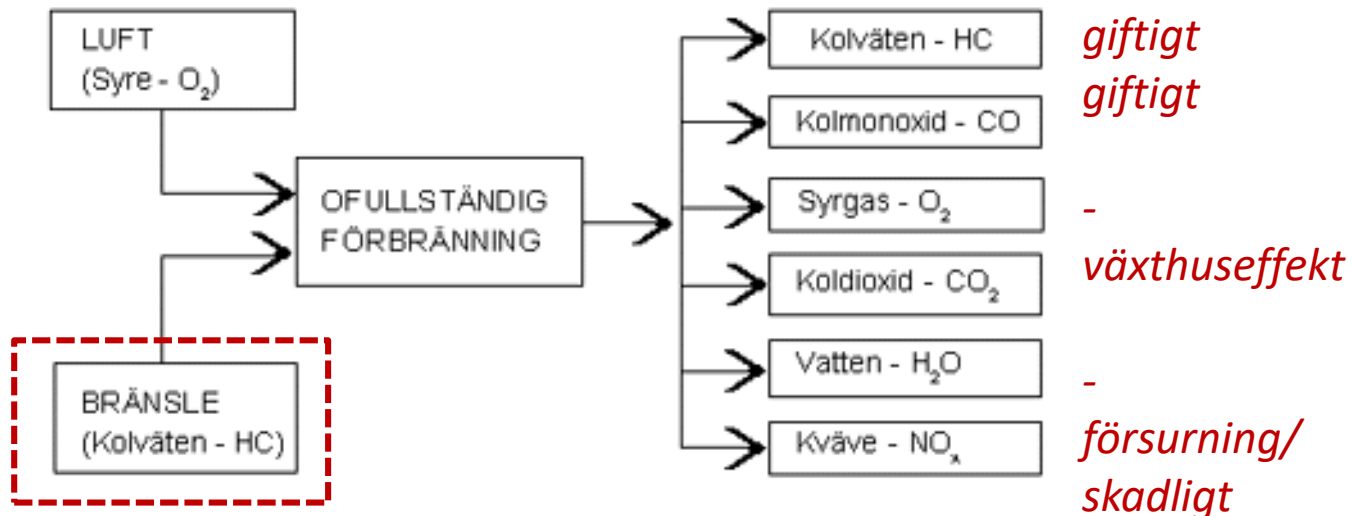
Oljeraffinaderi – råolja (kolväten) delas upp i olika fraktioner (delar) utifrån antalet kolatomer (olika kokpunkt)



FÖRBRÄNNING / CELLANDNING



Förbränning av kolväten ger utsläpp som orsakar **miljöproblem**



Kolväten

- alkaner
- alkener
- alkyner

Alkoholer

Kolväten (kol + väte) *summaformel, strukturformel*

Kolväten - Innehåller grundämnena kol, C och väte, H.

G

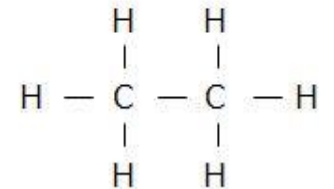
Mättade kolväten, Alkaner, slutar på -an

Antal kol	Namn	Summaformel Molekylformel	Strukturformel
1	Metan	CH ₄	$\begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{H} \\ \\ \text{H} \end{array}$

Exempel på summaformel för etan



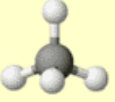
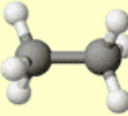
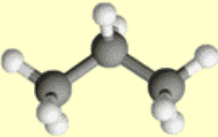
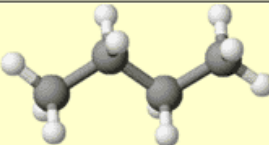
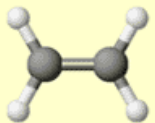
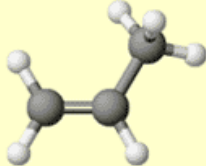
Exempel på strukturformel för etan



