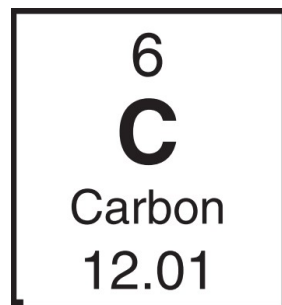
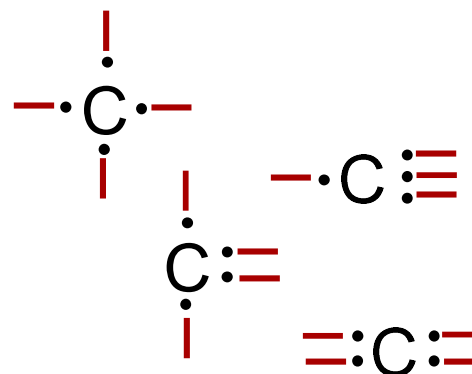
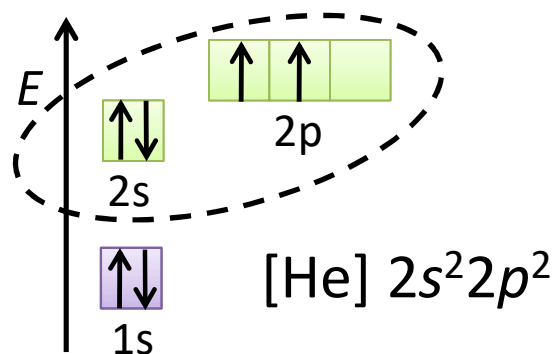


i legami nei composti del carbonio

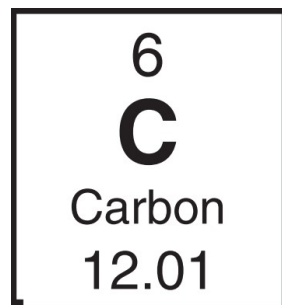


*caratteristiche
uniche*

1. struttura elettronica con **4 elettroni di valenza**
(tetravalenza) con possibilità di legami doppi e tripli

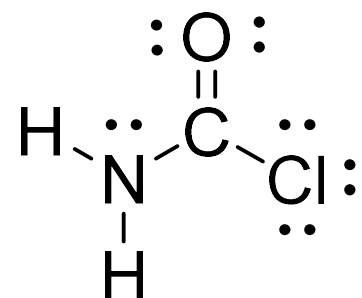


i legami nei composti del carbonio

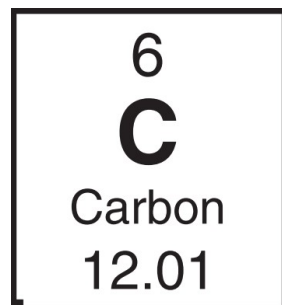


*caratteristiche
uniche*

2. **elettronegatività intermedia** ($\chi=2.5$), forma legami covalenti con elementi quali H, O, N ed alogeni



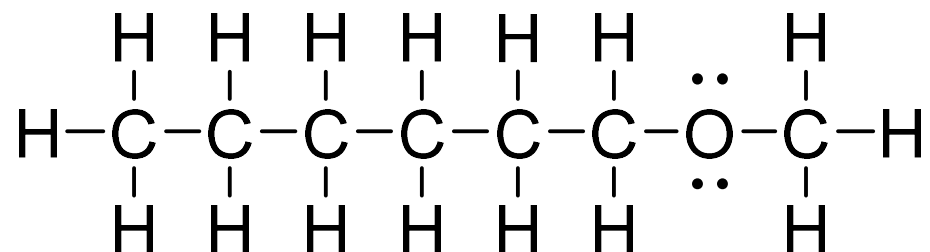
i legami nei composti del carbonio



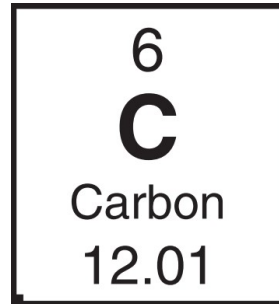
*caratteristiche
uniche*

3. **legami molto stabili** che permettono la formazione di lunghe catene, ma allo stesso tempo non troppo forti da impedire una certa reattività chimica

C—C	346 kJ/mol
Si—Si	222 kJ/mol
C—O	358 kJ/mol
Si—O	452 kJ/mol

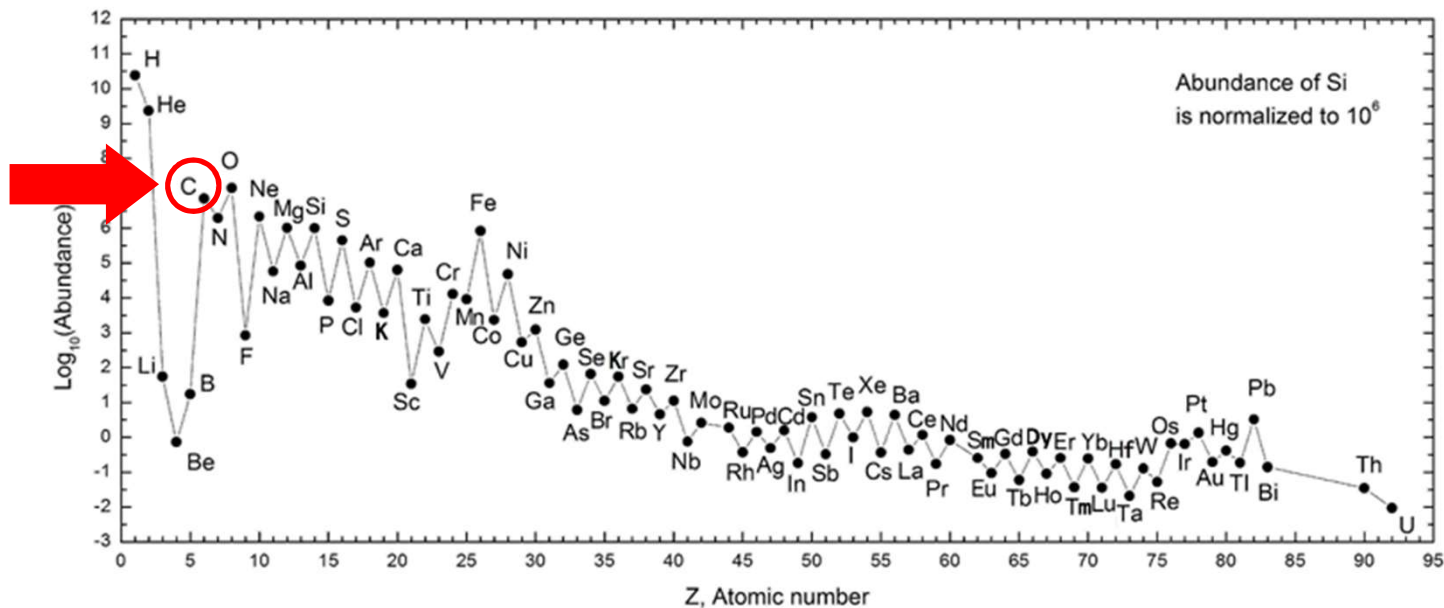


i legami nei composti del carbonio

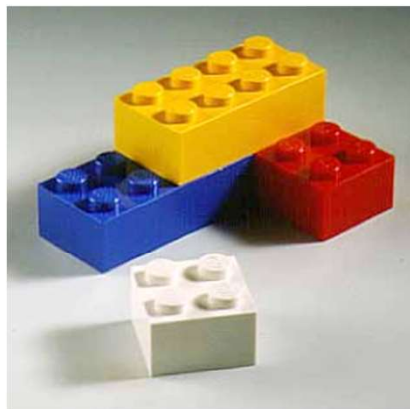


*caratteristiche
uniche*

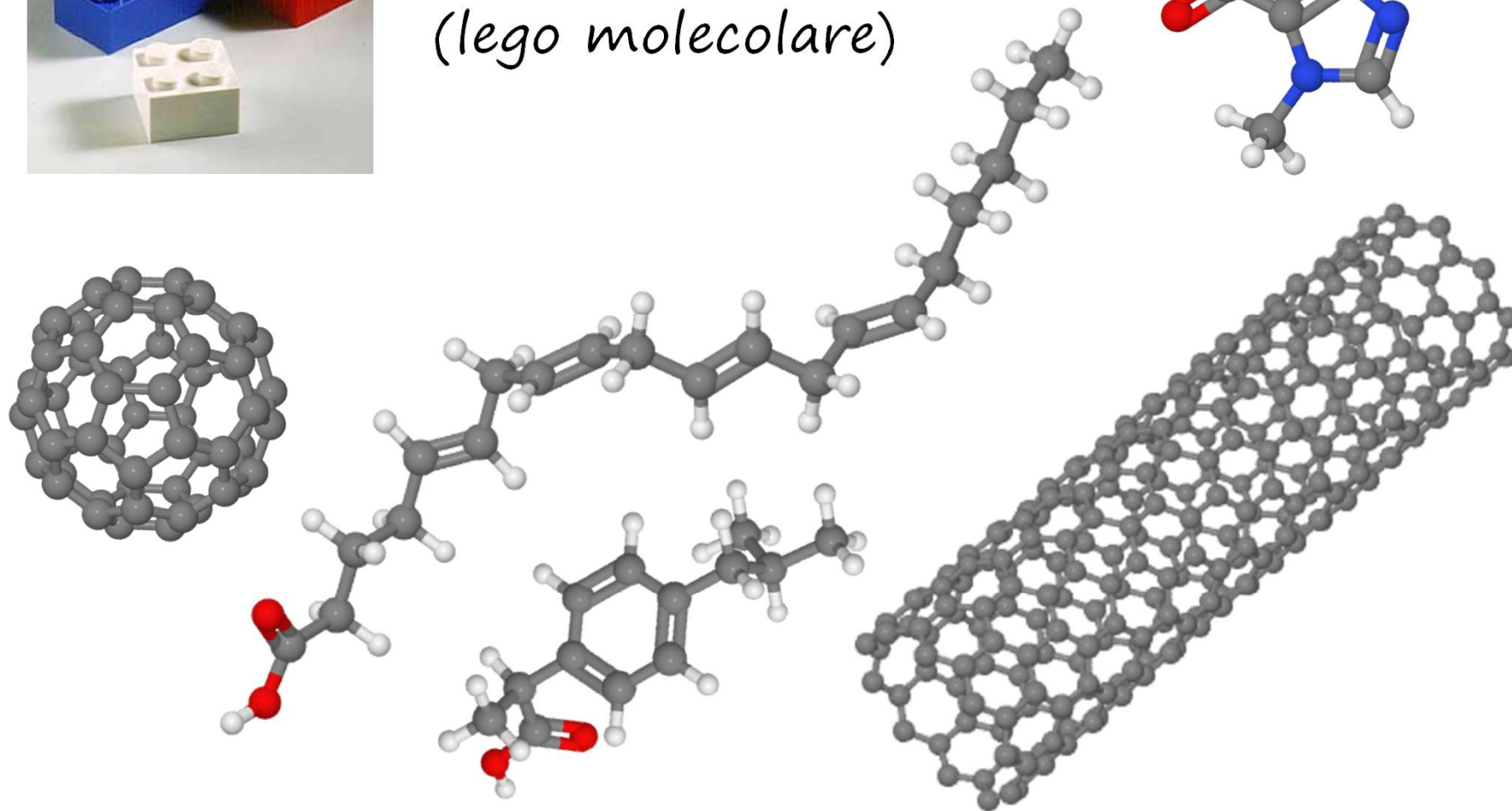
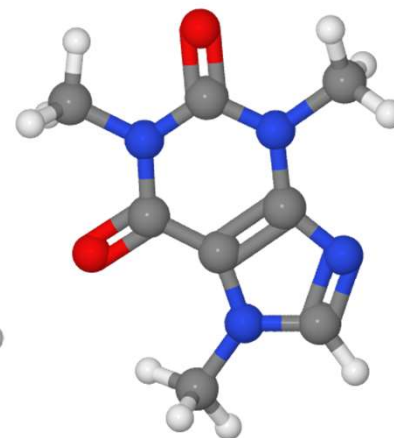
4. **abbondanza** (4° elemento più abbondante nell'universo)



i legami nei composti del carbonio



*ampia varietà
strutturale
(lego molecolare)*



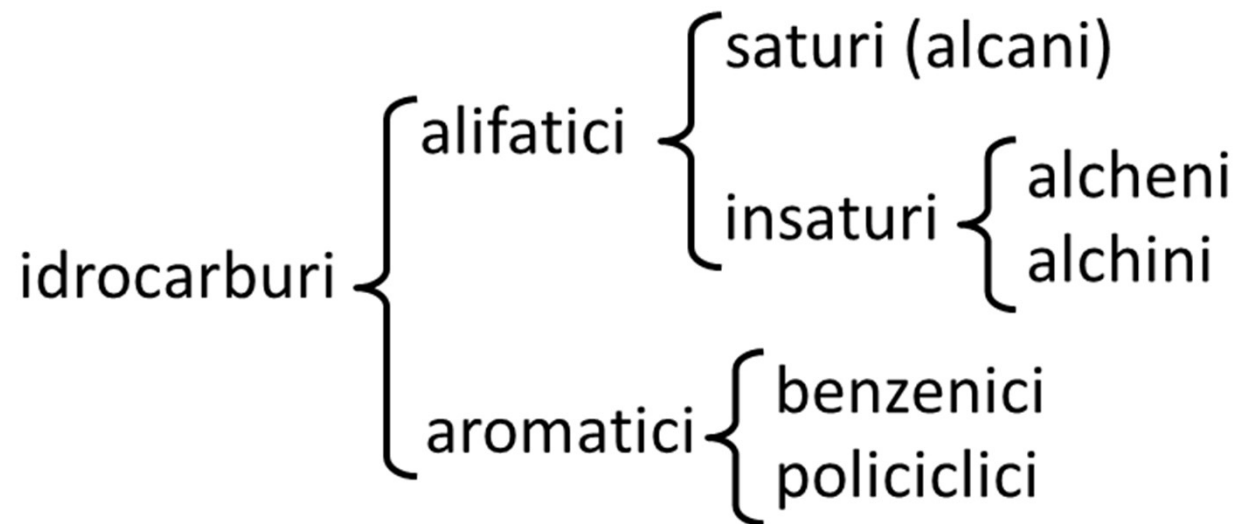
idrocarburi



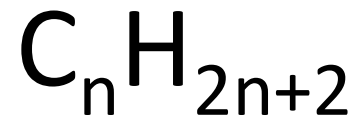
*principali costituenti
del petrolio*



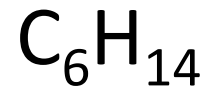
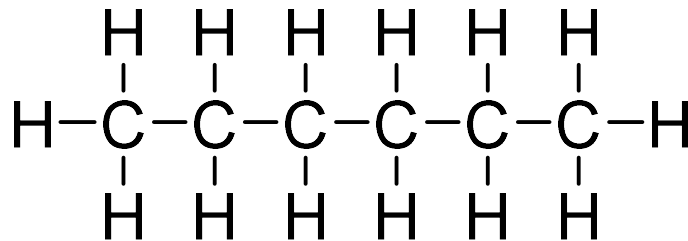
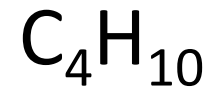
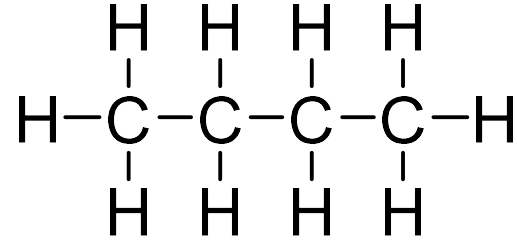
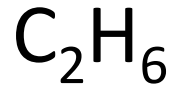
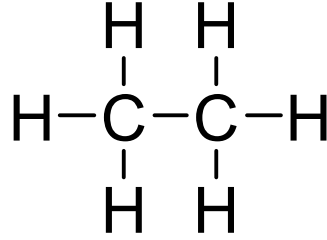
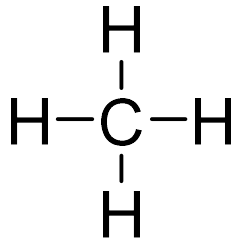
(classificazione generale)



alcani

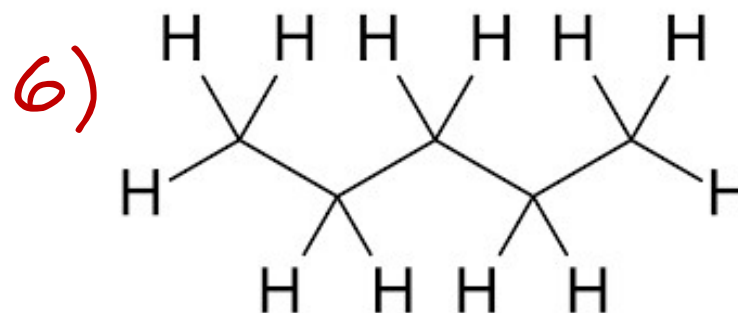
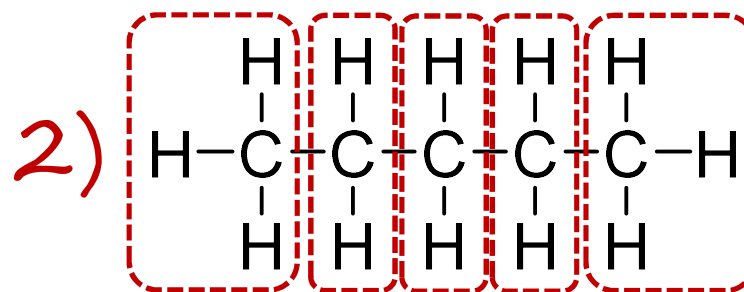
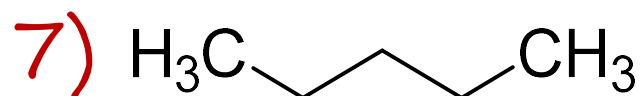
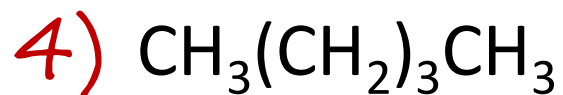
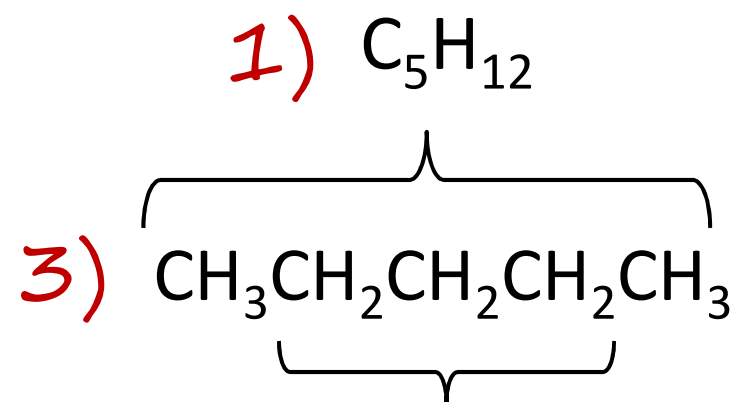


solo legami singoli

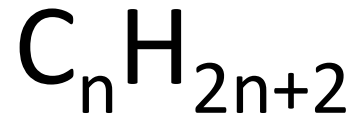


alcani

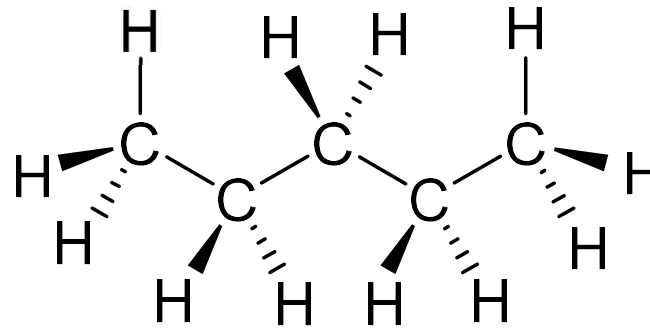
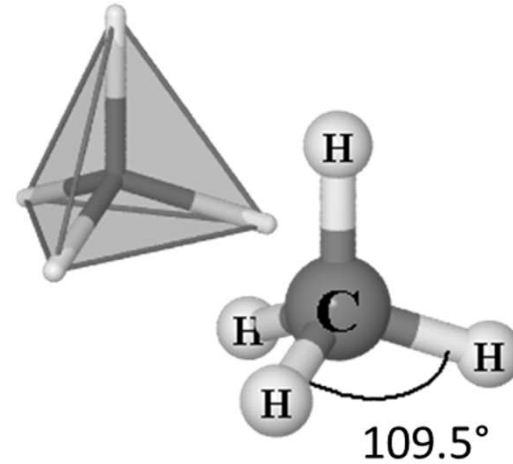
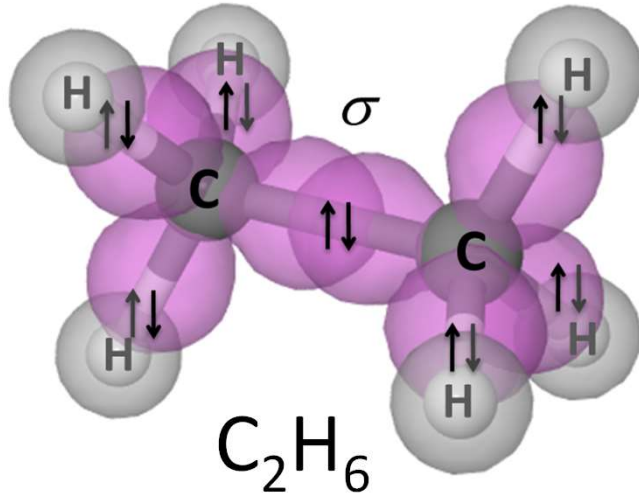
una formula, molte rappresentazioni



alcani

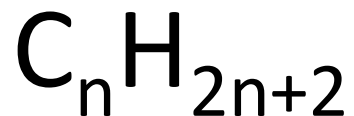


*solo carbonio sp^3
(tetraedrico)*



alcani

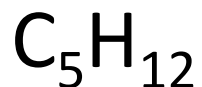
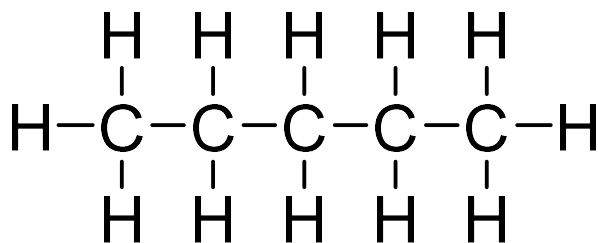
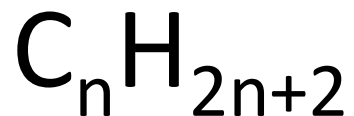
nomenclatura



(n° carboni) -ano

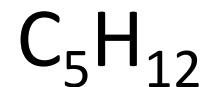
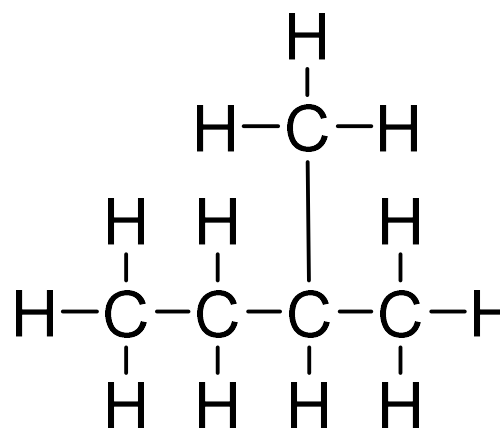
nome	n° atomi carbonio	formula	formula condensata
<i>metano</i>	1	CH ₄	CH ₄
<i>etano</i>	2	C ₂ H ₆	CH ₃ CH ₃
<i>propano</i>	3	C ₃ H ₈	CH ₃ CH ₂ CH ₃
<i>butano</i>	4	C ₄ H ₁₀	CH ₃ CH ₂ CH ₂ CH ₃
<i>pentano</i>	5	C ₅ H ₁₂	CH ₃ CH ₂ CH ₂ CH ₂ CH ₃
<i>esano</i>	6	C ₆ H ₁₄	CH ₃ (CH ₂) ₄ CH ₃
<i>eptano</i>	7	C ₇ H ₁₆	CH ₃ (CH ₂) ₅ CH ₃

alcani



pentano
(n-pentano)

alcani a
catena **lineare**

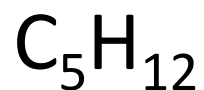
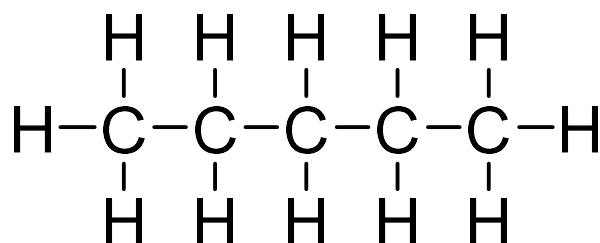
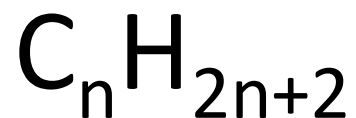


pentano
(iso-pentano)

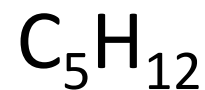
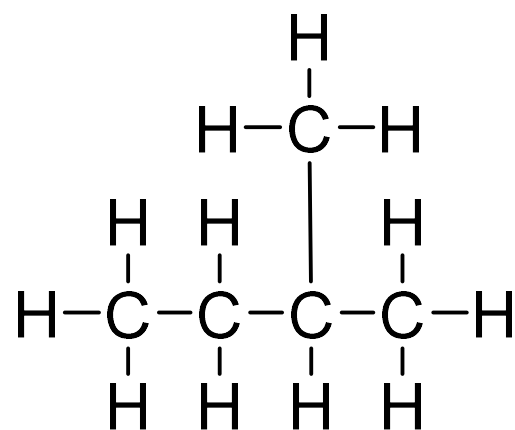
alcani a
catena **ramificata**

?