Metanserien

De 10 första kolvätena. De kallas med ett finare namn för *alkaner*

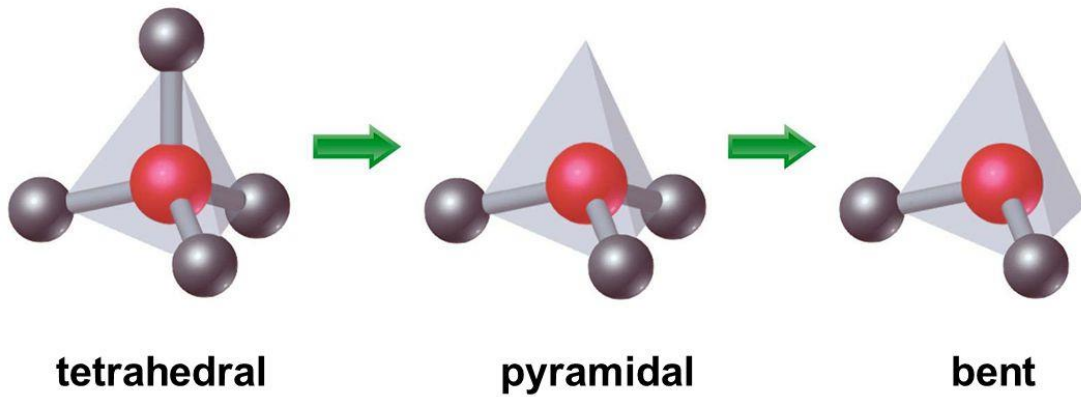
Metan	CH_4
Etan	C_2H_6
Propan	C_3H_8
Butan	C_4H_{10}
Pentan	C_5H_{12}
Hexan	C_6H_{14}
Heptan	C_7H_{16}
Oktan	C_8H_{18}
Nonan	C_9H_{20}
Dekan	$\text{C}_{10}\text{H}_{22}$

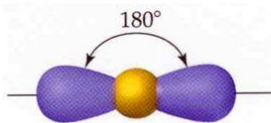
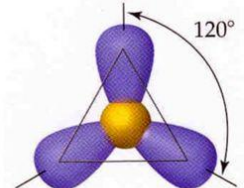
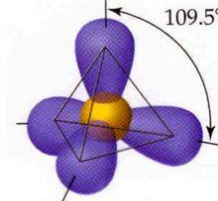
methane CH_4	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	
ethane C_2H_6	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$	
propane C_3H_8	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$	
butane C_4H_{10}	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$	
ethene C_2H_4	$\begin{array}{c} \text{H} \quad \quad \text{H} \\ \diagdown \quad / \\ \text{C}=\text{C} \\ / \quad \diagdown \\ \text{H} \quad \quad \text{H} \end{array}$	
propene C_3H_6	$\begin{array}{c} \quad \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H} \quad \quad \text{C}-\text{C}-\text{H} \\ \diagdown \quad / \quad \diagdown \\ \text{C}=\text{C} \quad \quad \text{H} \\ / \quad \diagdown \\ \text{H} \quad \quad \text{H} \end{array}$	

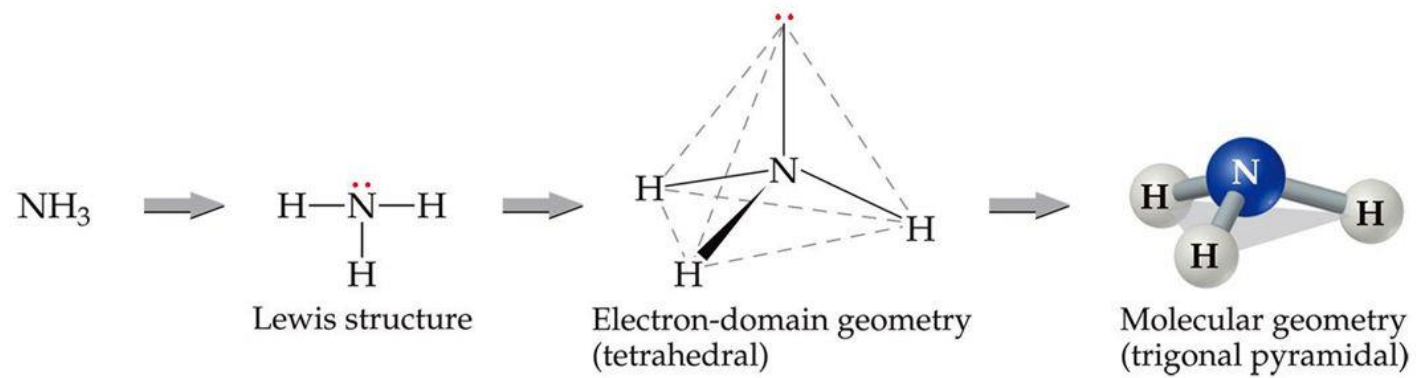
Alkaner - aggregationsform vid rumstemperatur och användning