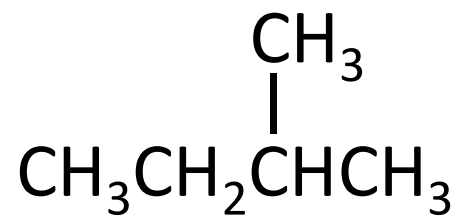
alcani



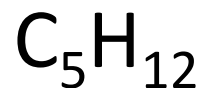
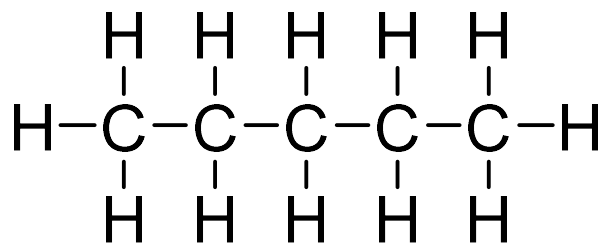
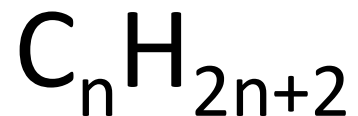
n-pentano



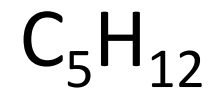
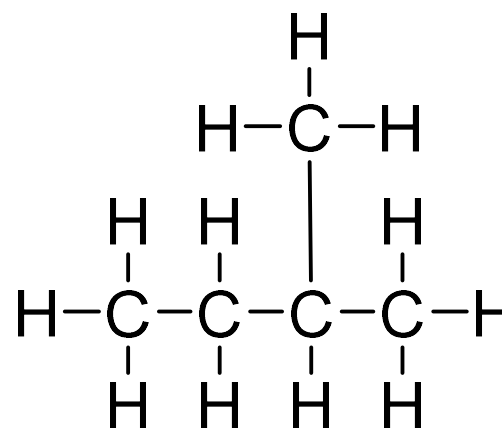
iso-pentano



alcani



n-pentano

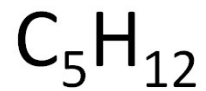
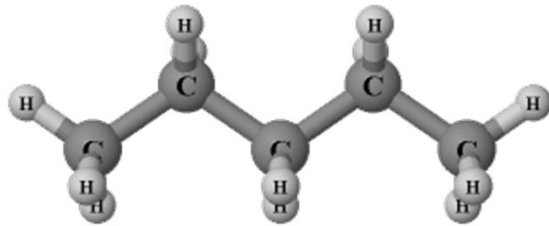
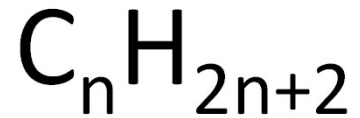


iso-pentano

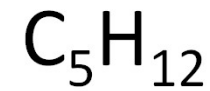
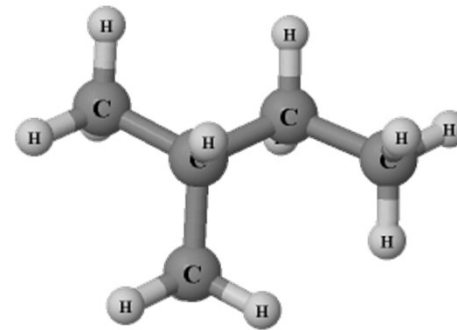
isomeri strutturali

*stessa composizione
ma forma diversa*

alcani



n-pentano

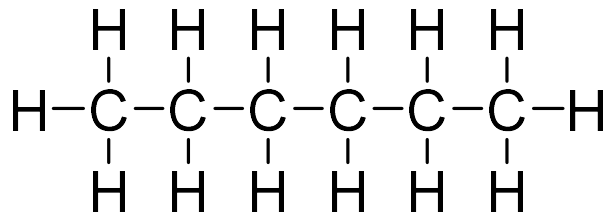
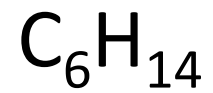


iso-pentano

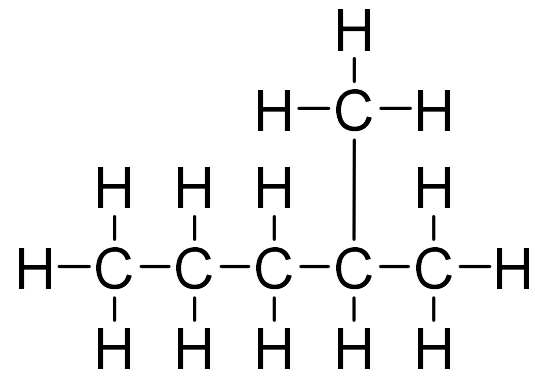
isomeri strutturali

*stessa composizione
ma forma diversa*

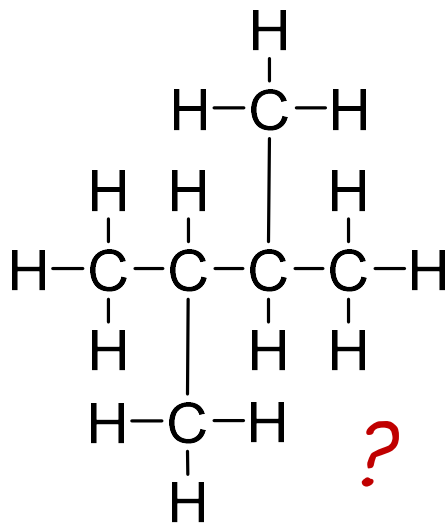
alcani



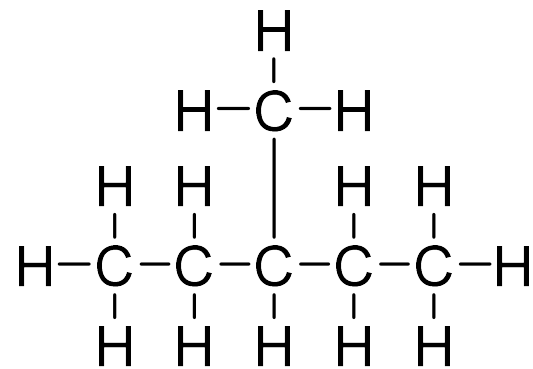
n-esano



iso-esano?

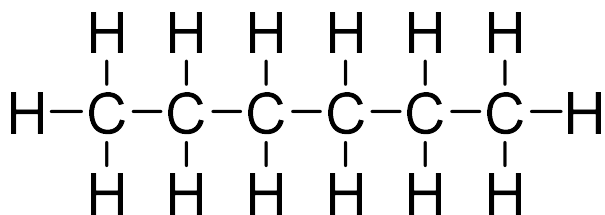
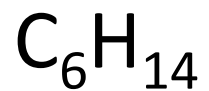


?



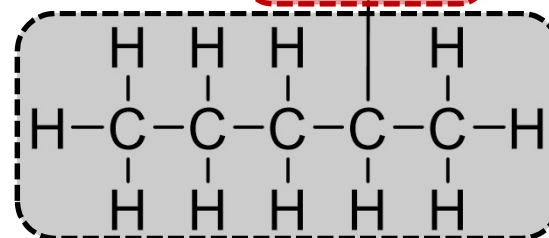
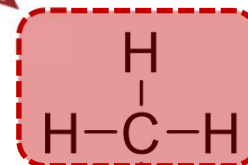
?

alcani



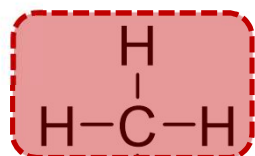
n-esano

*gruppo
laterale*

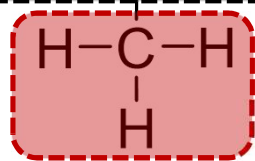
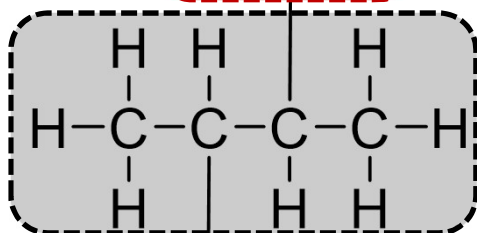


catena principale

*gruppo
laterale*

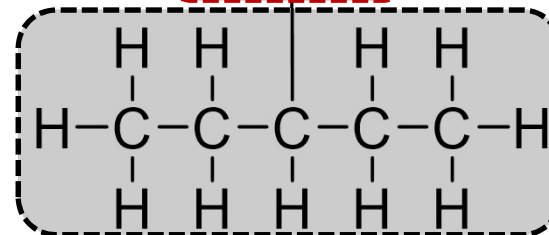
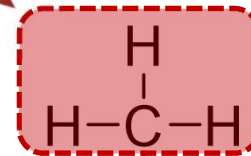


*catena
principale*



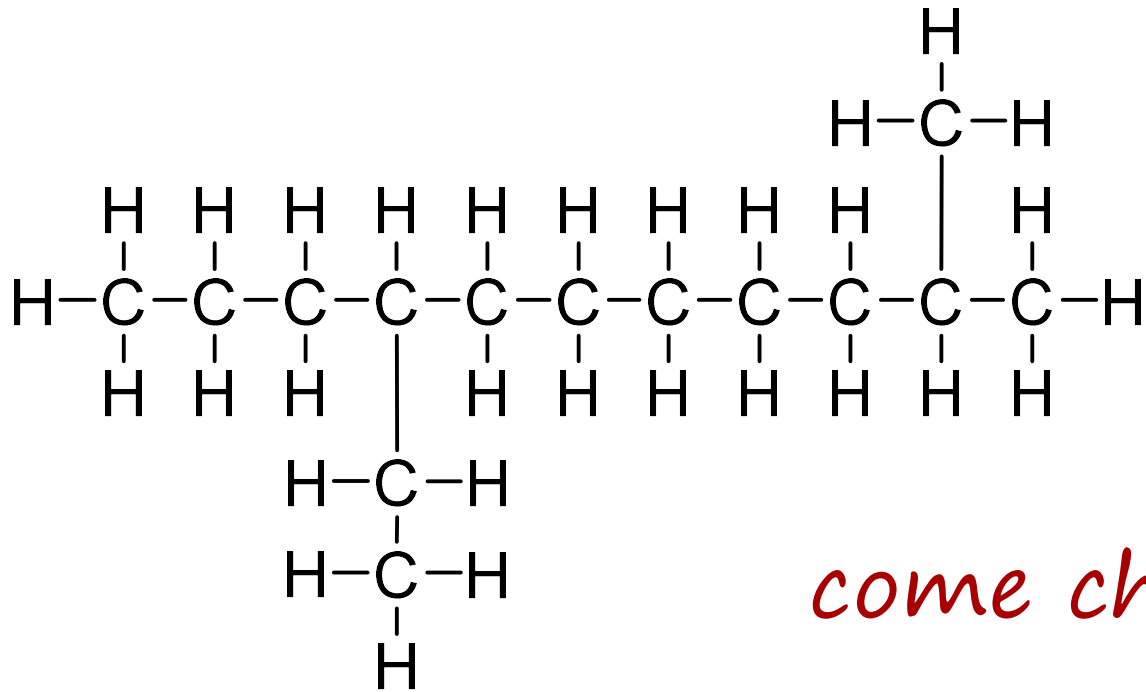
*gruppo
laterale*

*gruppo
laterale*

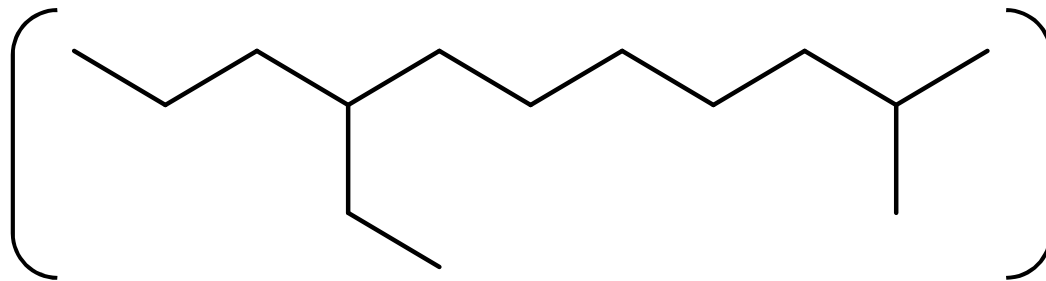


catena principale

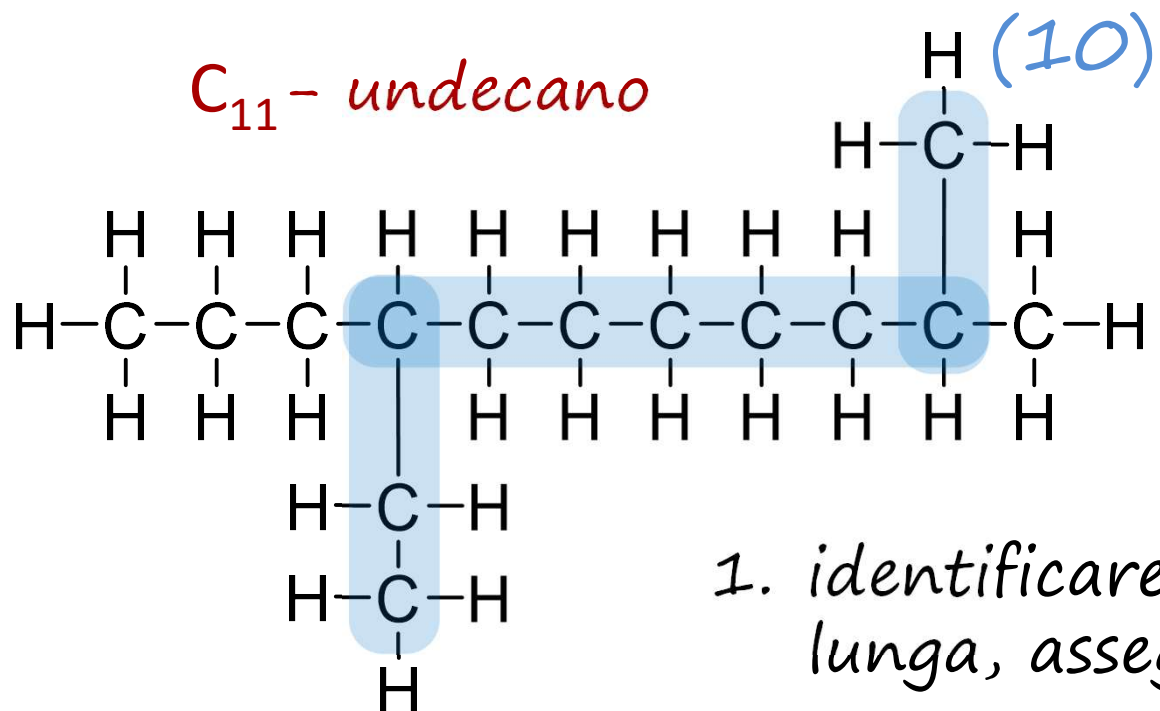
alcani



come chiamarlo?

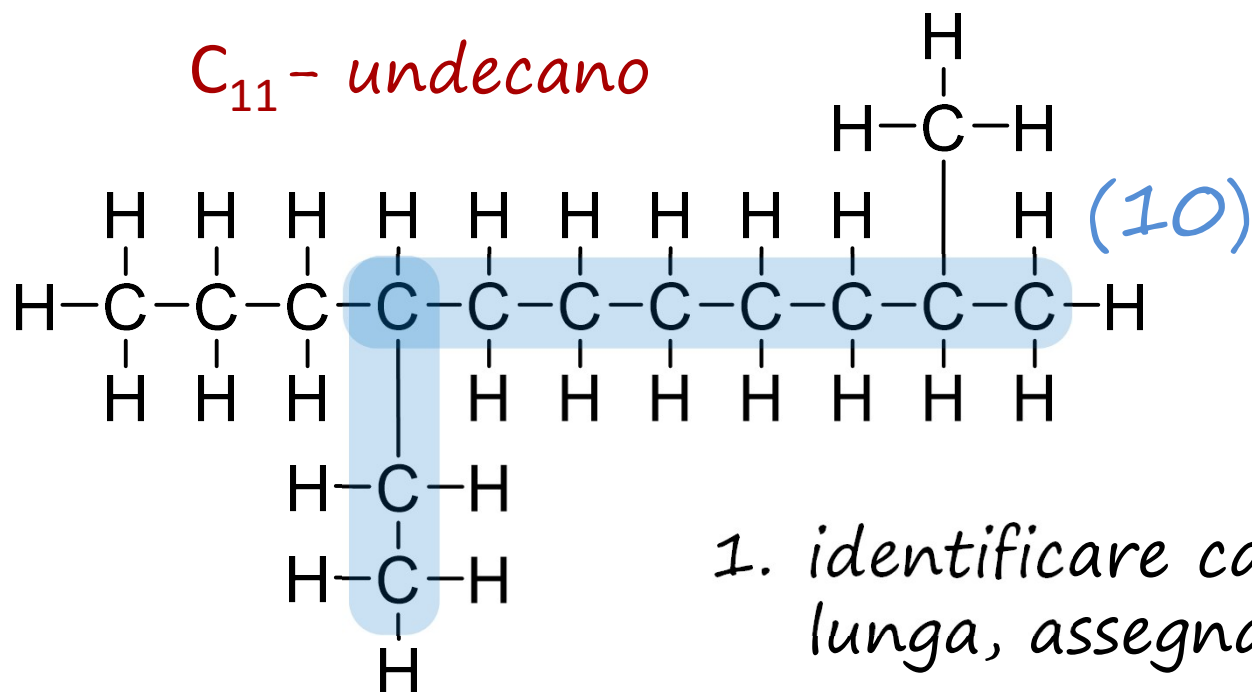


alcani

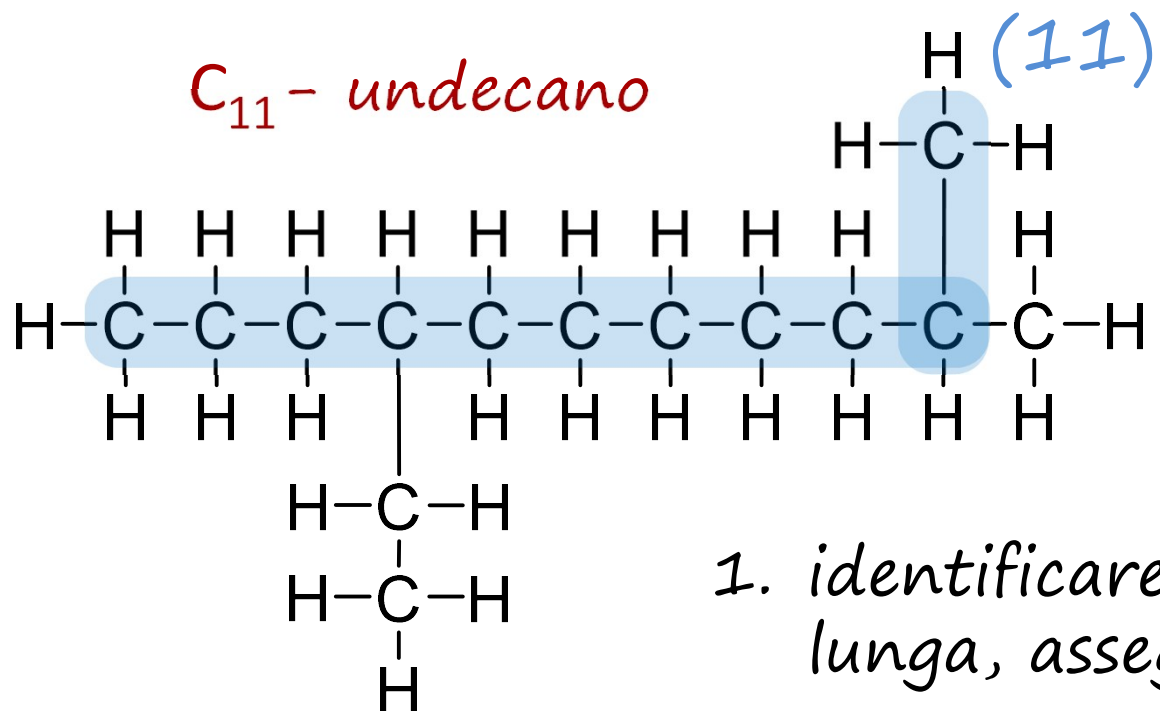


1. identificare catena più lunga, assegnare il nome

alcani

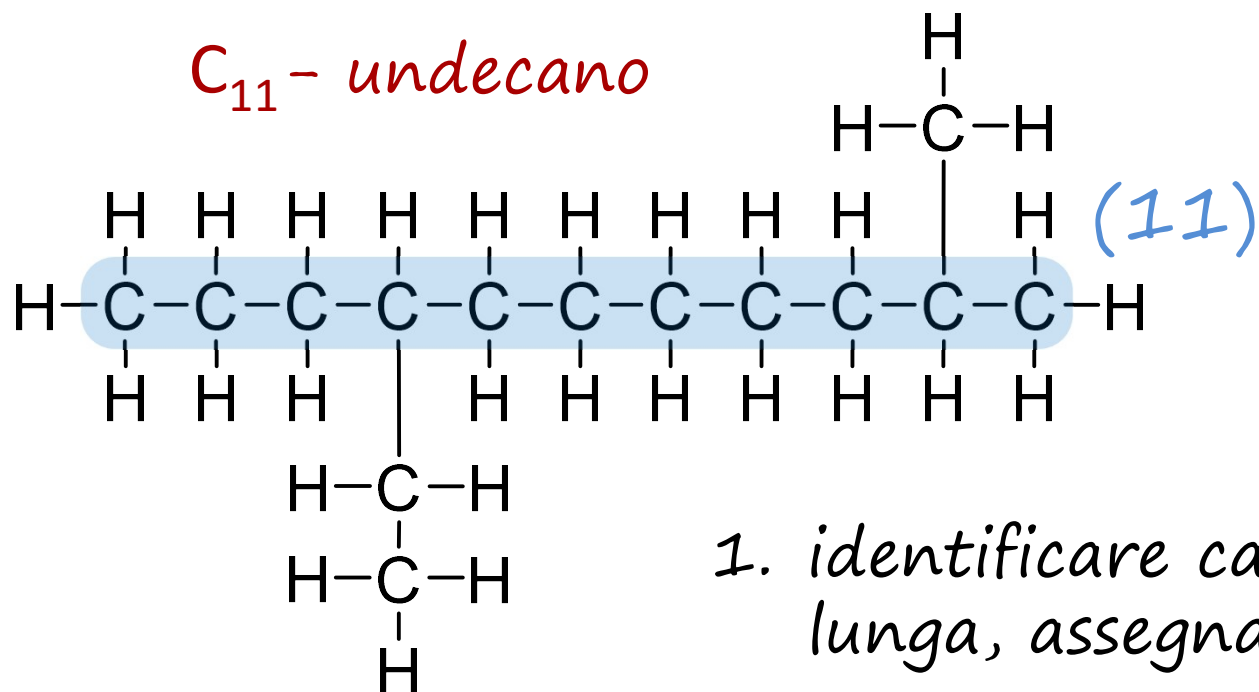


alcani



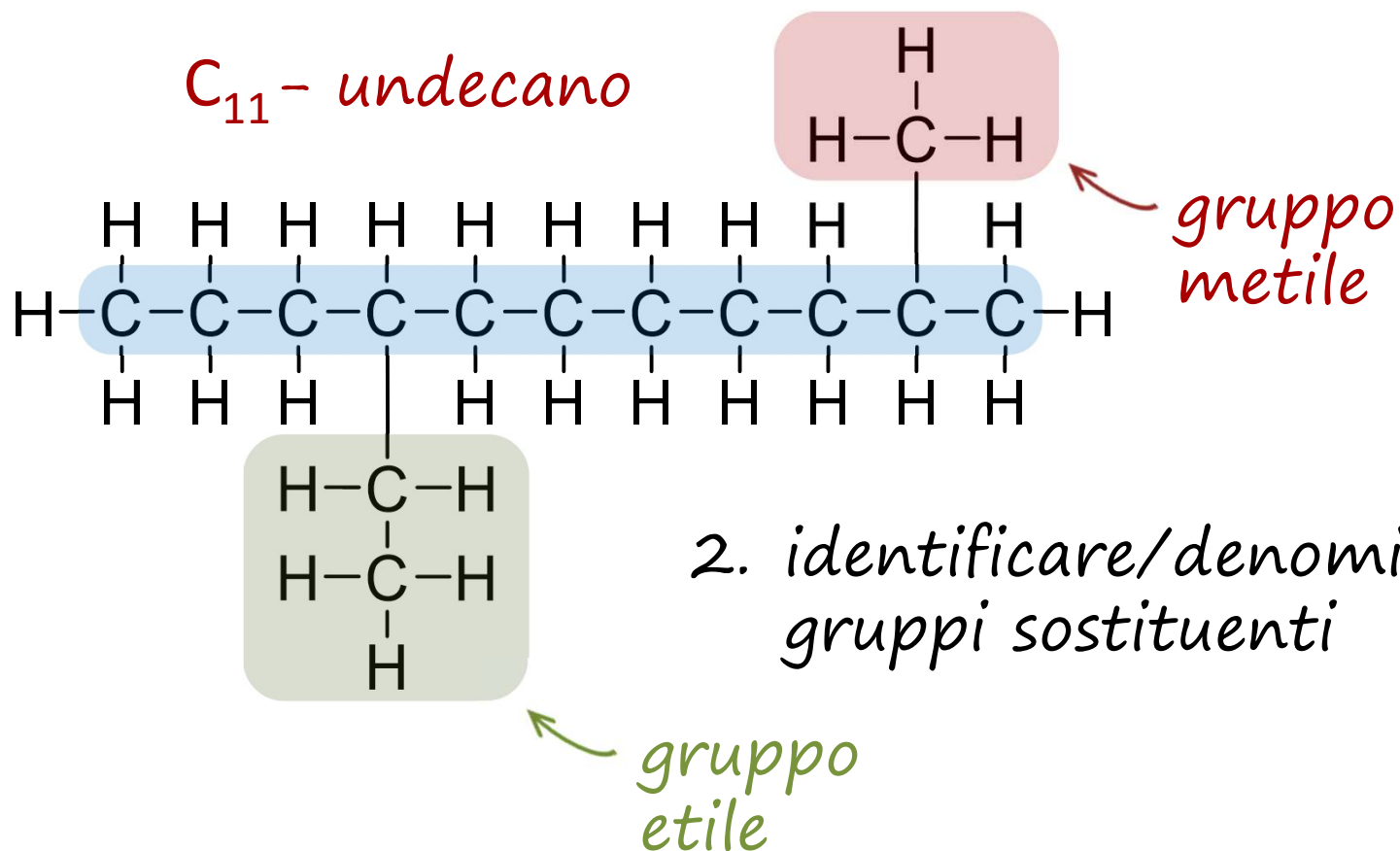
1. identificare catena più lunga, assegnare il nome

alcani

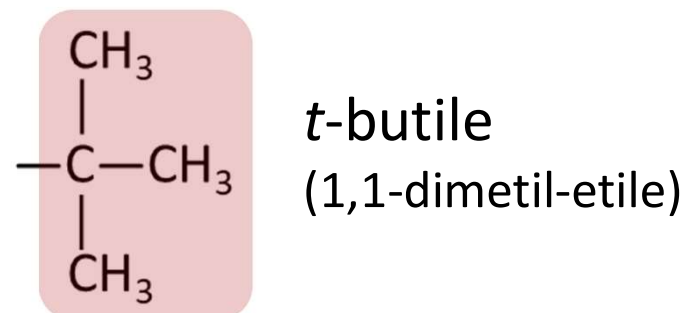
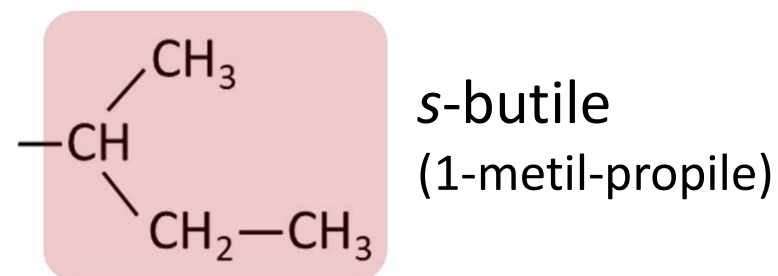
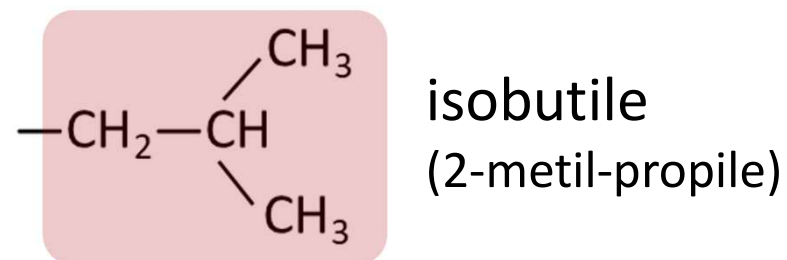
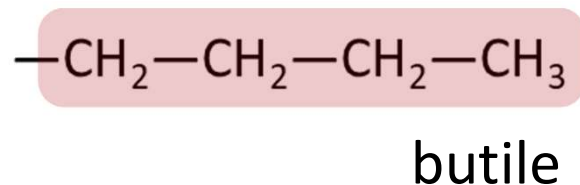
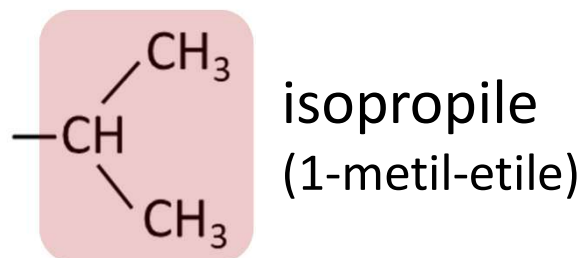
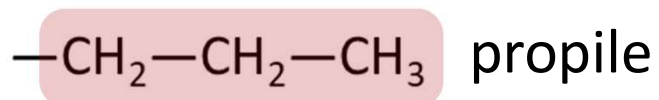
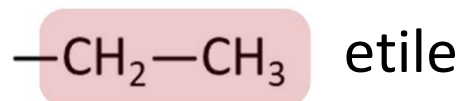


1. identificare catena più lunga, assegnare il nome

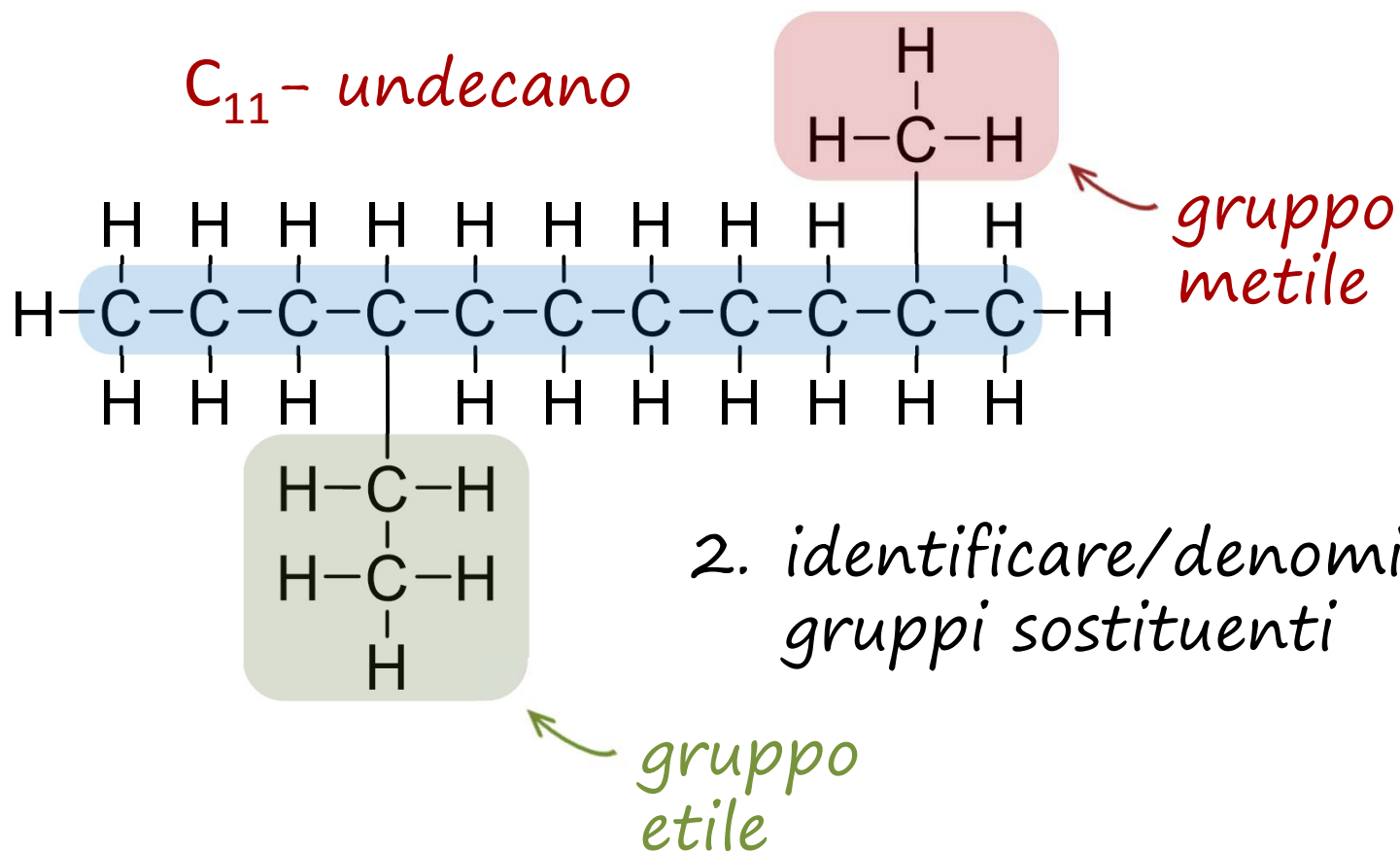
alcani



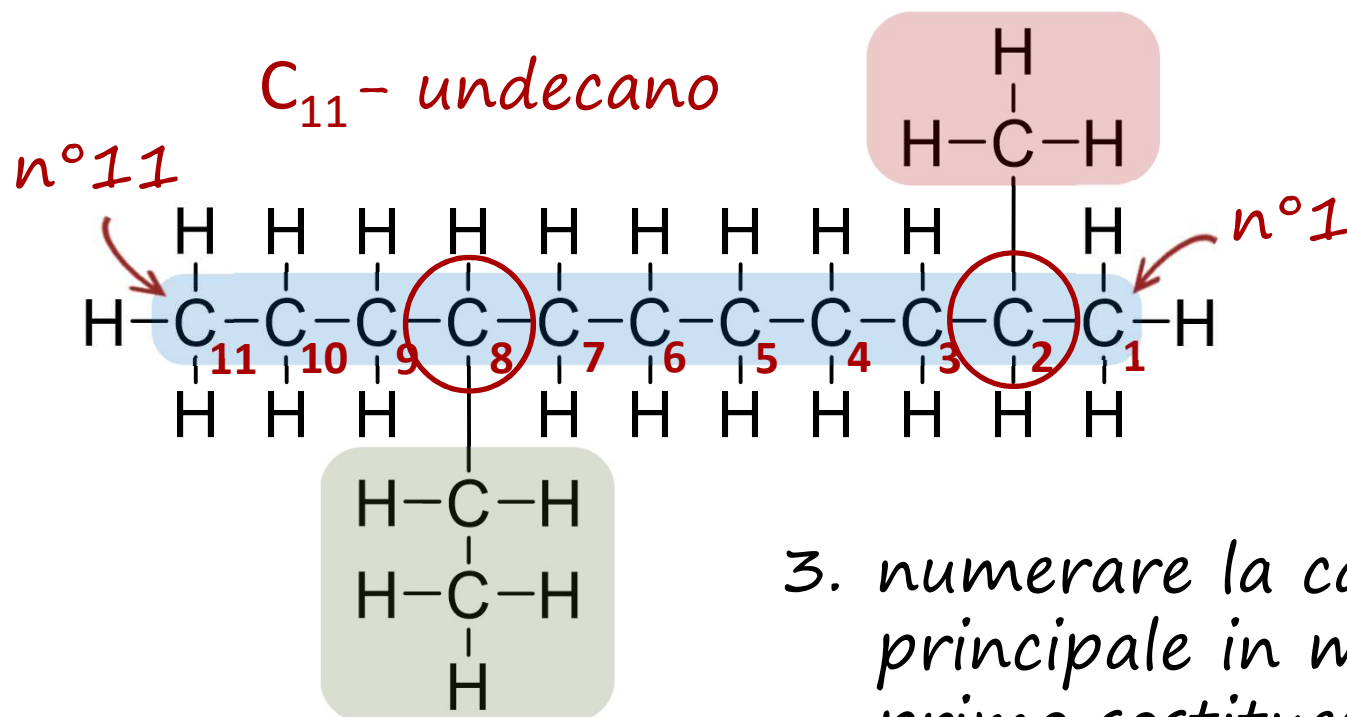
gruppi alchilici



alcani

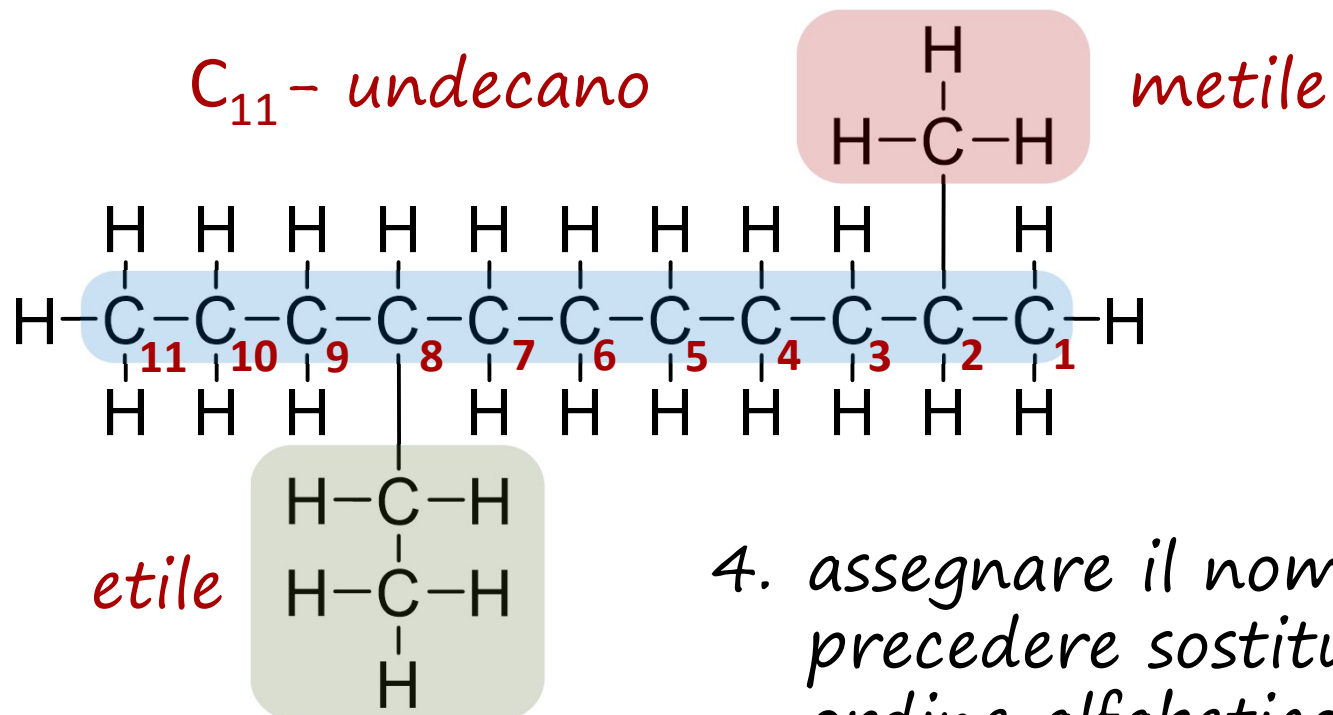


alcani



3. numerare la catena principale in modo che il primo sostituito abbia il numero più basso

alcani



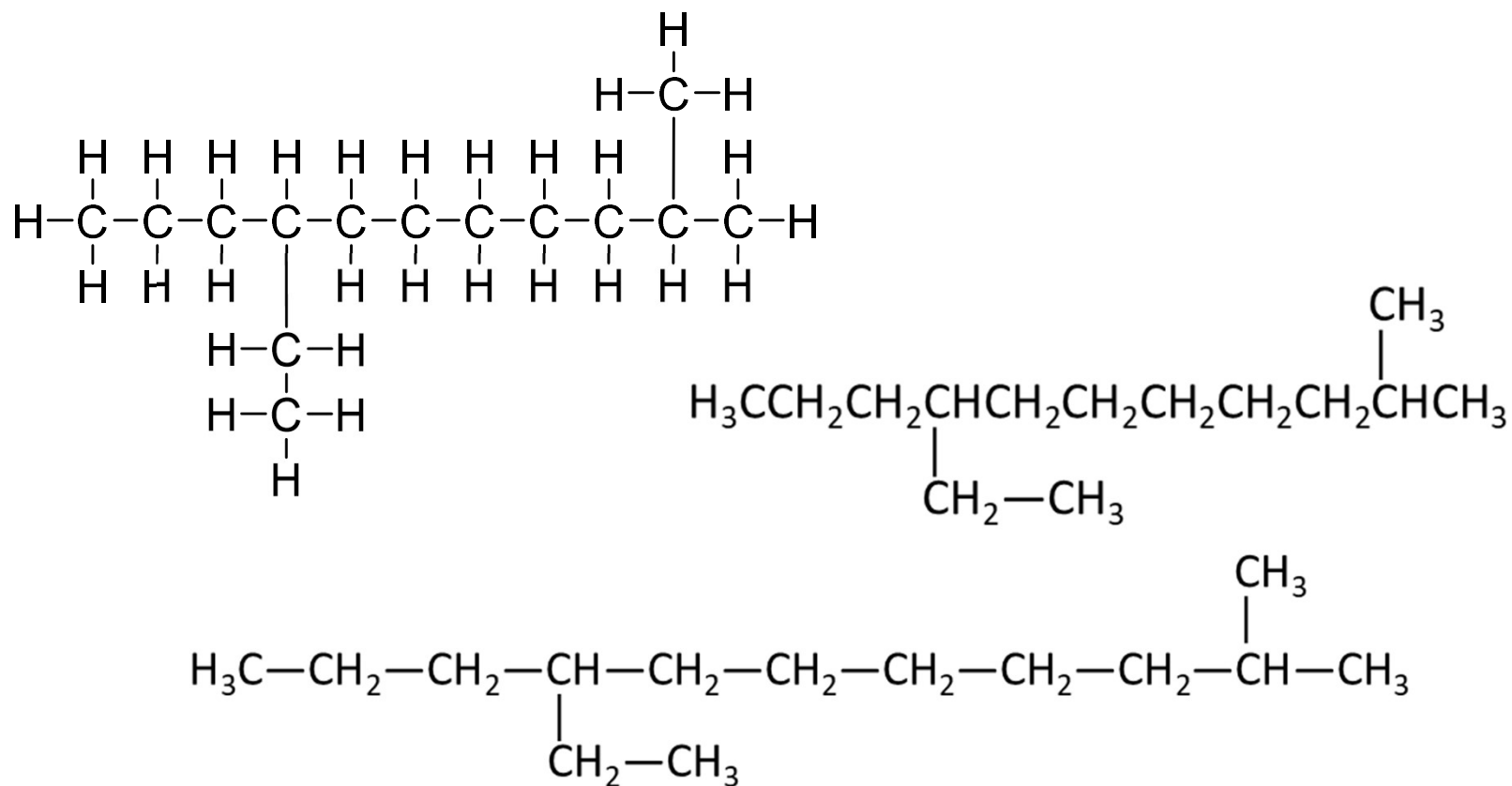
8 - etil - 2 - metil - undecano

posizione
sostituente

nome
sostituente
(senza ultima lettera)