Namn	Antal C	Formel	Fas	Användning
Metan	1	CH ₄	Gas	Naturgas – bränsle
Etan	2	C ₂ H ₆		Bränsle, plasttillverkning
Propan	3	C ₃ H ₈		Gasolbrännare, plasttillverkning
Butan	4	C ₄ H ₁₀		
Pentan	5	C ₅ H ₁₂	Flytande	Bensin, lösningsmedel
Hexan	6	C ₆ H ₁₄		
Heptan	7	C ₇ H ₁₆		
Oktan	8	C ₈ H ₁₈		Flygplansbränsle, bensin
Nonan	9	C ₉ H ₂₀		
Dekan	10	C ₁₀ H ₂₂		Flygplansbränsle
Undekan	11	C ₁₁ H ₂₄		
[...]				
Oktadekan	18	C ₁₈ H ₃₈	Fast	Dieselolja

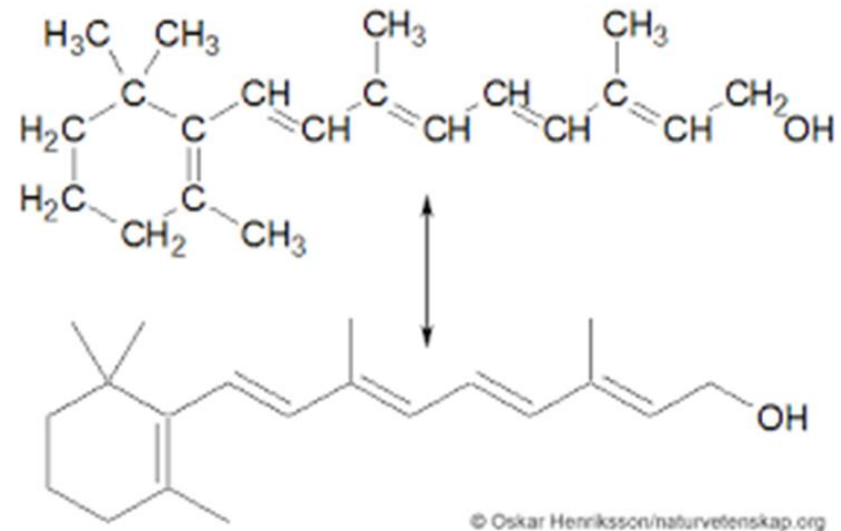
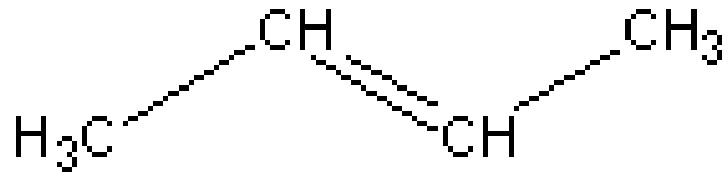
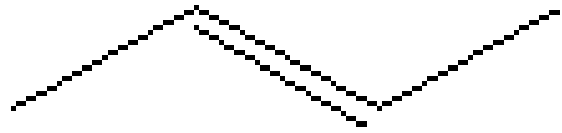
Molekylers form beror på *elektronmolnens* form

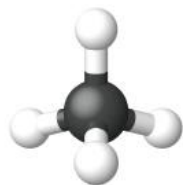
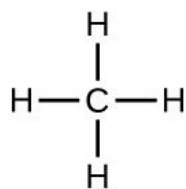


# e ⁻ pairs around central element	shape	geometry name	angles
2 pairs		linear	180°
3 pairs		trigonal planar	120°
4 pairs		tetrahedral	109.5°

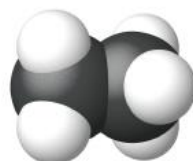
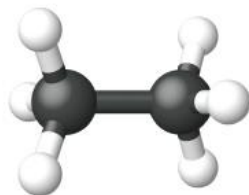
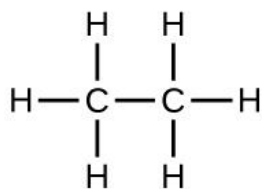


streckformler

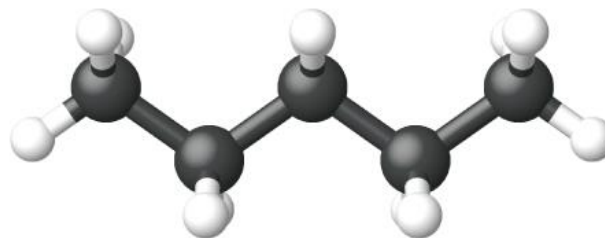
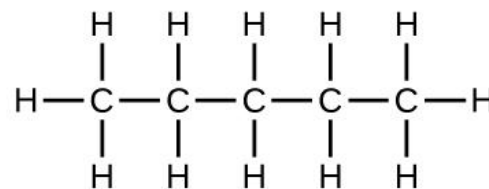




methane
 CH_4



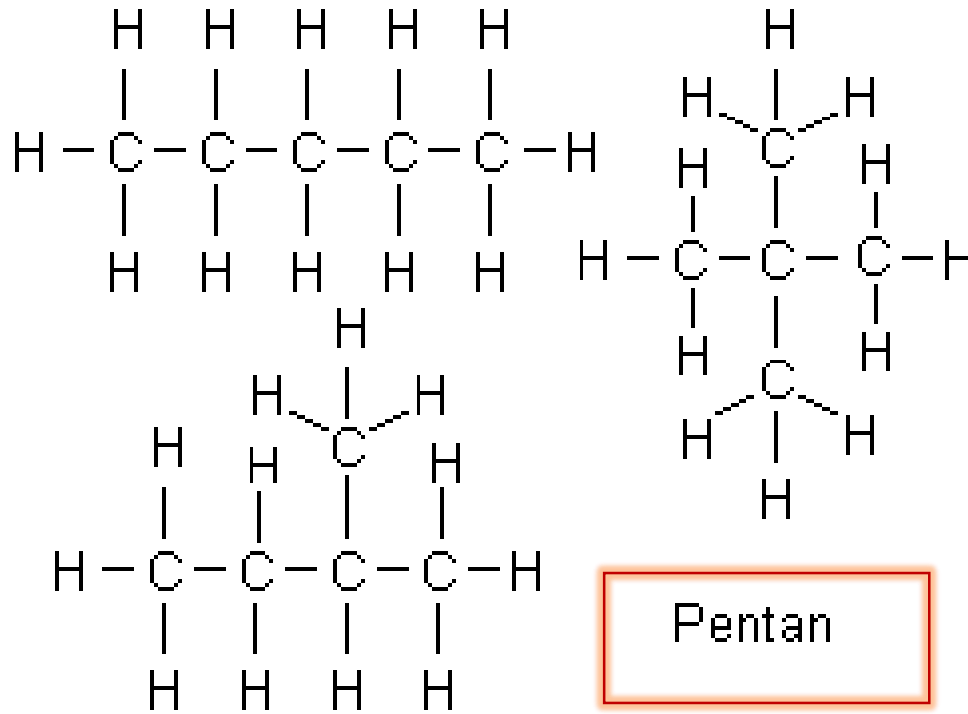
ethane
 CH_3CH_3 or C_2H_6



pentane
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ or C_5H_{12}

Isomerer

Strukturisomerer har *samma molekylformel men olika strukturformel.*



Namngivning av organiska ämnen

Rationellt namn

Etansyra

Butansyra

Diaminometanal

2,3,4,5,6-pentahydroxihexanal

2-hydroxipropansyra

1,2,3-propantriol

Trivialnamn

ättiksyra

smörsyra

urea, karbamid

druvsocker

mjölksyra

glycerol

Rationell nomenklatur

1. Man väljer ut den längsta kolkedjan i molekylen. Motsvarande kolväte, "stamkolväte", bestämmer sista delen av namnet.

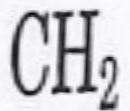
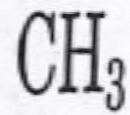
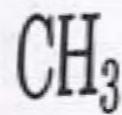
2. Man numrerar kolatomerna i en molekyl av stamkolvätet med början i den ände som är närmast en förgrening.

3. Före stamkolvätes namn anges substituenternas namn i bokstavsordning. Före en substituent anges dess plats i molekylen genom numret på den kolatom som binder substituenten.