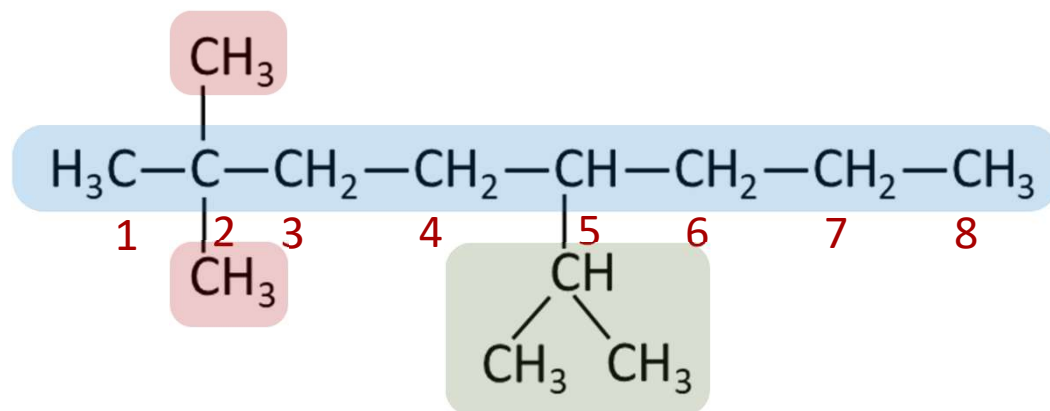
nome catena
principale

alcani



8 - etil - 2 - metil - undecano

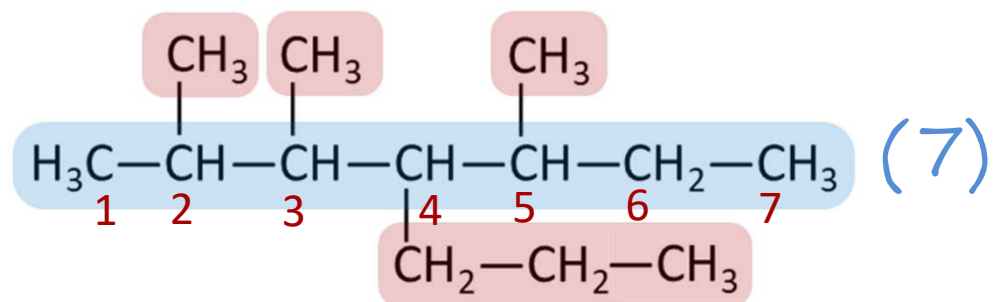
alcani



5-isopropil-2,2-*dimetil*-ottano

se più gruppi alchilici identici, usare prefissi di-, tri-, etc. indicando le posizioni con numeri (il prefisso non conta ai fini dell'ordine alfabetico)

alcani

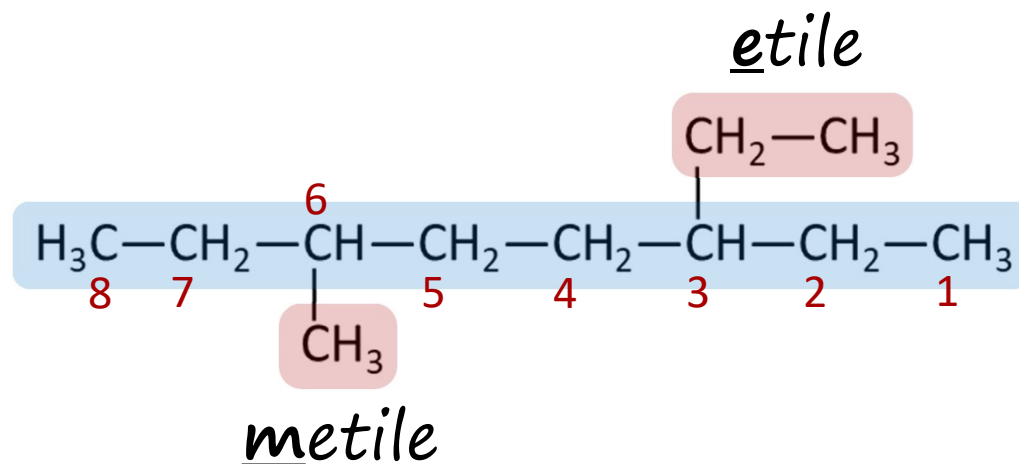


(4 sostituenti)

2,3,5-trimetil-4-propil-eptano

*se più catene di uguale lunghezza,
scegliere quella con più sostituenti*

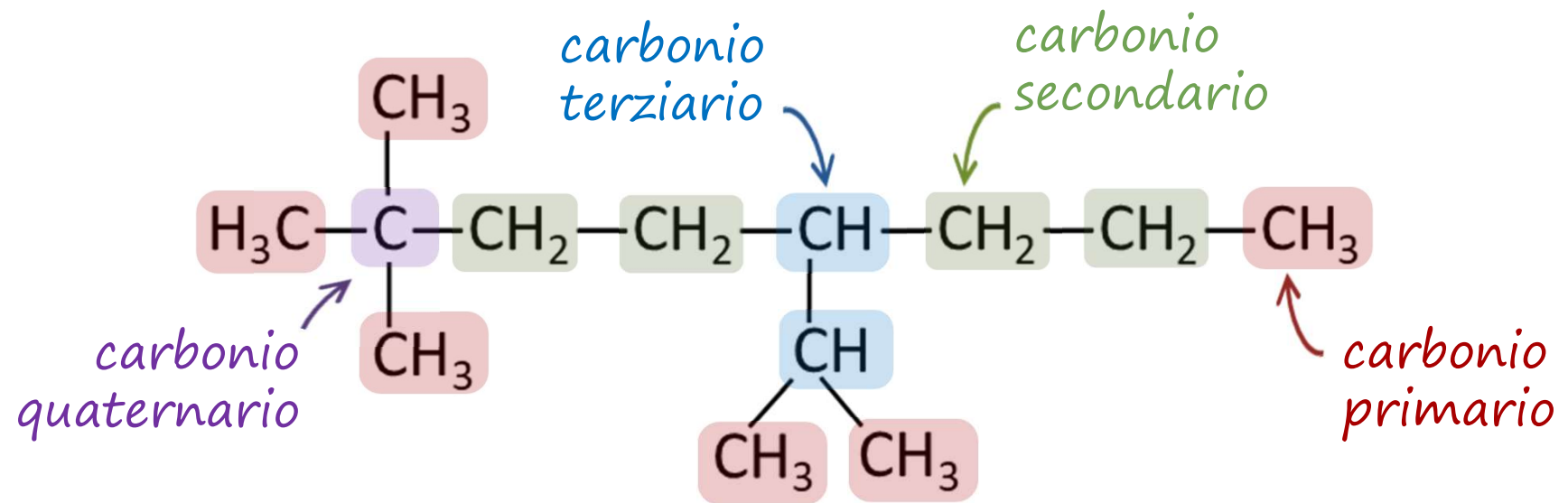
alcani



3-etil-6-metil-ottano

*se più sostituenti in posizioni equidistanti
da fine catena, precedenza numerazione
per ordine alfabetico*

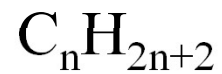
alcani



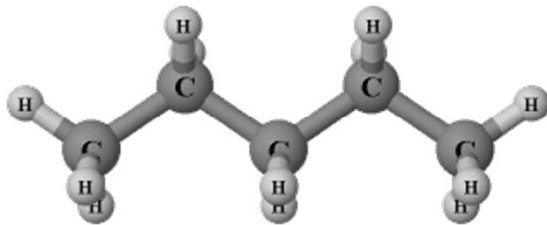
classificazione carbonio a seconda
di quanti altri carboni lega

alcani

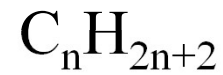
a catena lineare



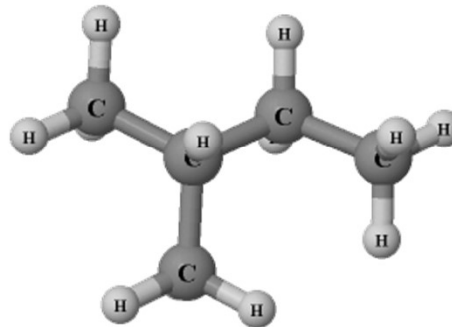
n-pentano (C_5H_{12})



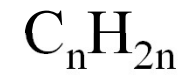
a catena ramificata



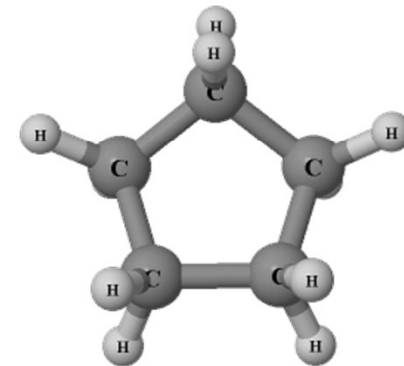
isopentano (C_5H_{12})



ciclici

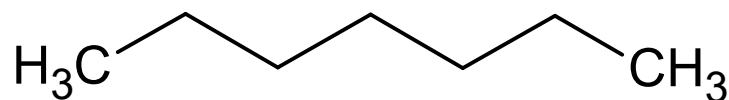
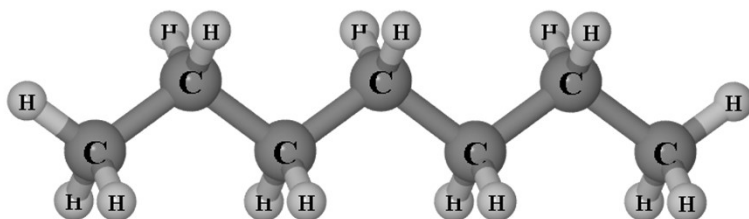
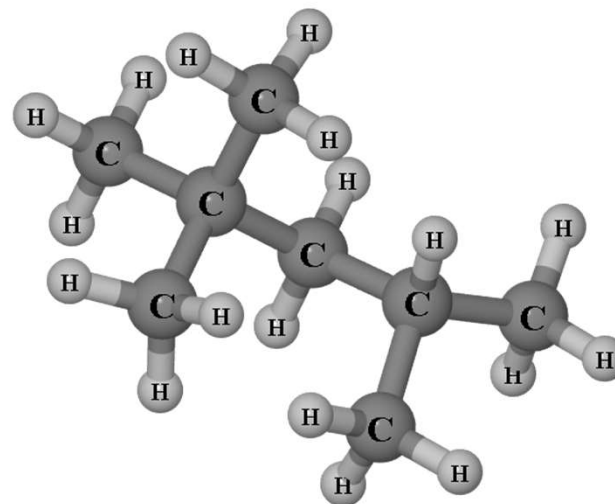


ciclopentano (C_5H_{10})

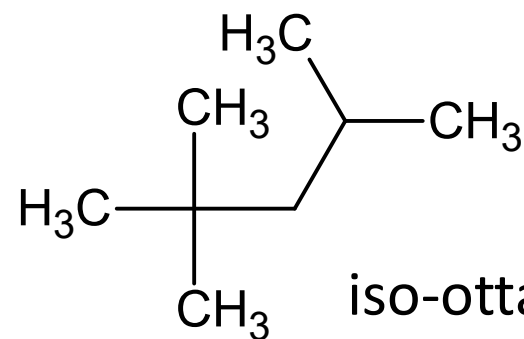


isomeri strutturali

n° di ottani

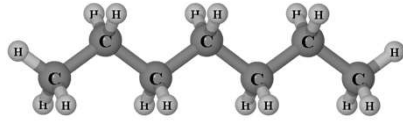


n-eptano
n° ottani = 0
(molto detonante)



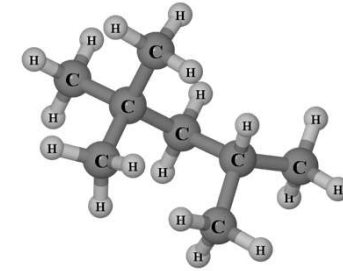
iso-ottano
n° ottani = 100
(poco detonante)

n° di ottani



N° ottani = 0
(100% n-eptano)

N° ottani = 50
(50% iso-ottano
50% n-eptano)



N° ottani = 100
(100% iso-ottano)



*campione di
benzina
(potere detonante
non noto)*

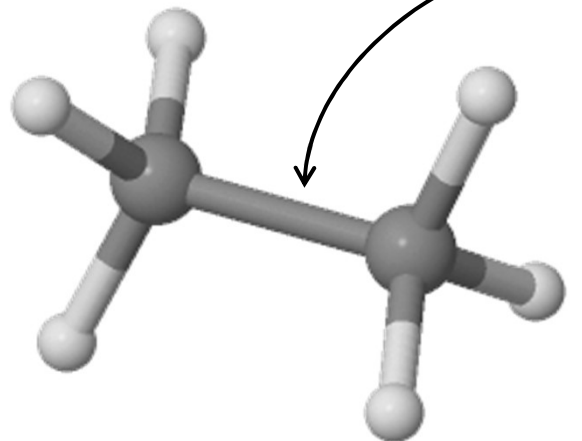
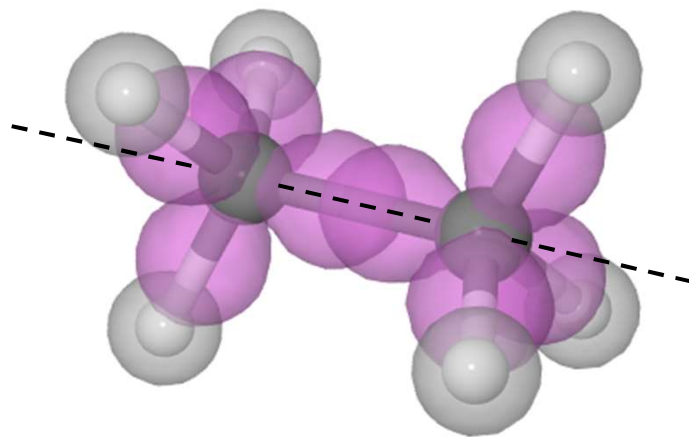


*?
=*



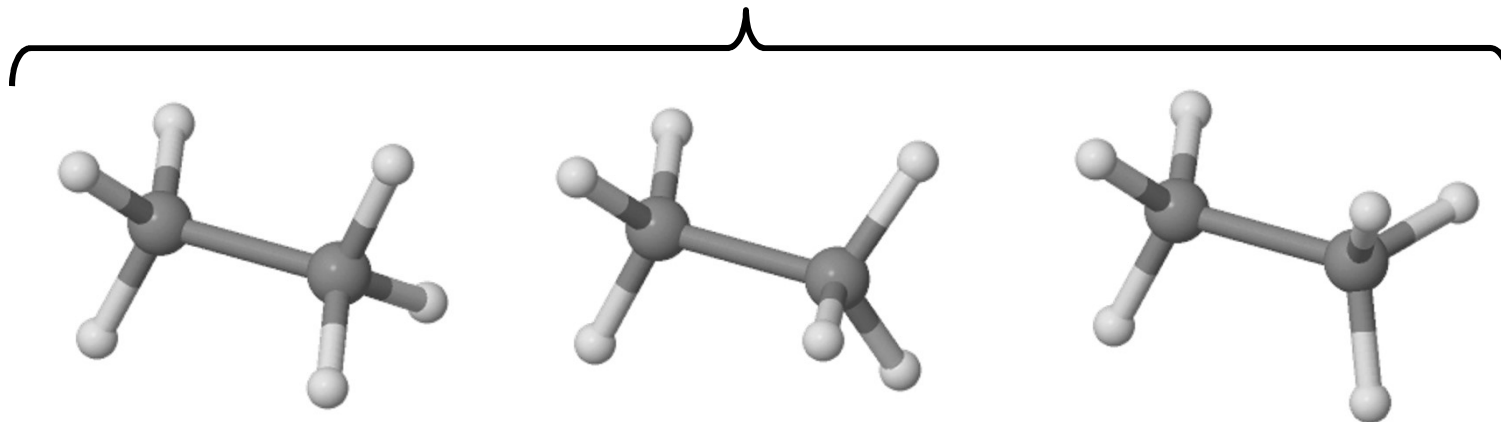
*pari a
85% ottani*

conformazione molecolare



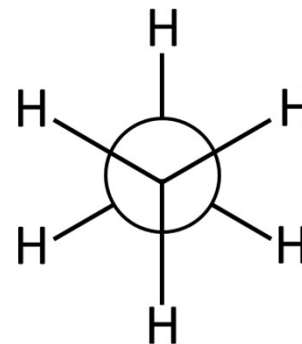
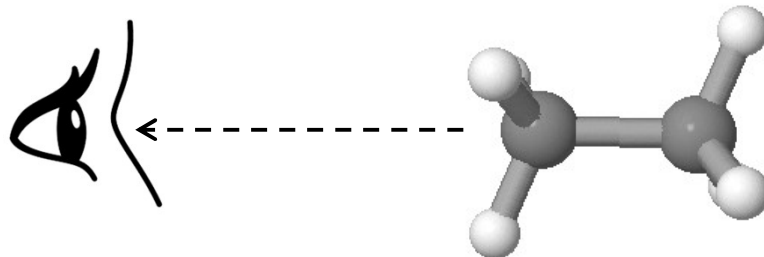
rotazione
possibile
attorno al
legame

conformeri (rotameri)

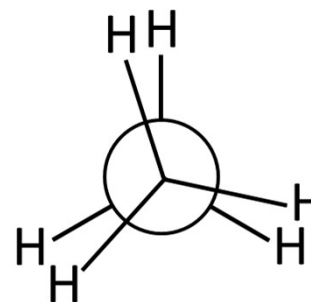
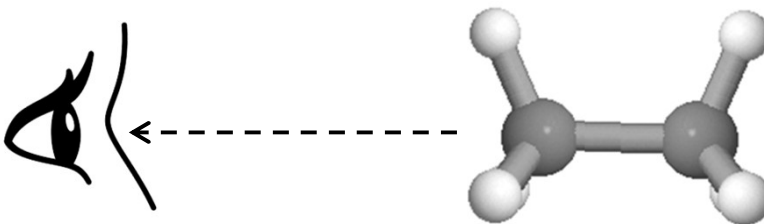