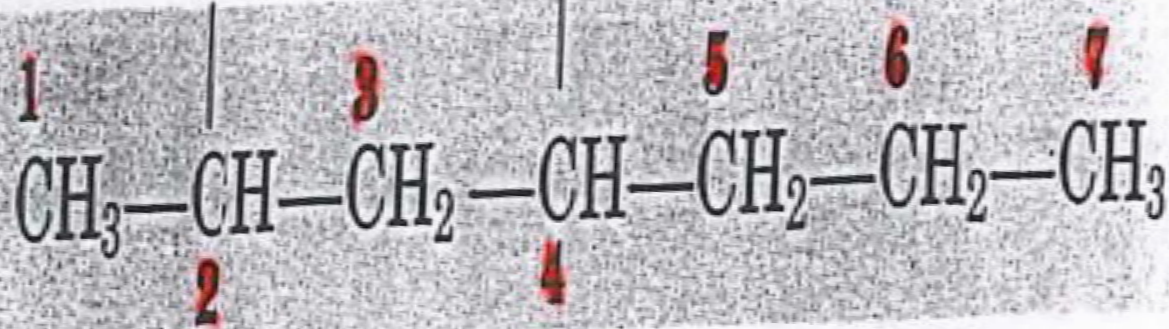
4. Om det finns två eller flera substituenter av samma slag i en molekyl anges detta med grekiska räkneord:

Antal substituent	1	2	3	4	5	6	
Räkneord	mono-	di-	tri-	tetra-	penta-	hexa-	osv

metylgrupp
(substituent)



etylgrupp (substituent)



4 etyl 2 metyl heptan

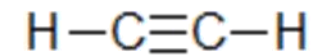
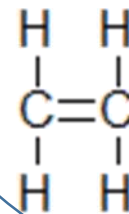
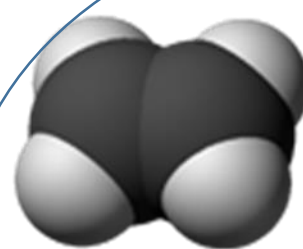
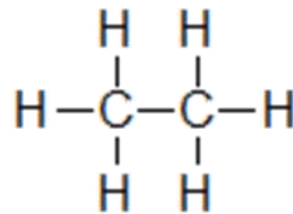
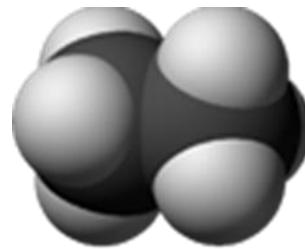
Omättade kolväten

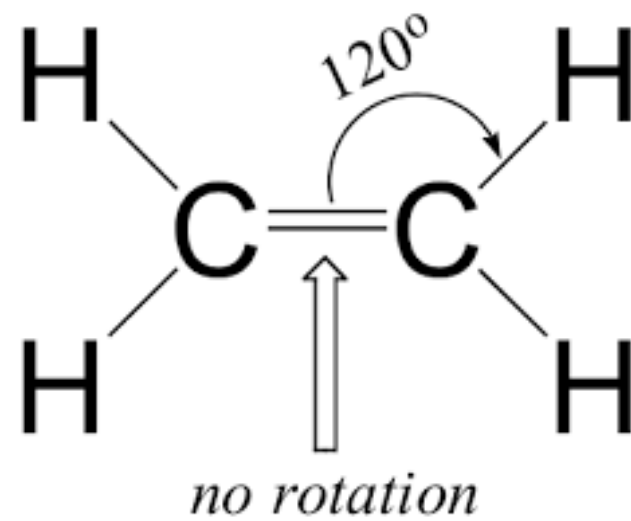
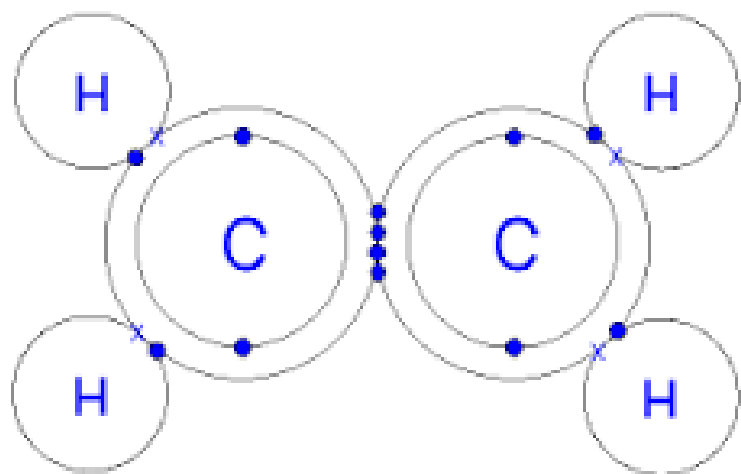
Omättad förening – har dubbel eller trippelbindning