conformazione molecolare

proiezione
di Newman

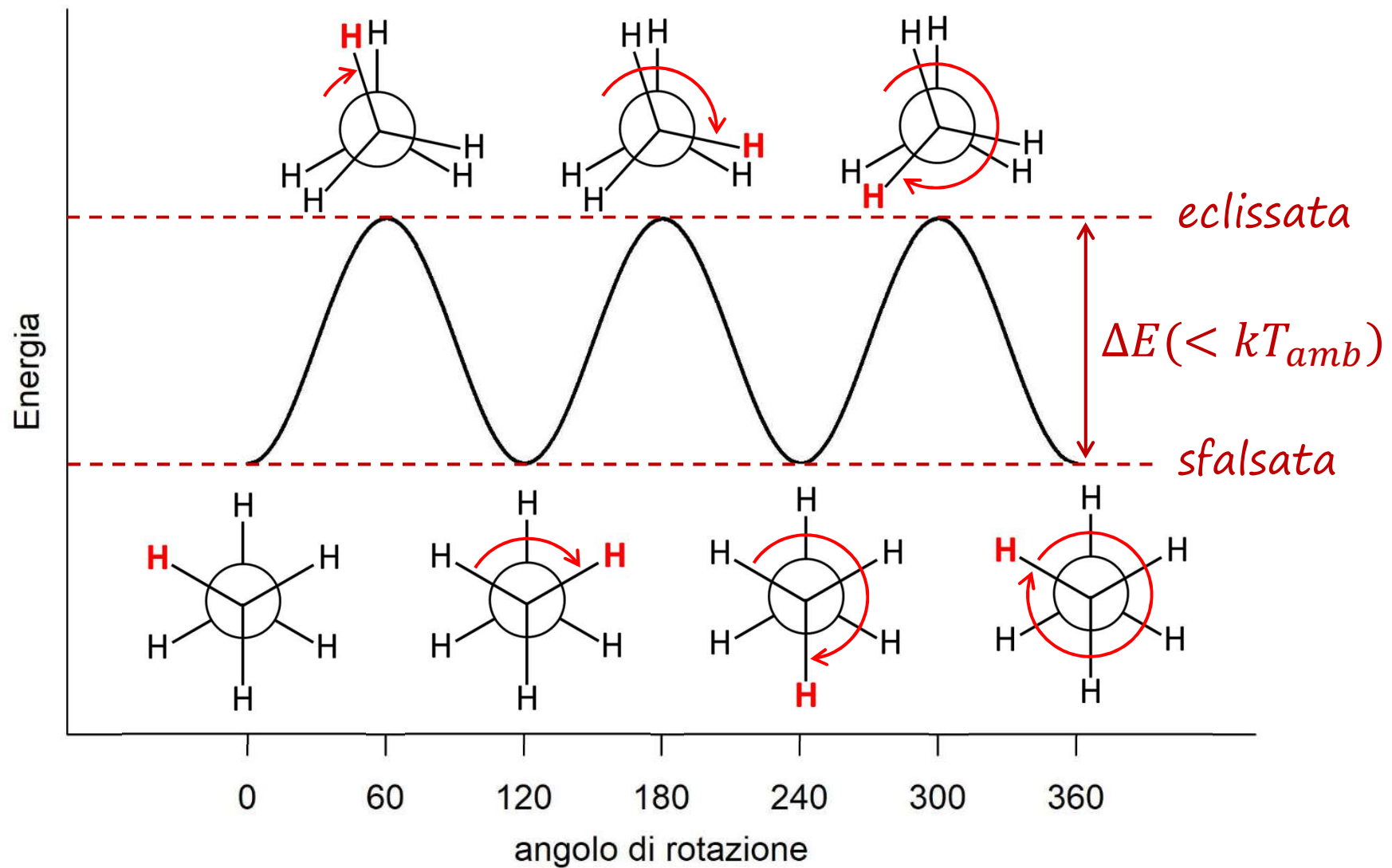


conformazione
sfalsata

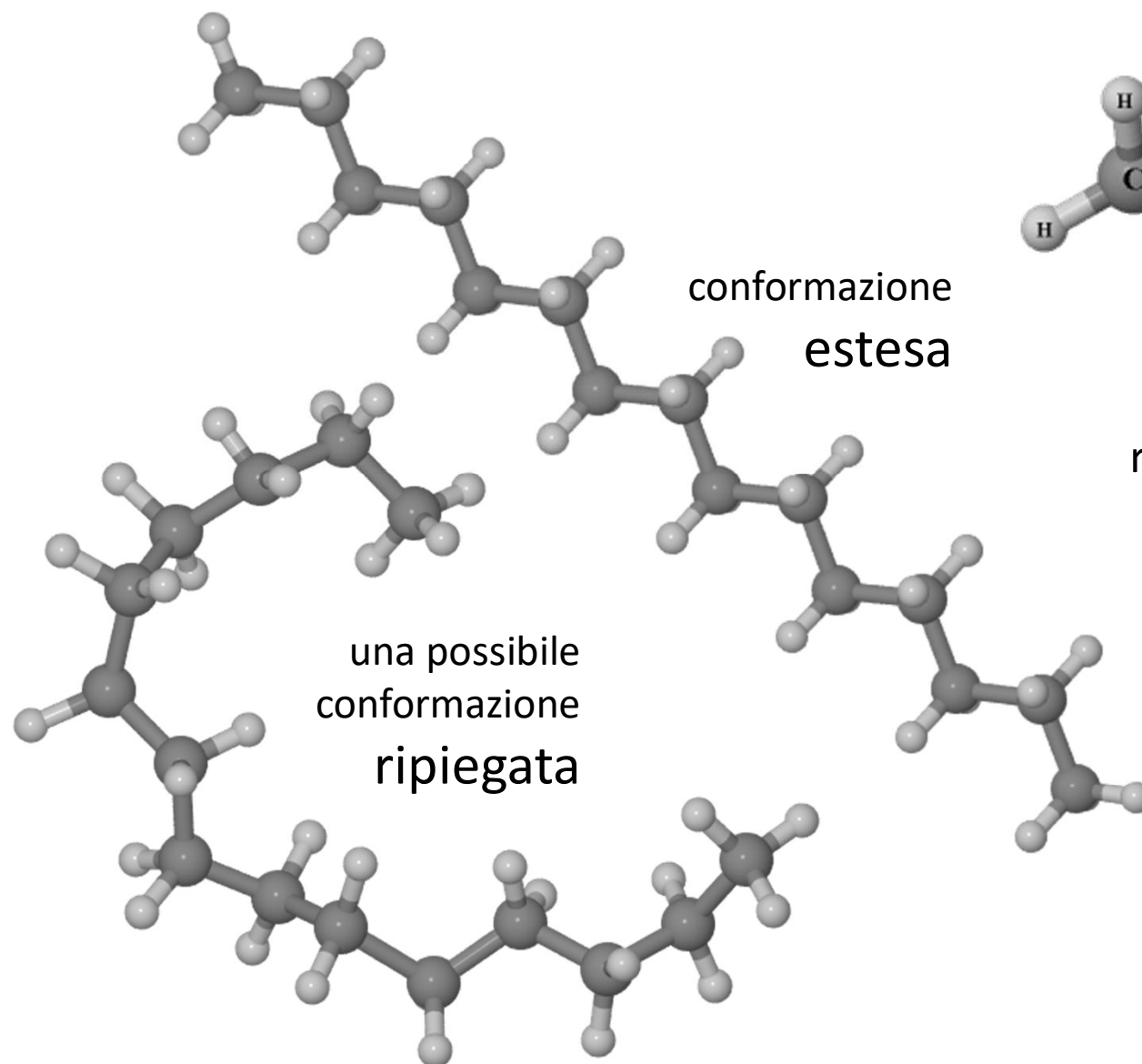


conformazione
eclissata

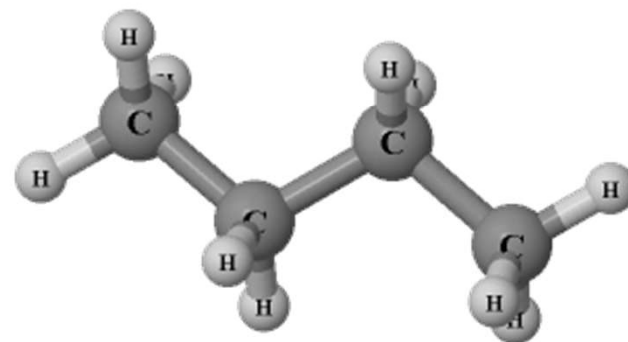
conformazione molecolare



conformazione molecolare



conformazione
estesa

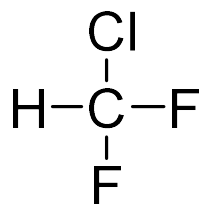


rotazione possibile
attorno C—C
(a T ambiente)

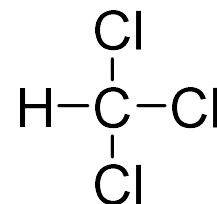
alogenuri alchilici

poco reattivi (paraffine, da parum affinum)

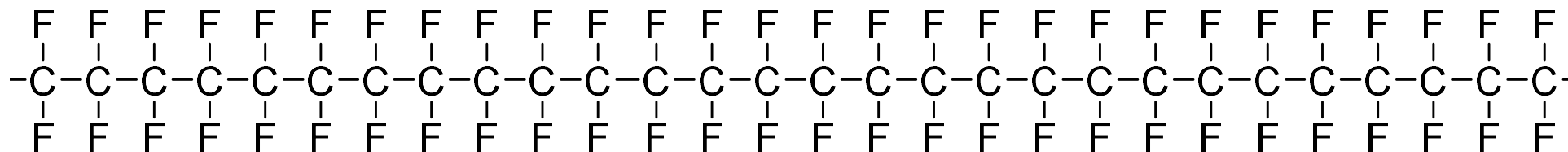
ma reagiscono in alogeni $\rightarrow$ alogenuri alchilici



freon
(cloro-difluoro-metano)



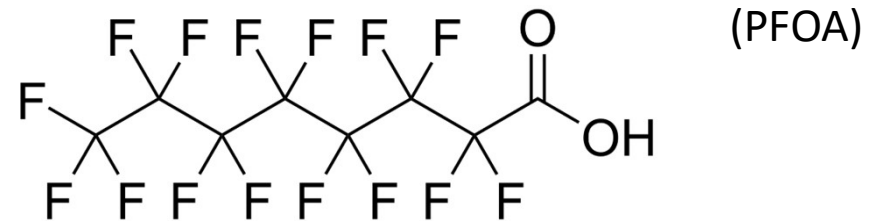
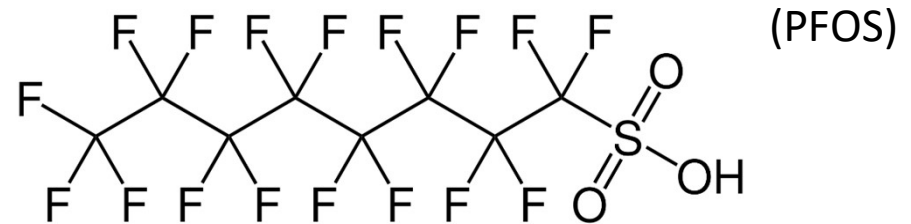
cloroformio
(tricloro-metano)



teflon
(poli-tetrafluoro-etilene)

alogenuri alchilici

PFAS (perfluoroalkyl substances)

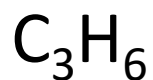
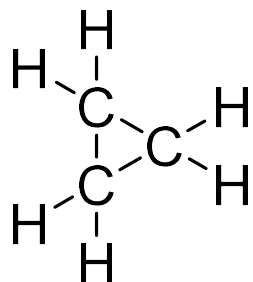


- molto usati per rendere tessuti idro-repellenti
- inquinanti persistenti
- probabilmente effetti sulla salute

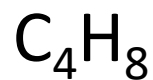
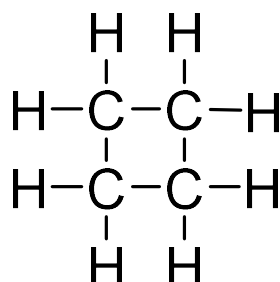
cicloalcani



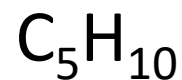
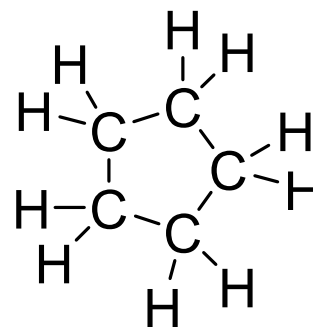
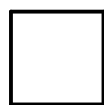
alcani ciclici



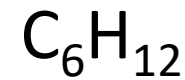
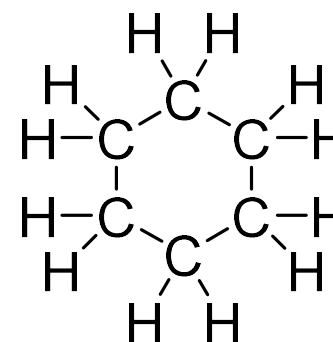
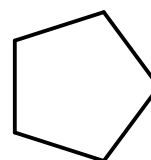
ciclopropano



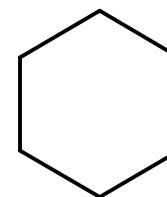
ciclobutano



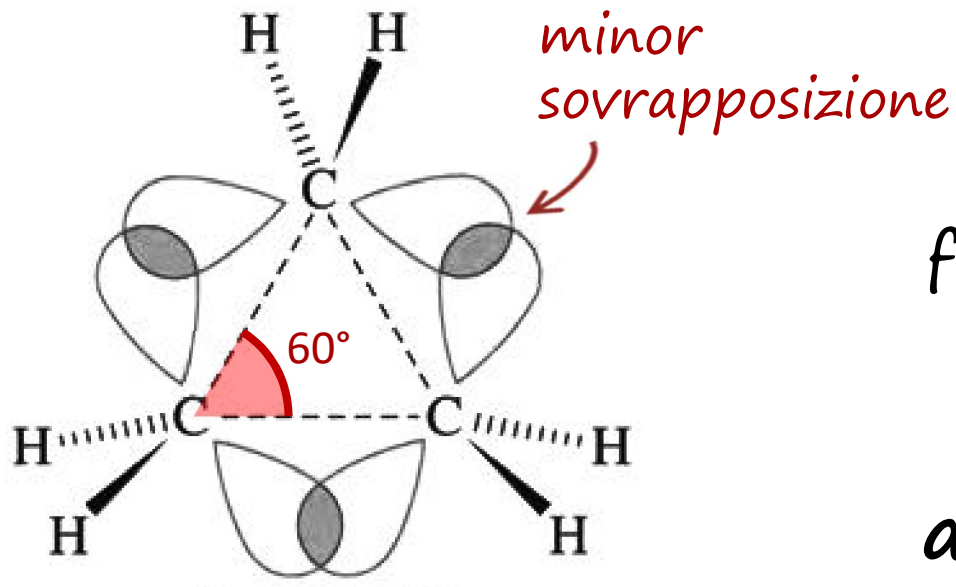
ciclopentano



cicloesano



cicloalcani

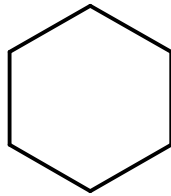
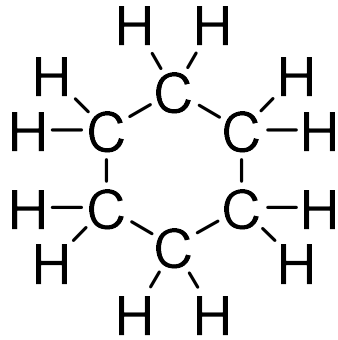


forte tensione
angolare
=
alta reattività

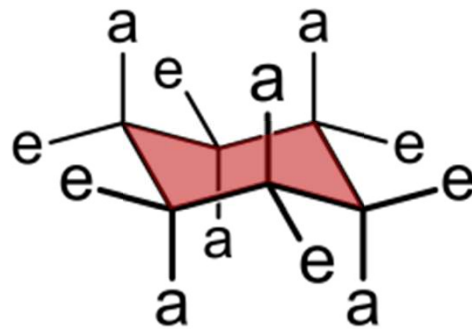
angoli di legame $< 109.5^\circ$
(C tetraedrico)

cicloalcani

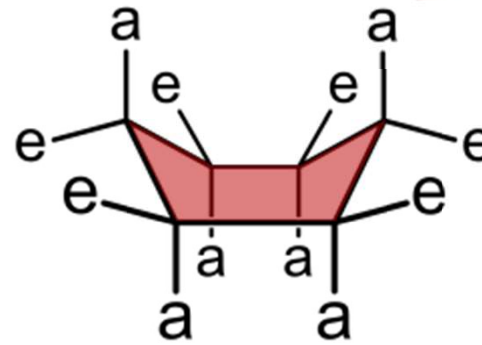
conformazioni per il cicloesano



*molecola
non planare*



sedia

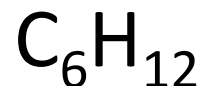
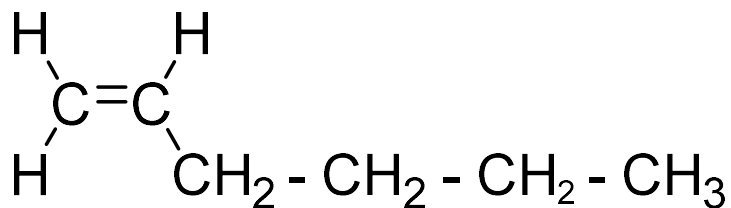
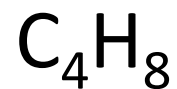
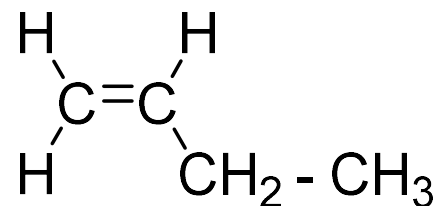
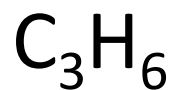
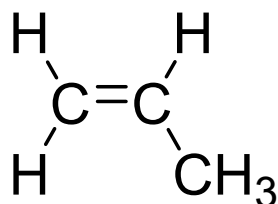
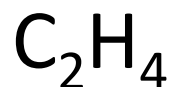
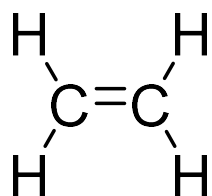


barca

*posizione
assiale*

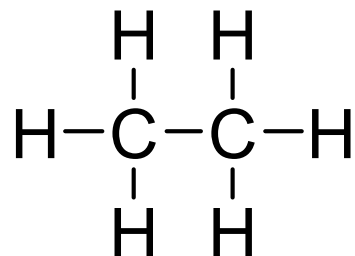
*posizione
equatoriale*

alcheni



alcheni

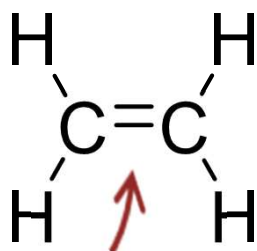
alcani



idrocarburi *saturi*

(i carboni sono saturi di H, non è più possibile aggiungere altri H)

alcheni



insaturazione

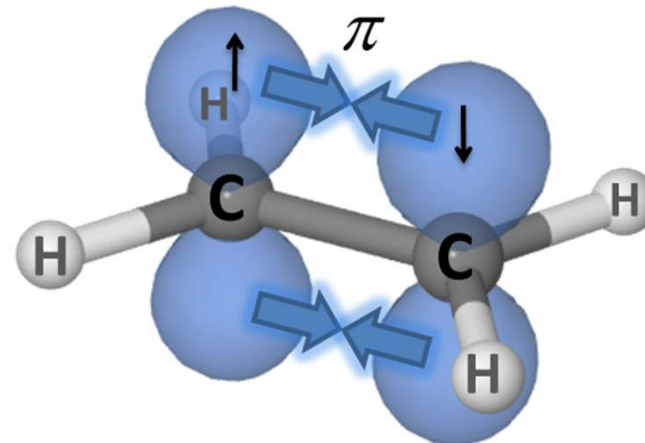
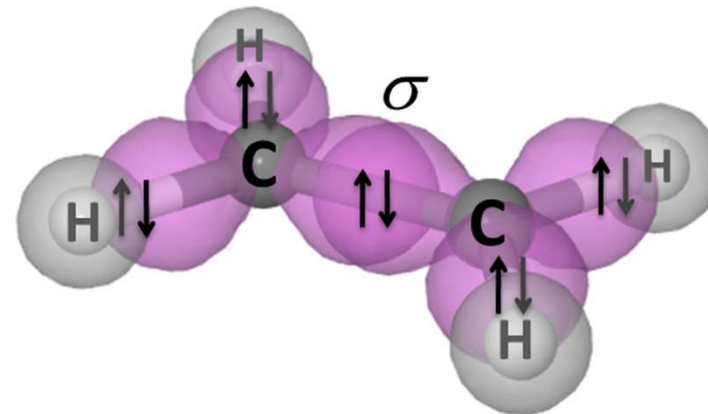
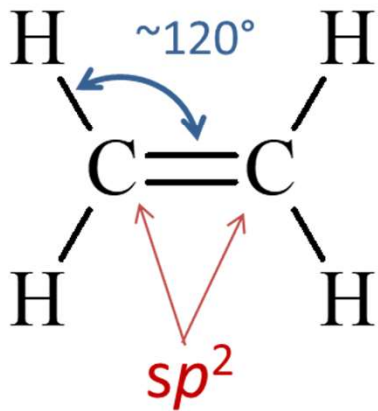
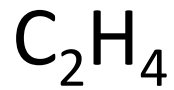
idrocarburi *insaturi*

(alcuni carboni sono insaturi di H, è possibile aggiungerne altri)

alcheni

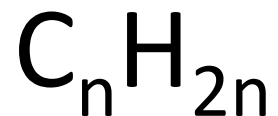


*anche carbonio sp^2
(trigonale planare)*



alcheni

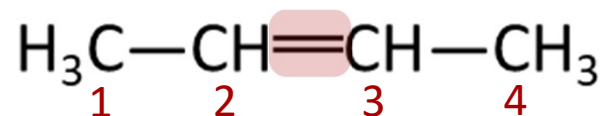
nomenclatura



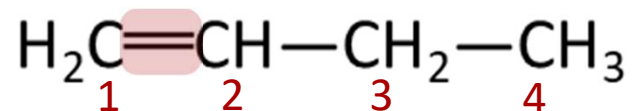
(n° carboni) -ene

nome	n° atomi carbonio	formula	formula condensata
<i>etene</i>	2	C_2H_4	$\text{CH}_2=\text{CH}_2$
<i>propene</i>	3	C_3H_6	$\text{CH}_2=\text{CHCH}_3$
<i>butene</i>	4	C_4H_8	$\text{CH}_2=\text{CHCH}_2\text{CH}_3$
<i>pentene</i>	5	C_5H_{10}	$\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{CH}_3$
<i>esene</i>	6	C_6H_{12}	$\text{CH}_2=\text{CH}(\text{CH}_2)_3\text{CH}_3$
<i>eptene</i>	7	C_7H_{14}	$\text{CH}_2=\text{CH}(\text{CH}_2)_4\text{CH}_3$

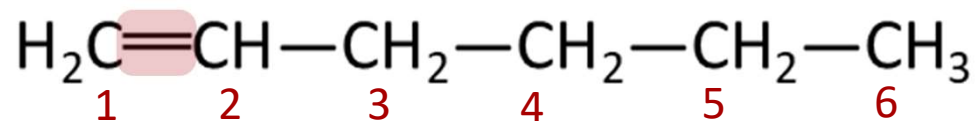
alcheni



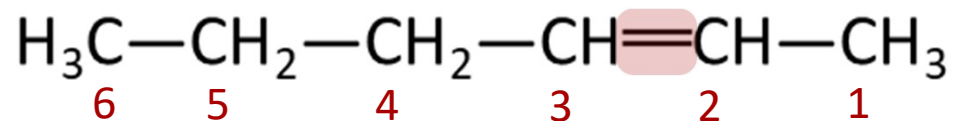
2-butene



1-butene

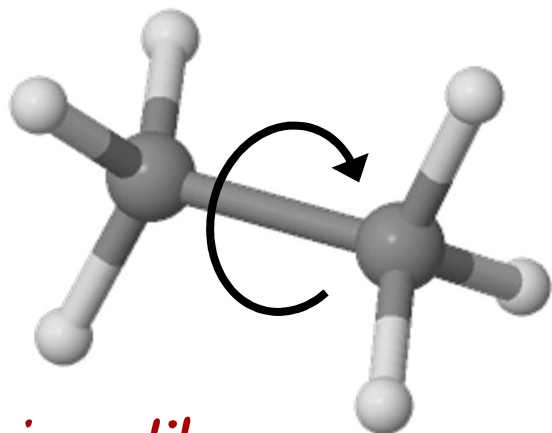


1-esene

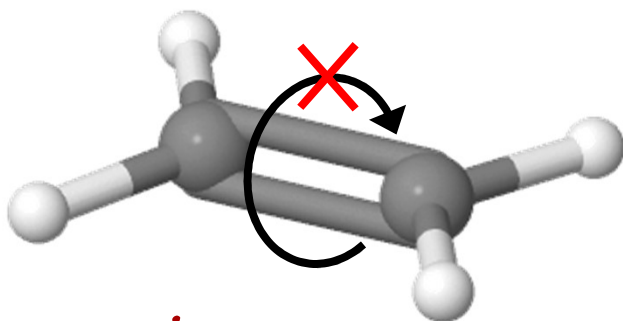


2-esene

alcheni

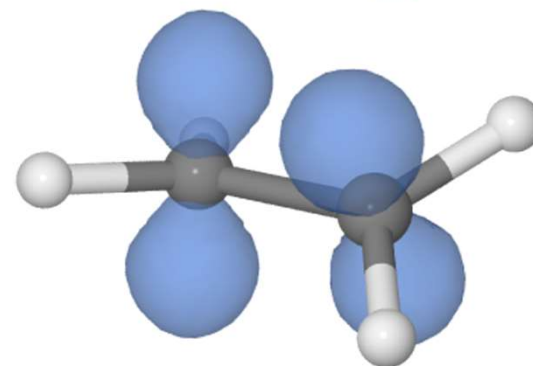
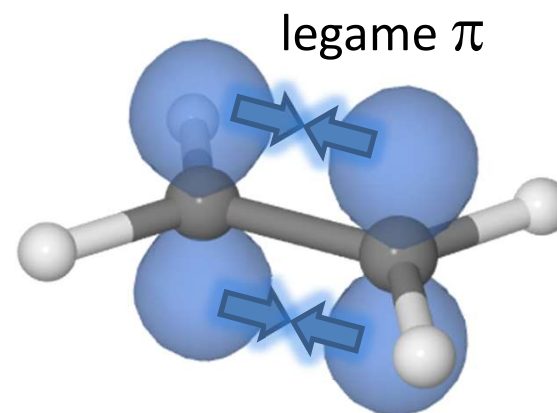