Alkaner - enkelbindning

Alkener – dubbelbindning

Alkyner - trippelbindning

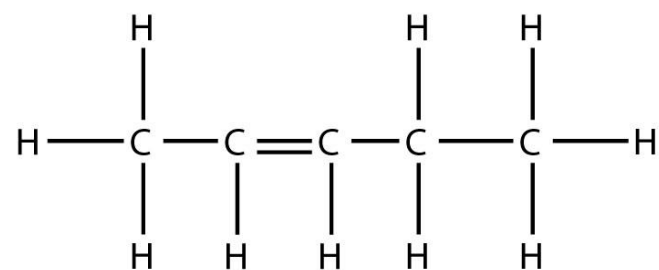




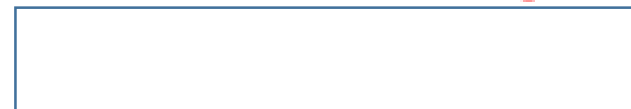
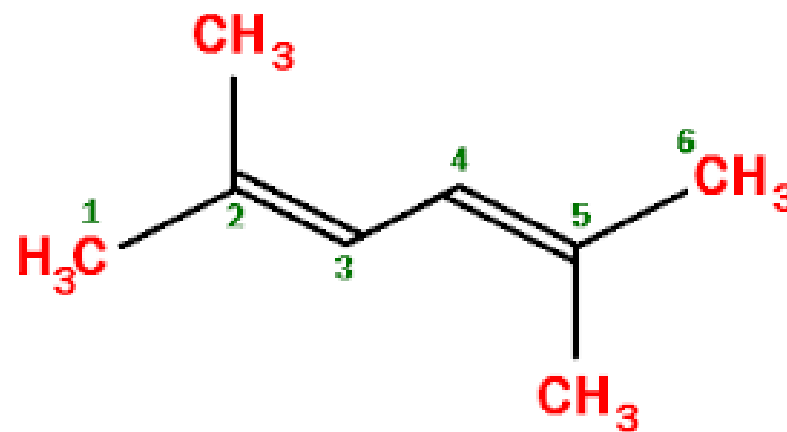
Namngivning *alkener, alkyner*

Alkaner	Alkener	Alkyner
$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array}$ <p>Etan (C₂H₆)</p>	$\begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{C}=\text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array}$ <p>Eten (C₂H₄)</p>	$\text{H}-\text{C}\equiv\text{C}-\text{H}$ <p>Etyn (C₂H₂)</p>
$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$ <p>Propan (C₃H₈)</p>	$\begin{array}{c} \text{H} \quad \quad \text{H} \\ \quad \quad \\ \text{C}=\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$ <p>Propen (C₃H₆)</p>	$\begin{array}{c} \quad \quad \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}\equiv\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \quad \quad \quad \text{H} \end{array}$ <p>Propyn (C₃H₄)</p>
$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$ <p>Butan (C₄H₁₀)</p>	$\begin{array}{c} \text{H} \quad \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{C}=\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array}$ <p>Buten (C₄H₈)</p>	$\begin{array}{c} \quad \quad \quad \text{H} \quad \text{H} \\ \quad \quad \quad \quad \\ \text{H}-\text{C}\equiv\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \quad \\ \quad \quad \quad \text{H} \quad \text{H} \end{array}$ <p>Butyn (C₄H₆)</p>

Vad heter alkenerna?



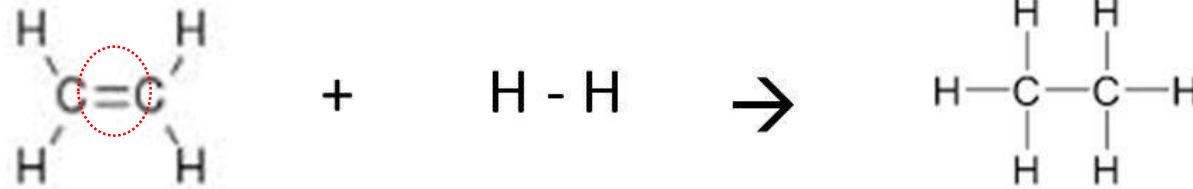
2-penten



Omättade kolväten reagerar gärna med andra ämnen.