*rotazione libera
attorno al legame*

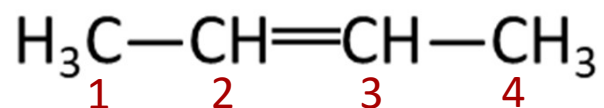


*rotazione
molto sfavorita*

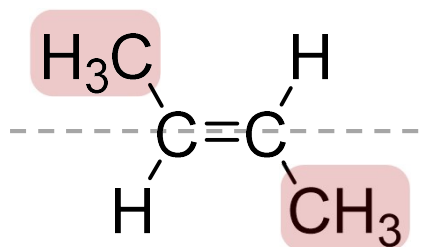
*diminuisce la
sovrapposizione
tra orbitali p*



alcheni

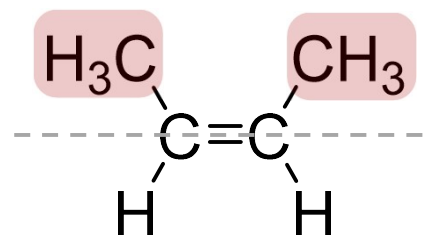


2-butene



trans-2-butene

*da parti opposte
rispetto all'asse del
doppio legame*

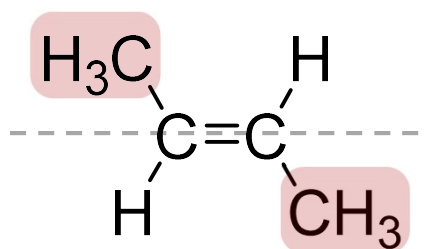


cis-2-butene

*dalla stessa parte
rispetto all'asse del
doppio legame*

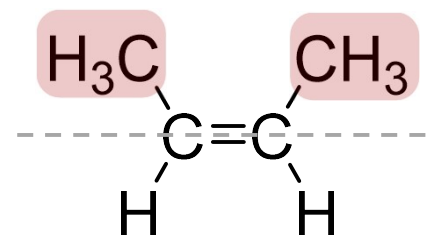
alcheni

stessa formula, diversa forma
ISOMERI



trans-2-butene

*da parti opposte
rispetto all'asse del
doppio legame*



cis-2-butene

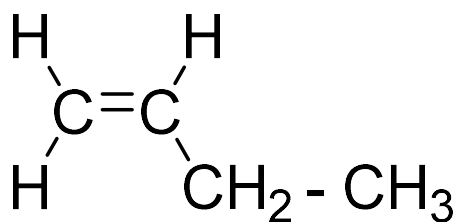
*dalla stessa parte
rispetto all'asse del
doppio legame*

alcheni

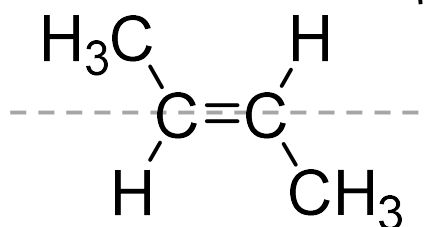
stessa formula, struttura diversa

isomeri
strutturali

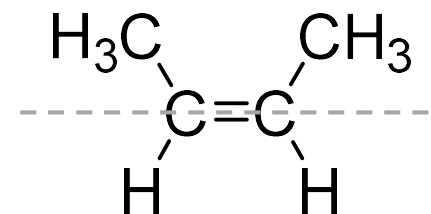
*2 tipi diversi
di isomeria!!!*



1-butene



trans-2-butene



cis-2-butene

isomeri
geometrici

STEREOMERIA



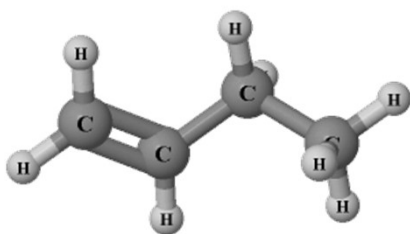
*stessa formula, stessa struttura
DIVERSA GEOMETRIA*

alcheni

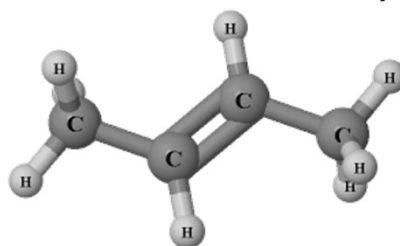
stessa formula, struttura diversa

isomeri
strutturali

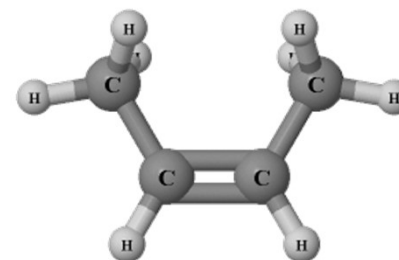
*2 tipi diversi
di isomeria!!!*



1-butene



trans-2-butene



cis-2-butene

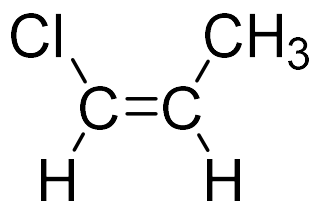
isomeri
geometrici

STEREOMERIA

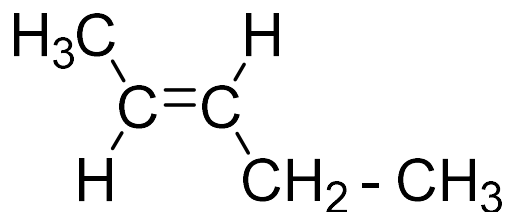


*stessa formula, stessa struttura
DIVERSA GEOMETRIA*

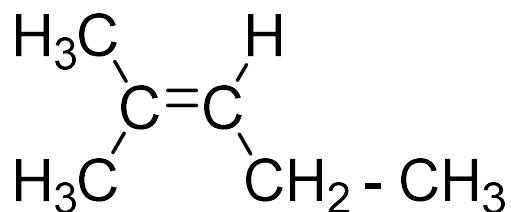
alcheni



? *cis-1-cloro-1-propene*

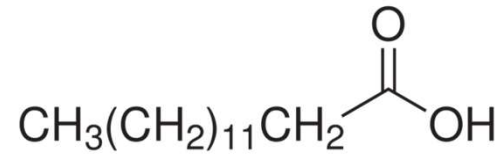


? *trans-2-pentene*

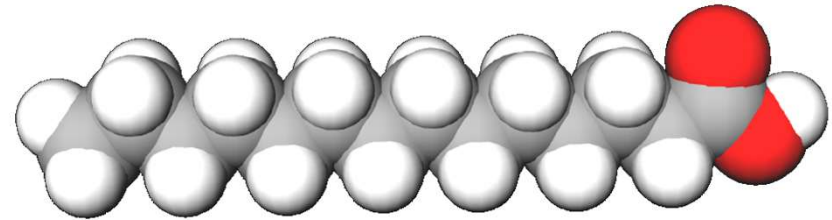
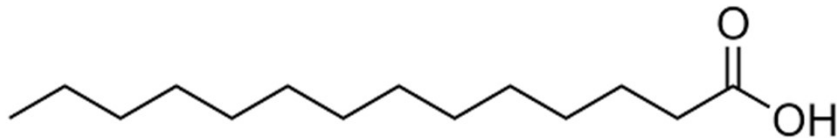


? *2-metil-2-pentene*

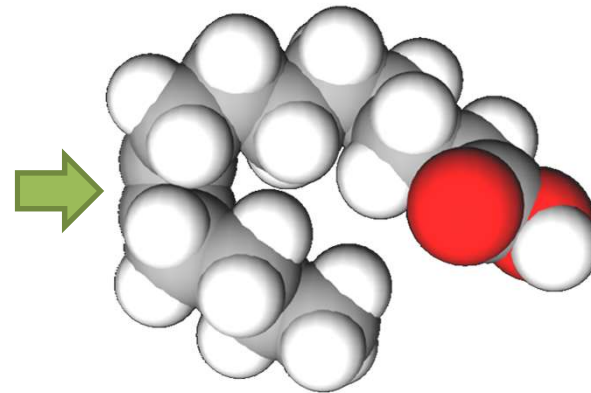
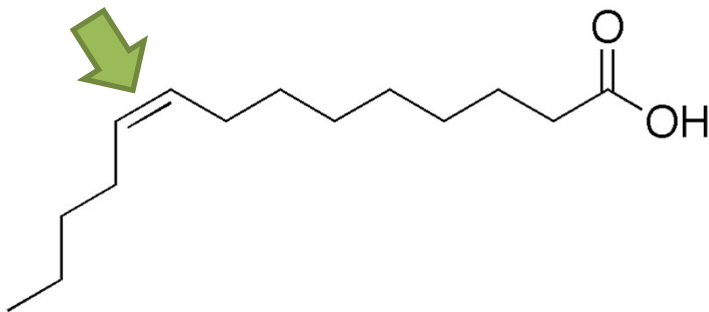
grassi saturi ed insaturi



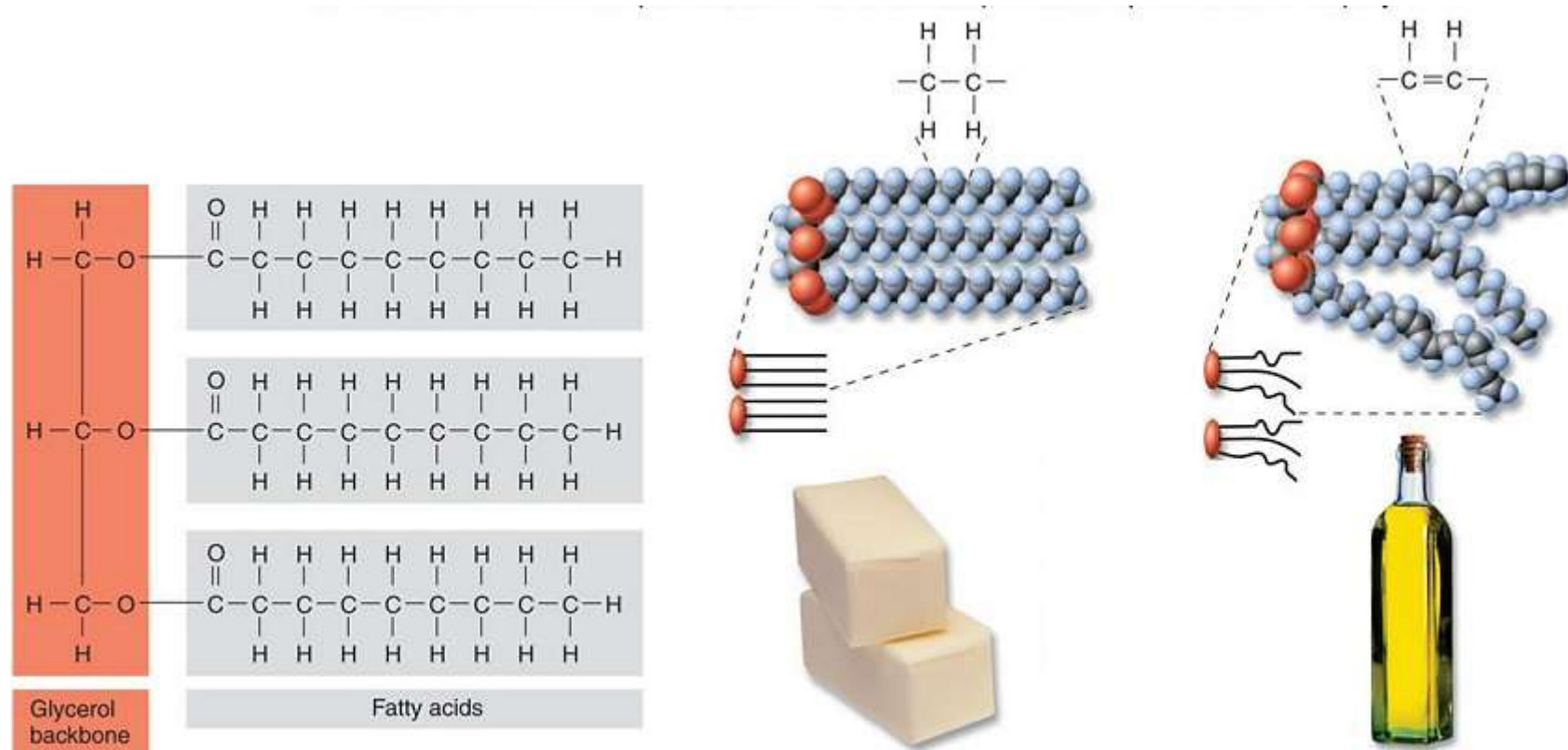
(acido miristico)



(acido miristoleico)

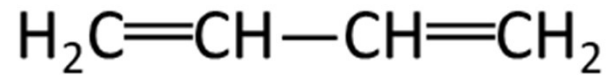


grassi saturi ed insaturi

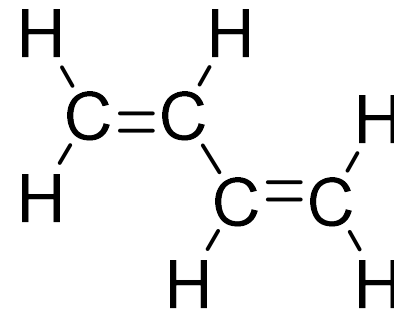
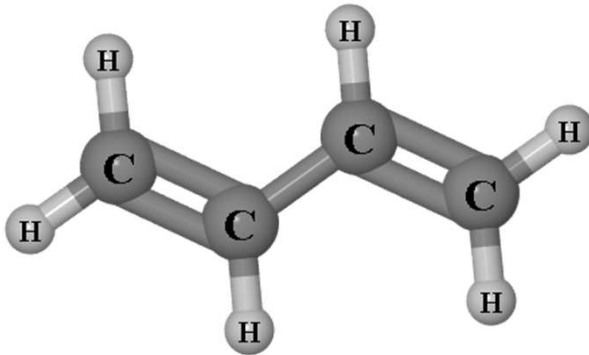


alcheni

*è possibile la presenza di più
doppi legami (polieni)*

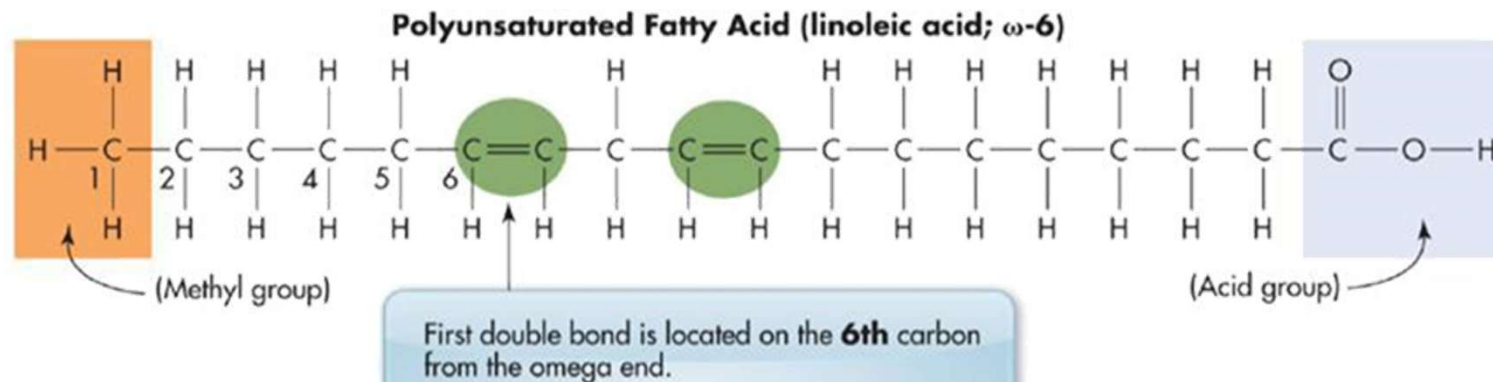
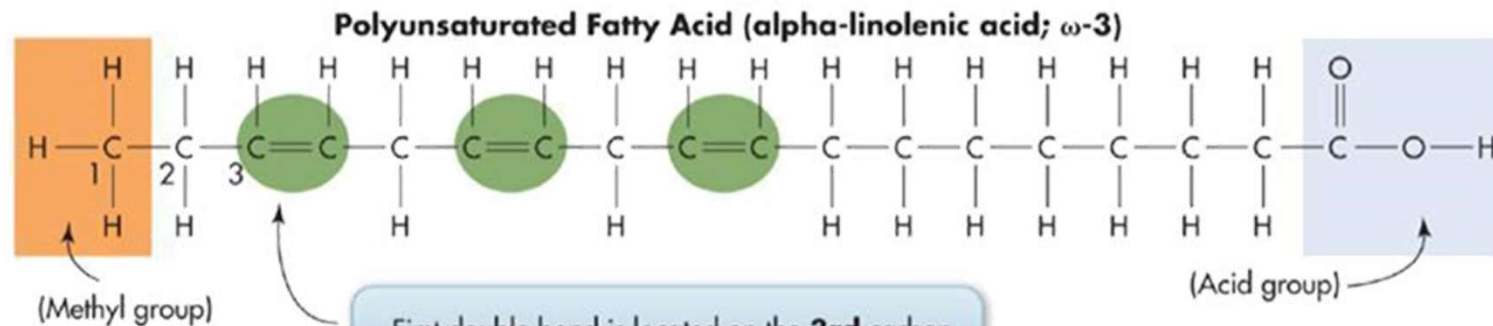


butadiene

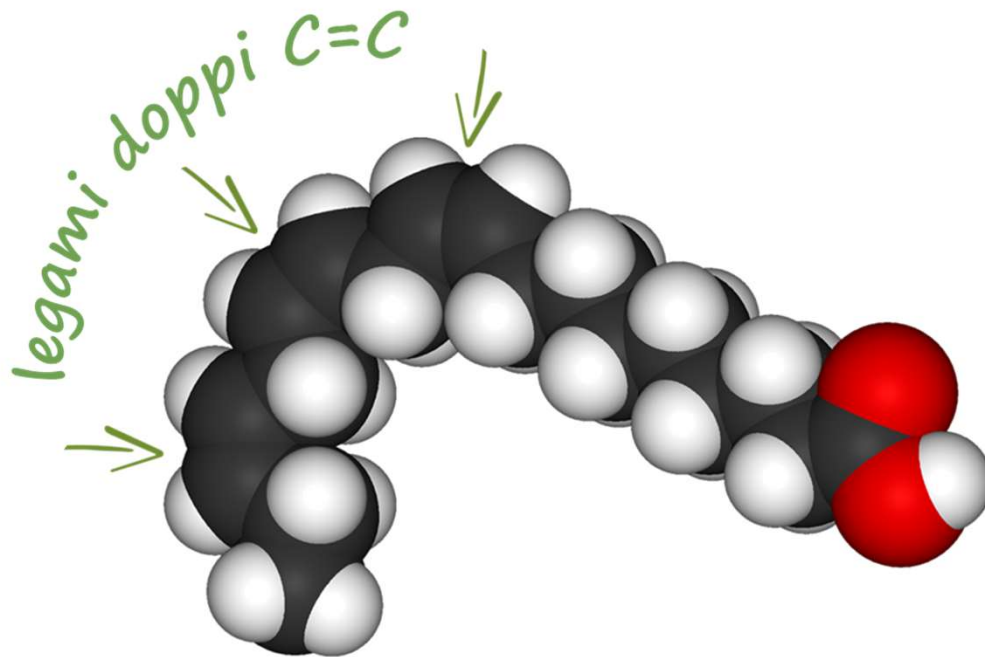


grassi *poli*-insaturi

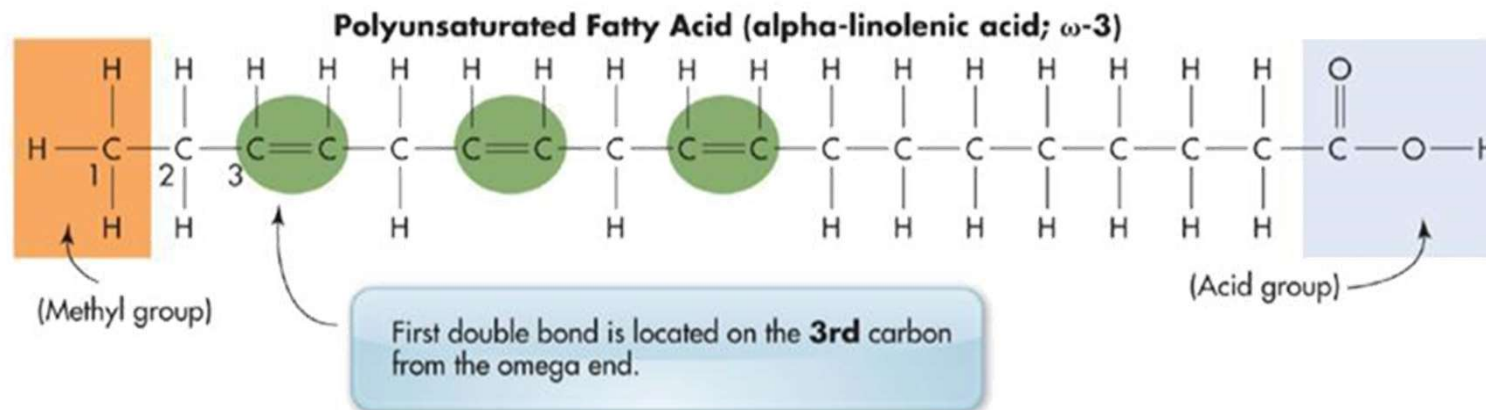
omega-3 e
omega-6



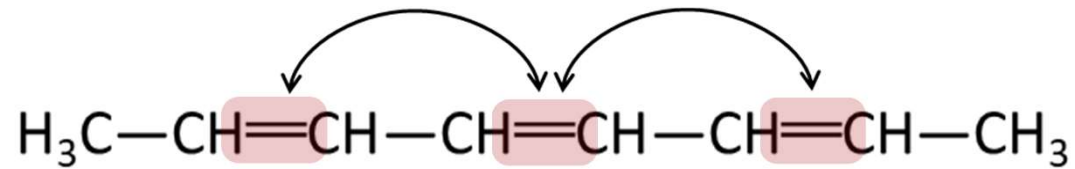
grassi *poli*-insaturi



geometria
non lineare

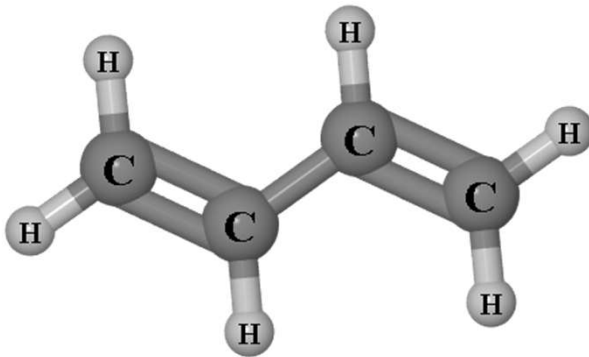


polieni coniugati

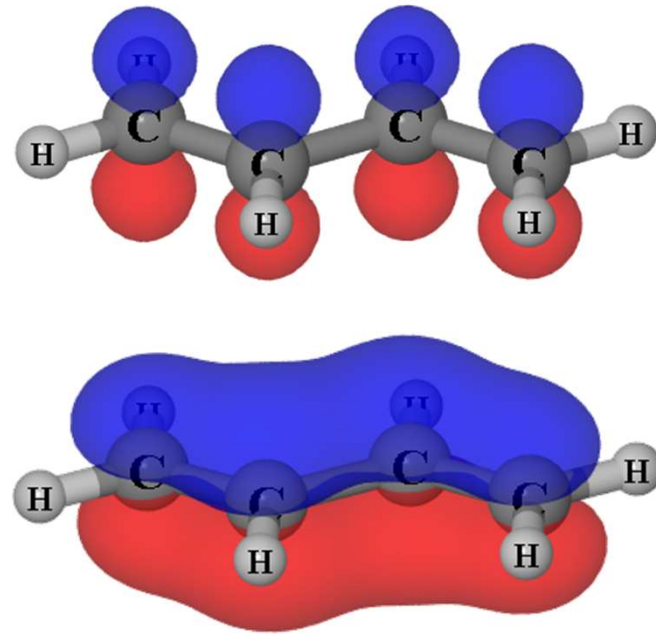


alternati

se i doppi legami sono “coniugati”
→ sistema π delocalizzato



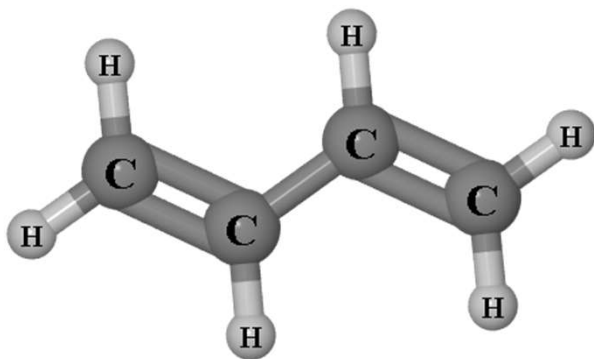
butadiene



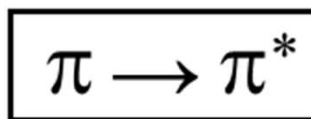
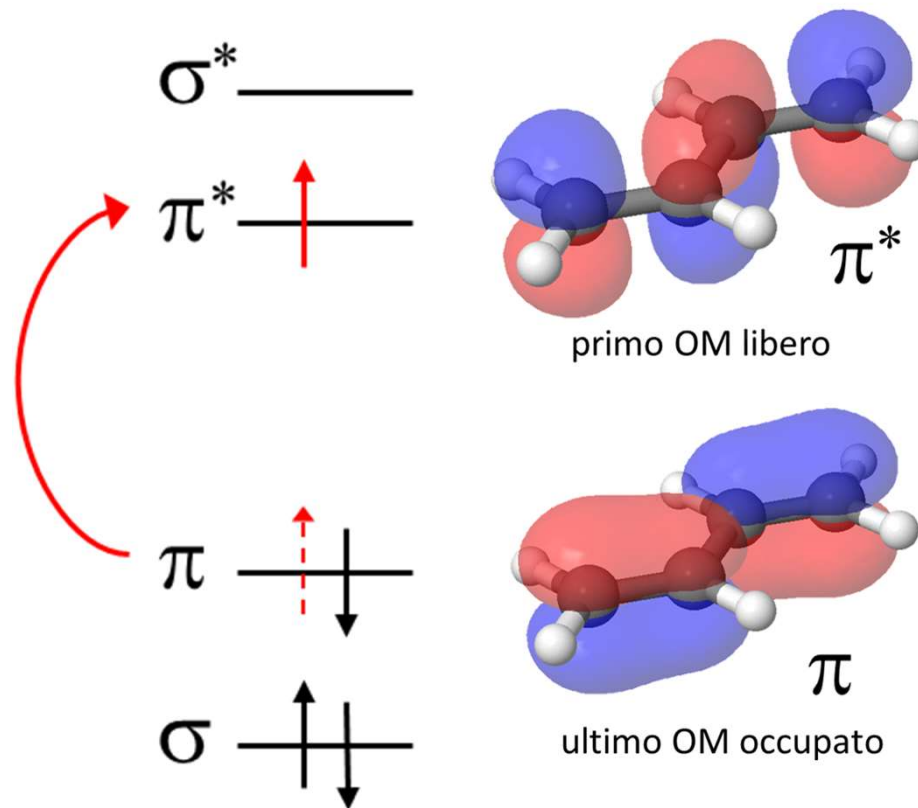
(esempio orbitale molecolare legante)

polieni coniugati

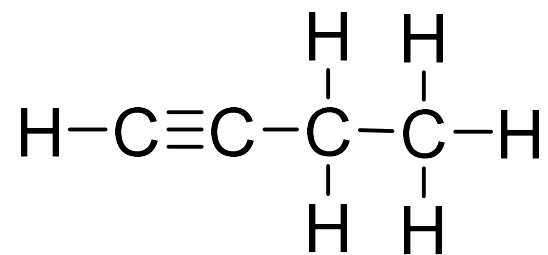
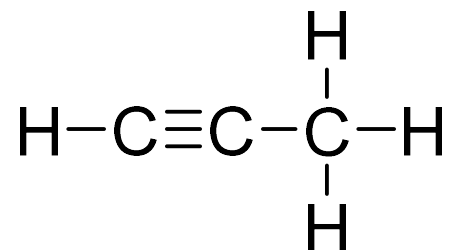
*sono comuni le
transizioni $\pi \rightarrow \pi^*$*



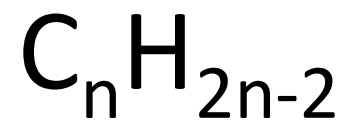
butadiene



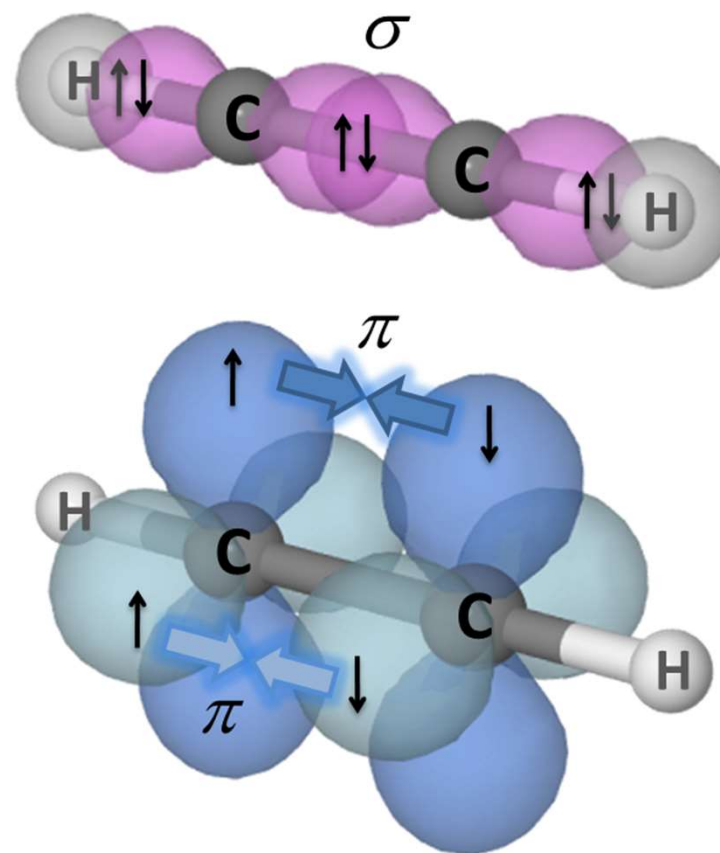
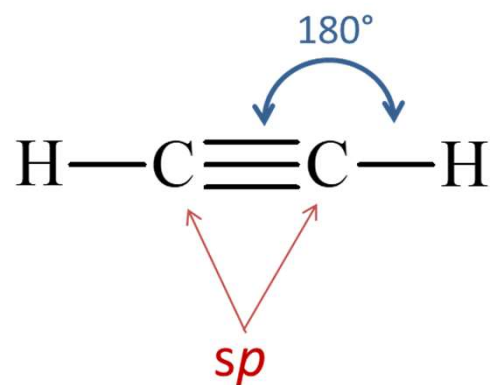
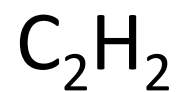
alchini



alchini

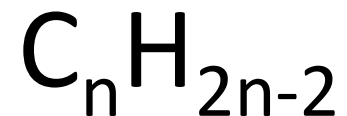


*anche carbonio sp
(lineare)*



alchini

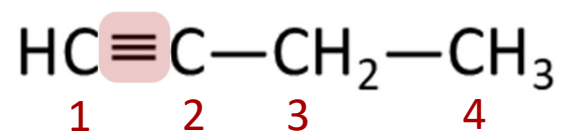
nomenclatura



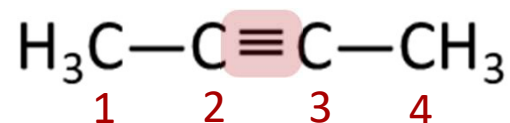
(n° carboni) -ino

nome	n° atomi carbonio	formula	formula condensata
<i>etino</i>	2	C_2H_2	$\text{CH} \equiv \text{CH}$
<i>propino</i>	3	C_3H_4	$\text{CH} \equiv \text{CCH}_3$
<i>butino</i>	4	C_4H_6	$\text{CH} \equiv \text{CCH}_2\text{CH}_3$
<i>pentino</i>	5	C_5H_8	$\text{CH} \equiv \text{CCH}_2\text{CH}_2\text{CH}_3$
<i>esino</i>	6	C_6H_{10}	$\text{CH} \equiv \text{C}(\text{CH}_2)_3\text{CH}_3$
<i>eptino</i>	7	C_7H_{12}	$\text{CH} \equiv \text{C}(\text{CH}_2)_4\text{CH}_3$

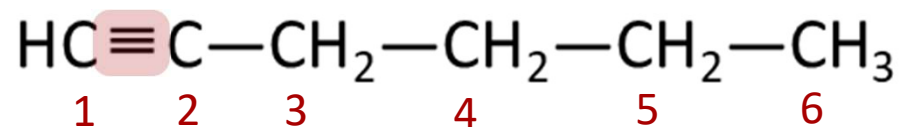
alchini



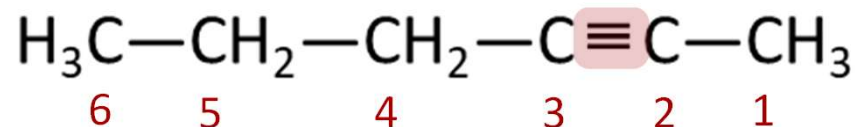
1-butino



2-butino

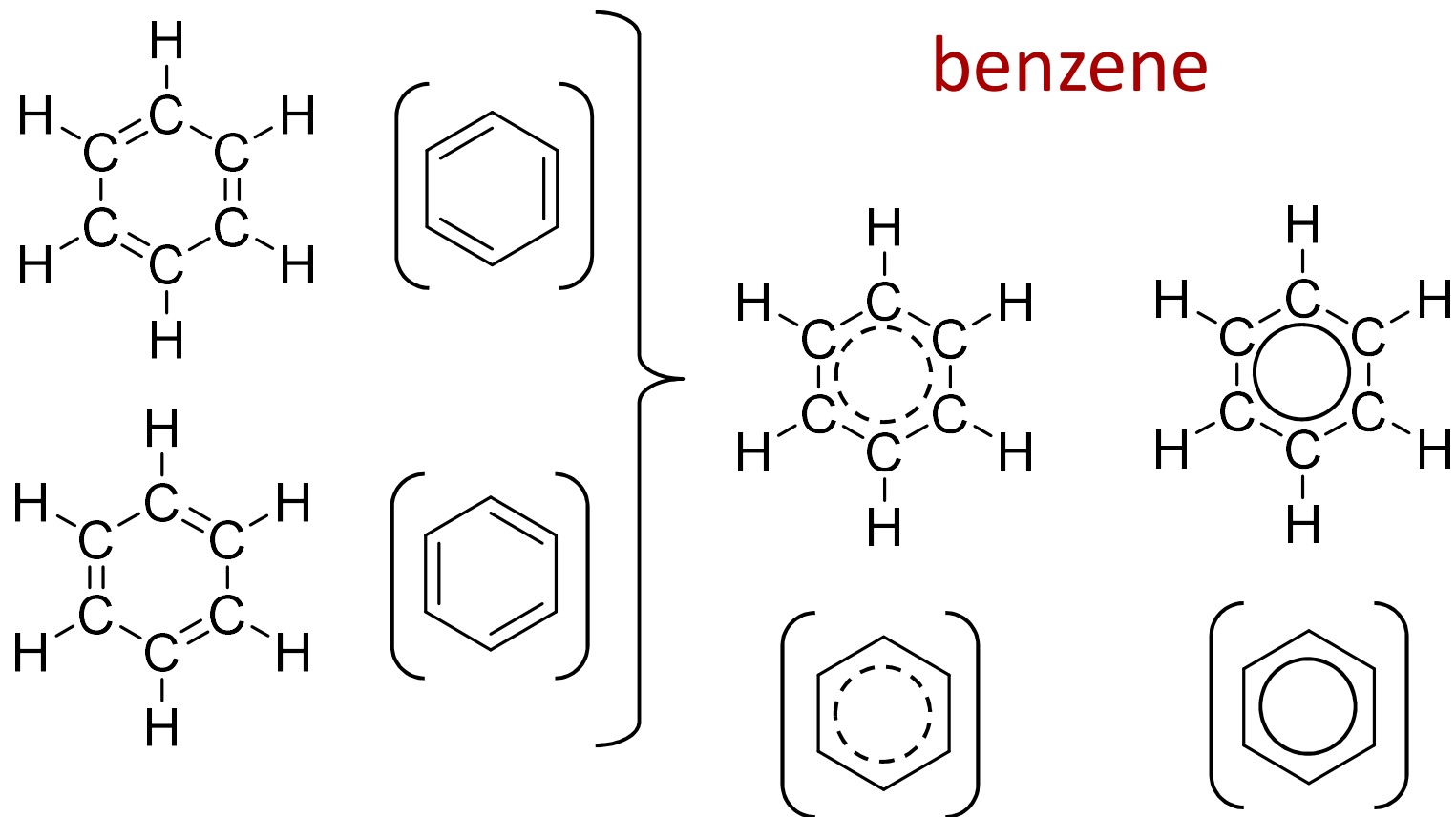


1-esino



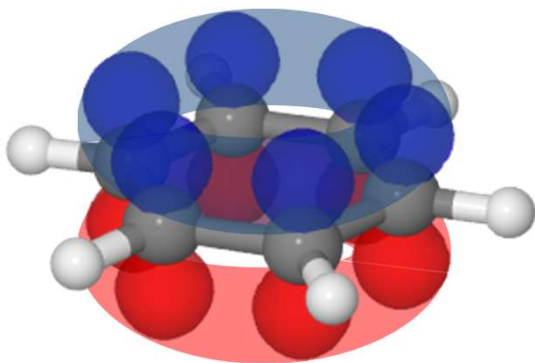
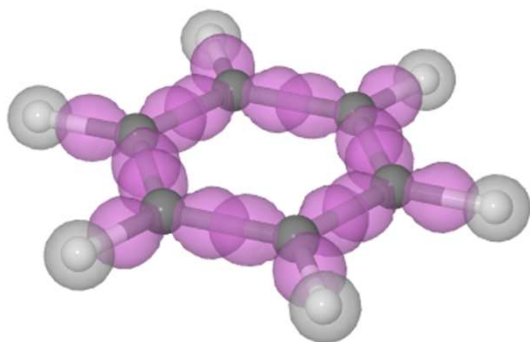
2-esino

idrocarburi aromatici



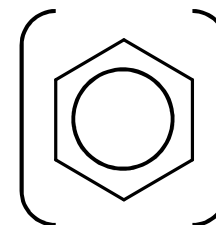
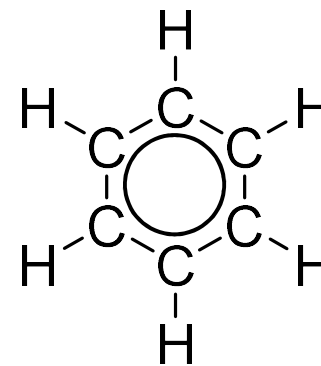
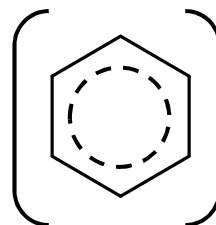
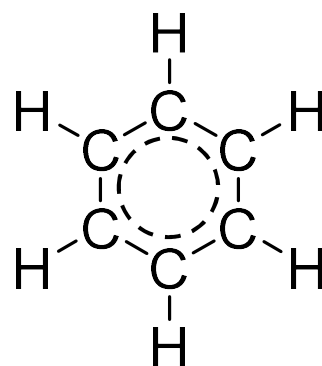
idrocarburi aromatici

carbonio sp^2



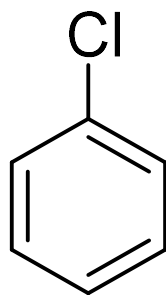
aromaticità

benzene

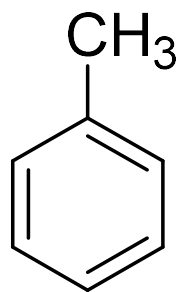


idrocarburi aromatici

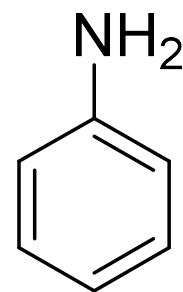
derivati mono-sostituiti



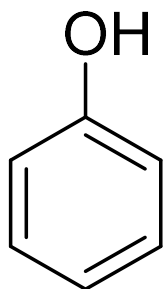
clorobenzene



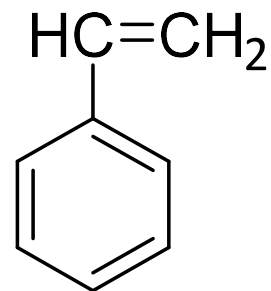
toluene



anilina



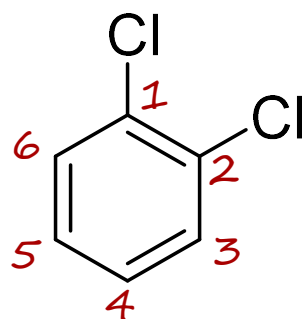
fenolo



stirene

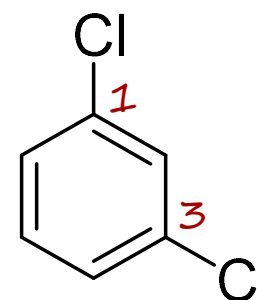
idrocarburi aromatici

derivati di-sostituiti



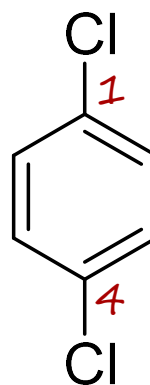
1,2-diclorobenzene
(orto-dibromobenzene)
(o-dibromobenzene)

orto-



1,3-diclorobenzene
(meta-dibromobenzene)
(m-dibromobenzene)

meta-

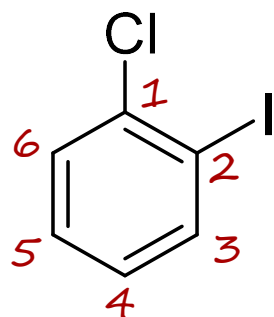


1,4-diclorobenzene
(para-dibromobenzene)
(p-dibromobenzene)

para-

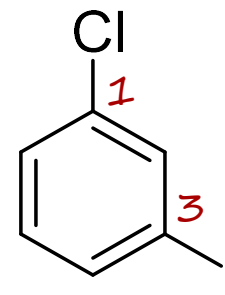
idrocarburi aromatici

derivati di-sostituiti



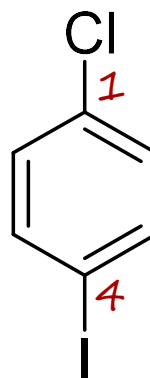
1-cloro-2-iodo-benzene
(orto-cloriodobenzene)

orto-



1-cloro-3-iodo-benzene
(meta-cloriodobenzene)

meta-

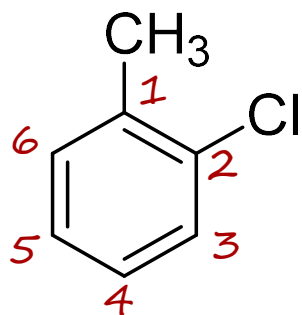


1-cloro-4-iodo-benzene
(para-cloriodobenzene)