F

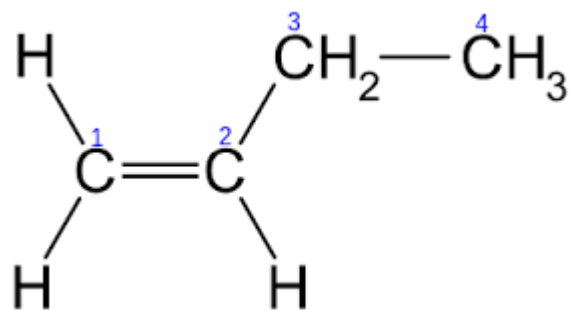
Eten + Vätgas → Etan



"omätt",
dubbelbindning

- Bygg en *buten-molekyl* , (C_4H_8)
- *Vad heter den? (rationellt namn)*

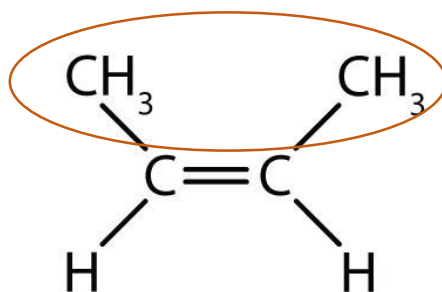
Tre olika *buten* (C_4H_8)



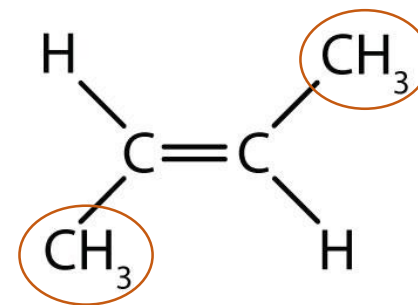
1-buten

Cis-trans-isomeri

(en typ av stereoisomeri -atomer olika lägen kring en dubbelbindning)



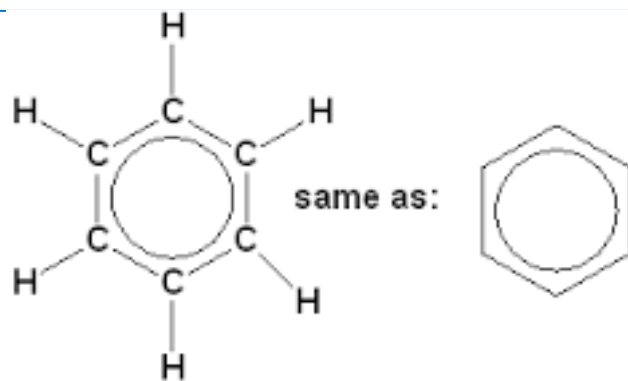
cis-2-butene



trans-2-butene

Arener – föreningar med *bensenringar*

Bensen C_6H_6



Aromatiska kolväten – innehåller en eller flera bensenringar ("Aromatiska" - många doftämnen innehåller bensenring)

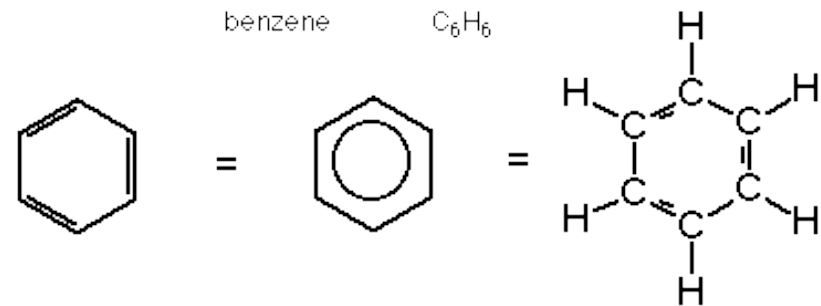
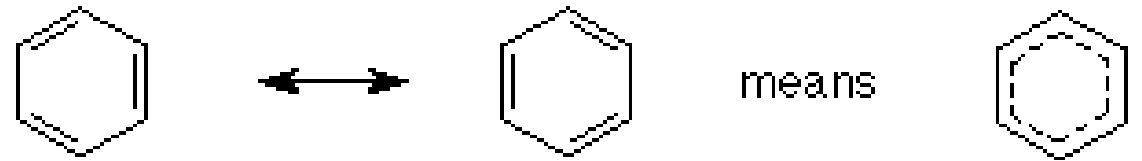
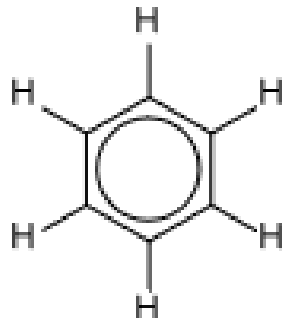
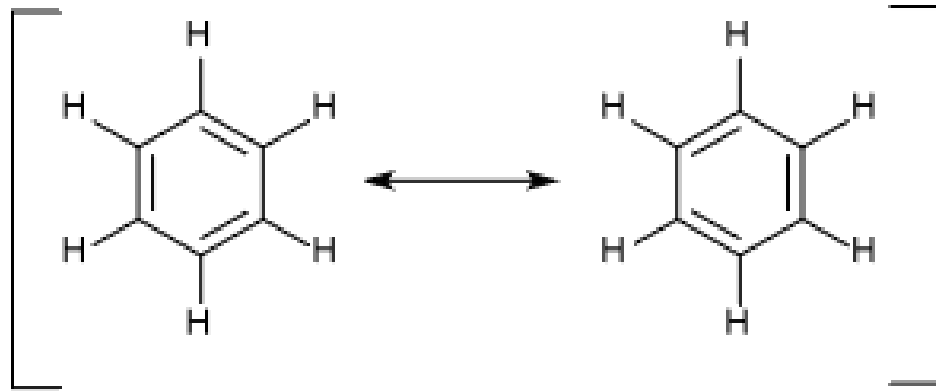
Konjugerade dubbelbindningar (omväxlande enkel- /dubbelbindning), *resonansstruktur*

→ ger en mycket stabil struktur

Stabila molekyler = beständiga, svårnedbrytbara

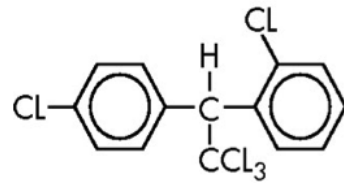
Konjugerade dubbelbindningar (omväxlande enkel- /dubbelbindning), *resonansstruktur*

(Kraften/bindningen mellan atomerna är ett mellanting mellan en enkel och en dubbelbindning)

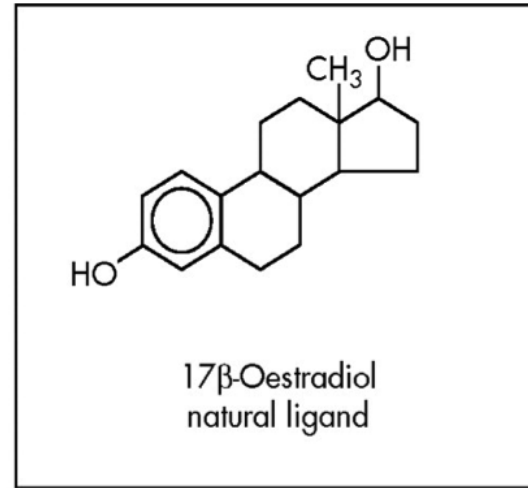


Stabila molekyler som är skadliga blir *miljögifter*, tex PCB, DDT

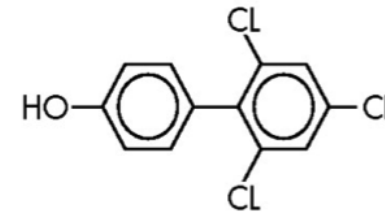
Olika gifter (miljögifter) med bensenringar jmf med östrogen (könshormon)



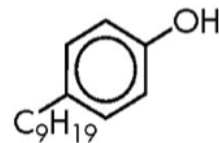
o,p'-DDT



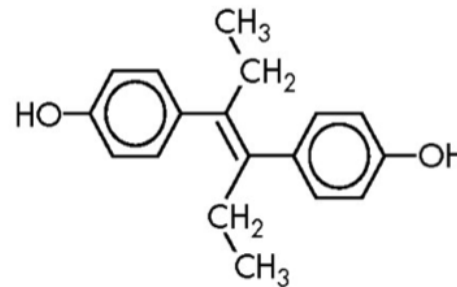
17β-Oestradiol
natural ligand



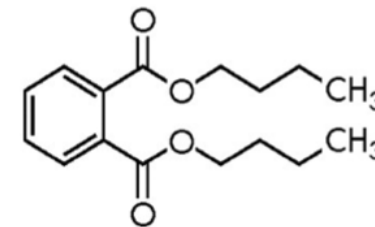
PCBs



4-Nonylphenol (NP)



Diethylstilbestrol
(DES)



Dibutyl phthalate

1. Övningsstencil rep. kolväten, struktur
3. Läs boken sid 107-126 (till vecka 48)