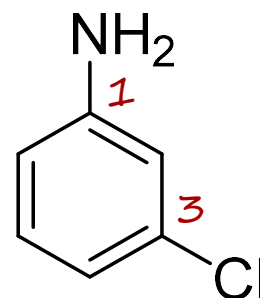
para-

idrocarburi aromatici

derivati di-sostituiti



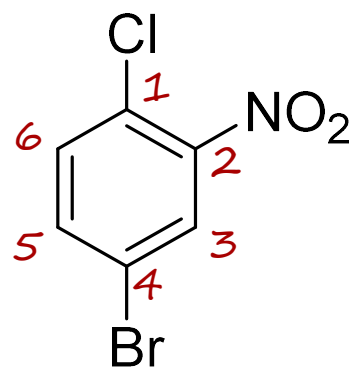
orto-clorotoluene



meta-cloroanilina

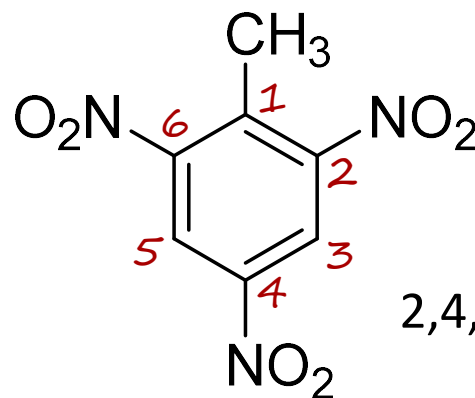
idrocarburi aromatici

derivati di-sostituiti



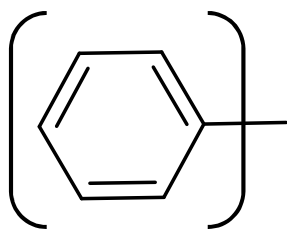
4-bromo-1-cloro-2-nitro-benzene

*quando più
sostituenti, sostituenti
in ordine alfabetico,
numerandoli in modo
da ottenere cifre più
basse possibile*

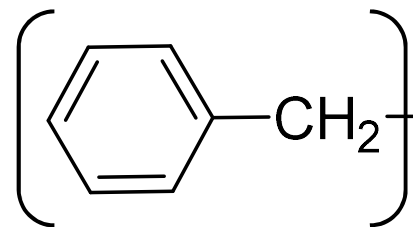


2,4,6-tri-nitro-toluene (TNT)

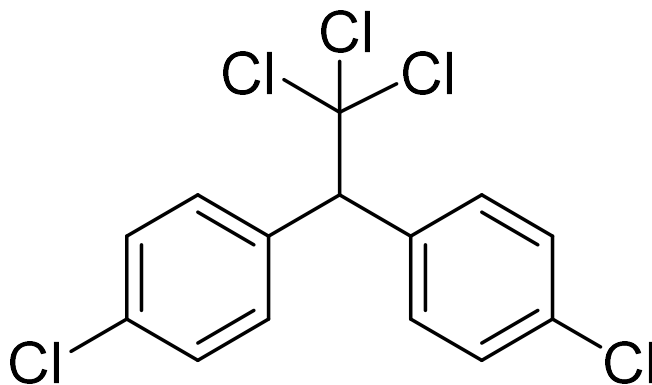
sostituenti arilici



fenile



benzile

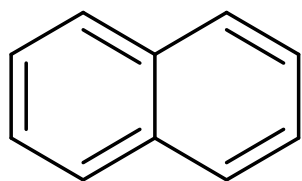


1,1,1-tricloro-2,2-bis(p-clorofenil)etano

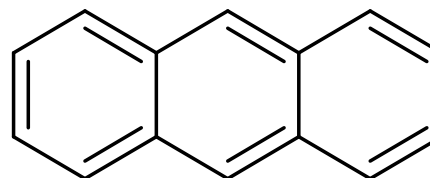
(dicloro difenil tricloroetano - DDT)

idrocarburi aromatici policiclici

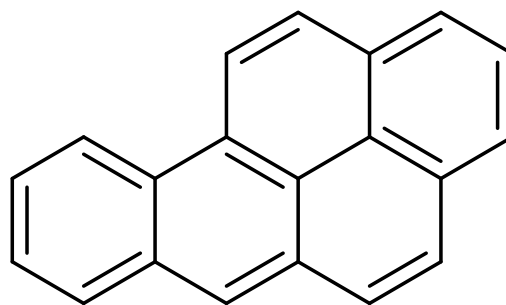
(PAH)



naftalene

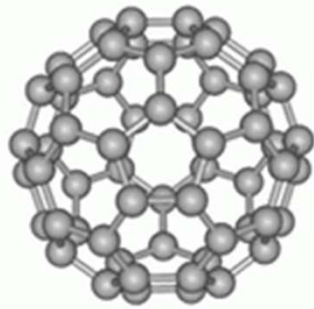


antracene

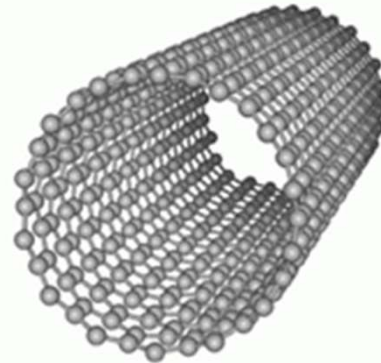
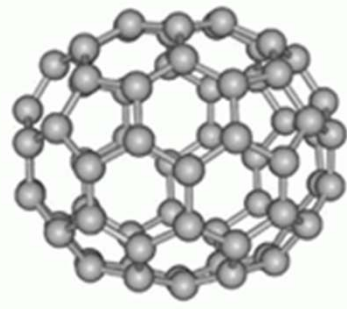


benzo[a]pirene

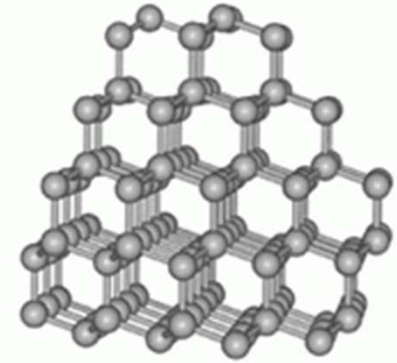
nanostrutture di carbonio



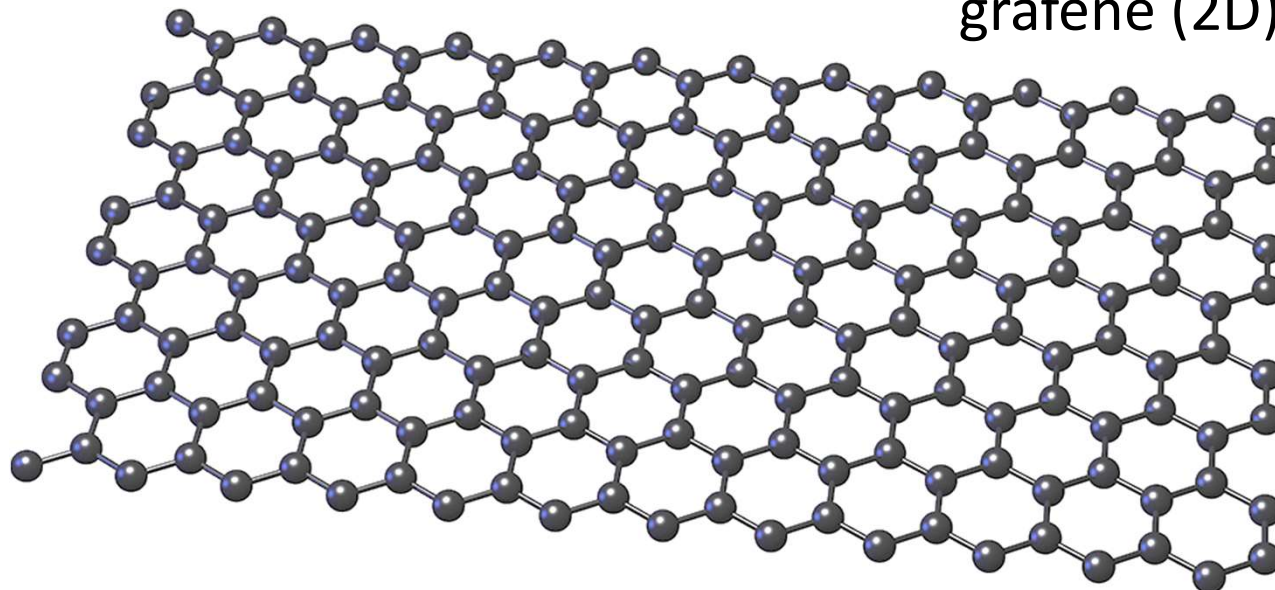
fullereni (0D)



nano-tubi (1D)



nano-diamanti
(0D)



grafene (2D)

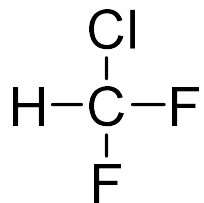
composti organici

*(composti di carbonio,
idrogeno ed altri elementi)*

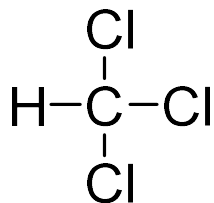
C, H + O, N, alogeni, etc.

*ENORME
varietà*

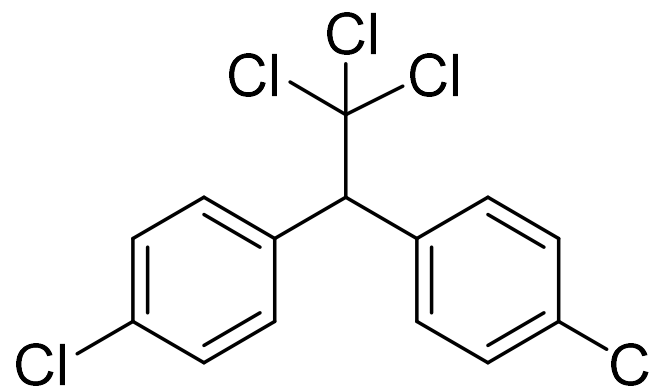
alogenuri alchilici ed arilici



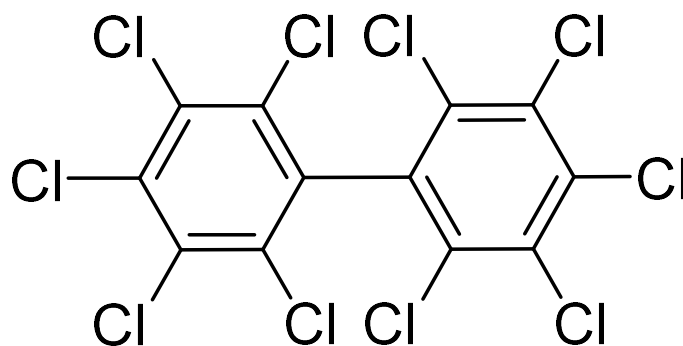
(cloro-
difluoro-
metano)



(cloroformio)



(DDT)



(caso Caffaro
a Brescia)

policloro-bifenili (PCB)

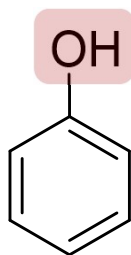
alcoli

nomenclatura

(n° carboni) -olo

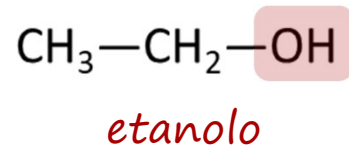


(aromatici)

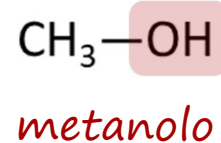


fenolo

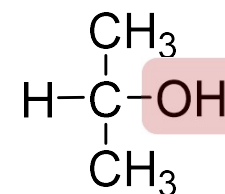
(alifatici)



(primari)

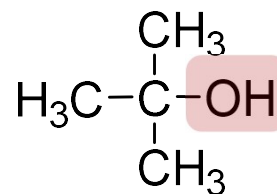


(secondari)



*isopropanolo
(alcol isopropilico)*

(terziari)



2-metil-2-propanolo

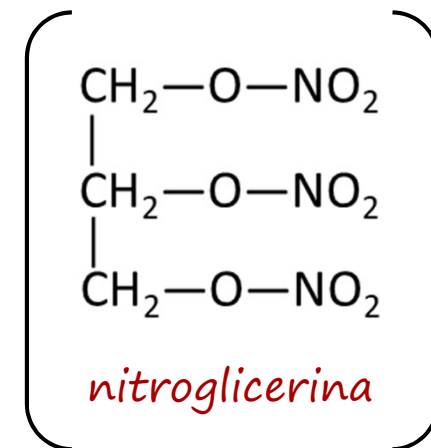
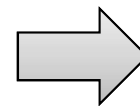
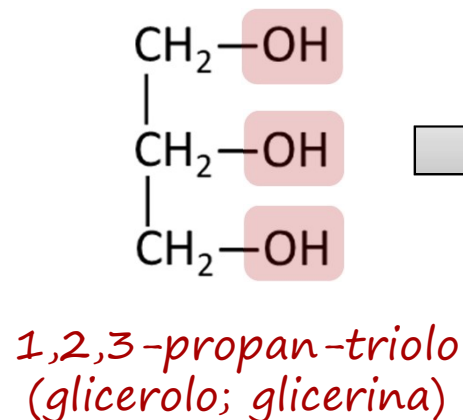
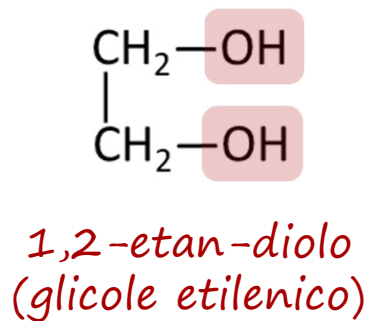
(poli-)alcoli (o poliolì)

nomenclatura



(n° carboni) -olo

preceduto da -di,
-tri, -tetra, etc.



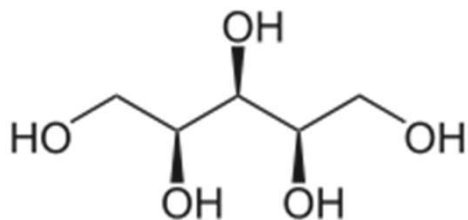
(poli-)alcoli (o poliolì)

nomenclatura

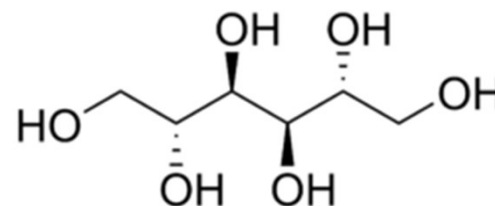


(n° carboni) -olo

preceduto da -di,
-tri, -tetra, etc.



xilitolo

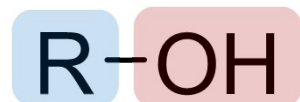


mannitolo

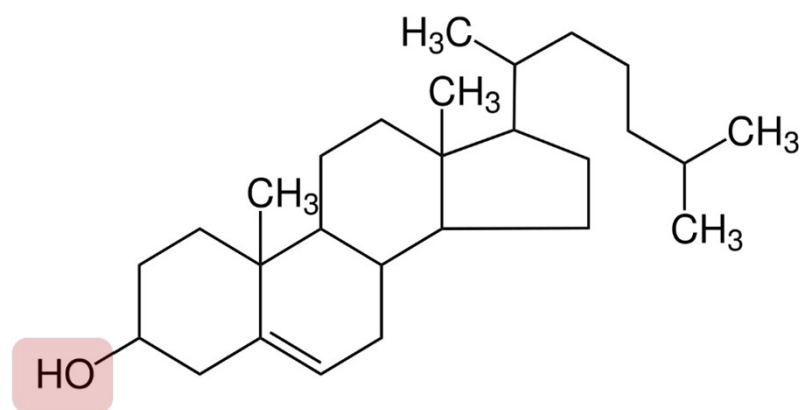
uso come dolcificanti

alcoli

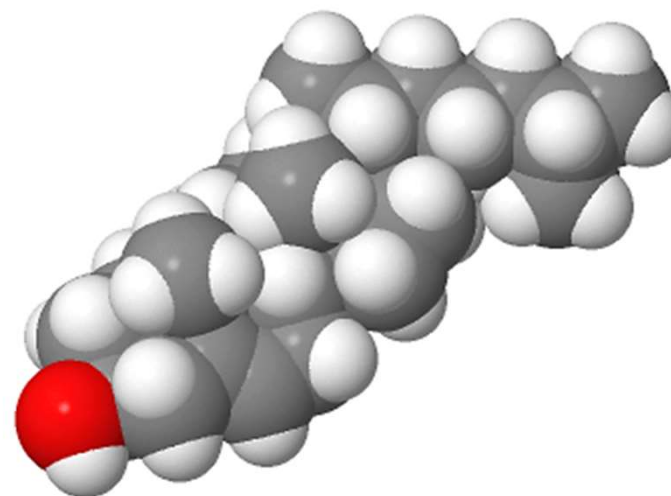
nomenclatura



(n° carboni) -olo



colesterolo

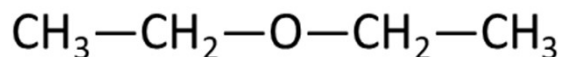


eteri

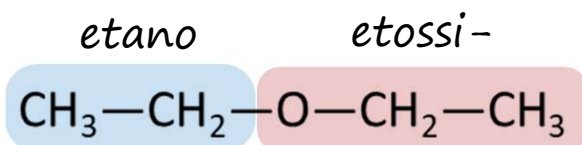
nomenclatura



(nome R_1 - nome R_2) etere

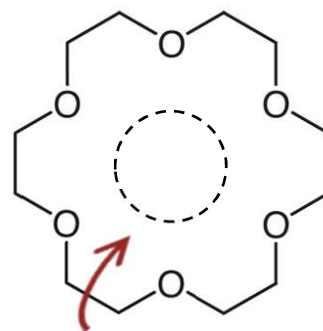


*dietil-etere
(etere di-etilico)*

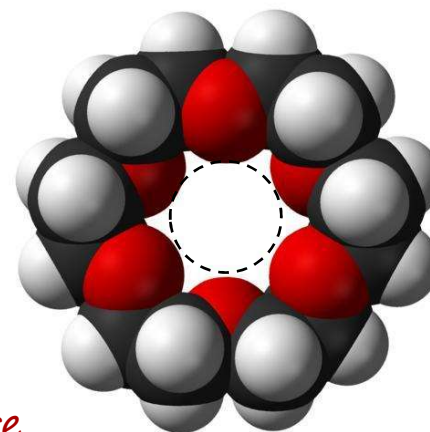


*etossi-etano
(IUPAC)*

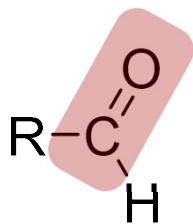
eteri corona



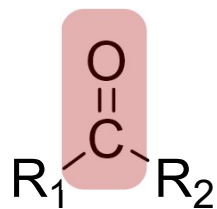
*spazio per ospitare
ione metallico*



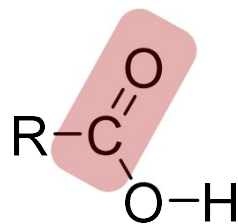
composti carbonilici



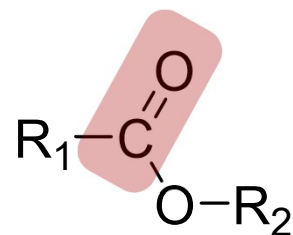
aldeidi



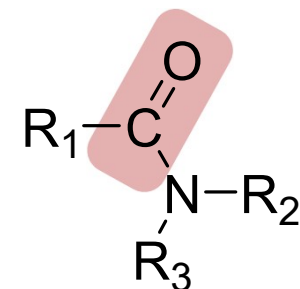
chetoni



*acidi
carbossilici*



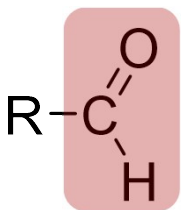
esteri



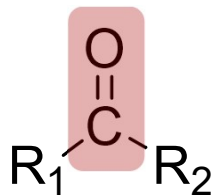
ammidi

*tutti caratterizzati dal
doppio legame C=O*

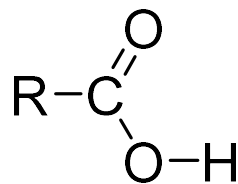
composti carbonilici



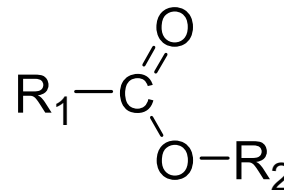
aldeidi



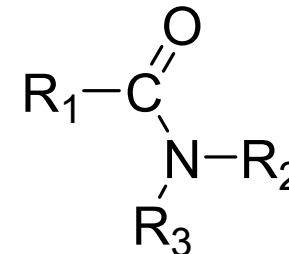
chetoni



*acidi
carbossilici*



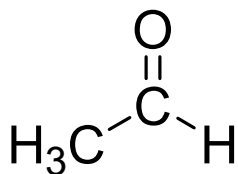
esteri



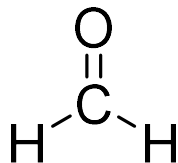
ammidi

nomenclatura

*(n° carboni) - **ale***



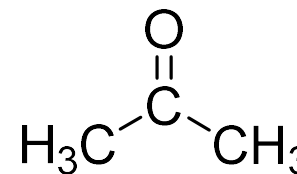
*etanale
(acetaldeide)*



*metanale
(formaldeide)*

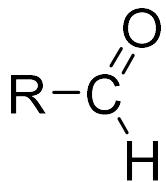
nomenclatura

*(n° carboni) - **one***

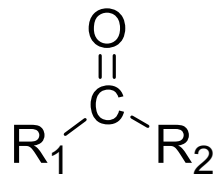


*propanone
(acetone, dimetilchetone)*

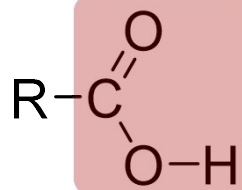
composti carbonilici



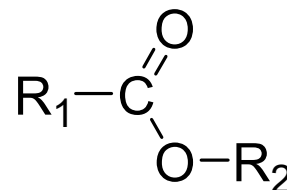
aldeidi



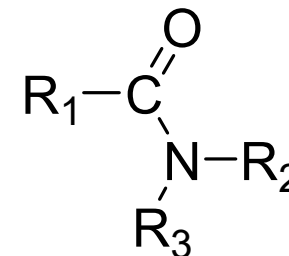
chetoni



*acidi
carbossilici*



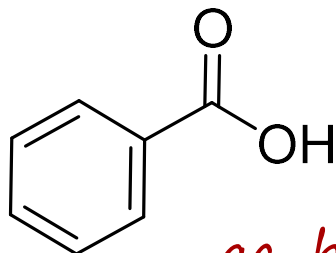
esteri



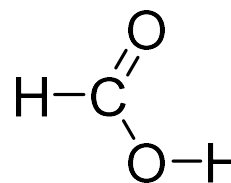
ammidi

nomenclatura

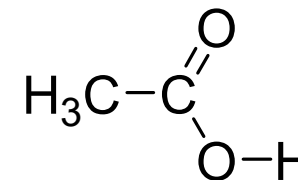
acido (n° carboni) - oico



ac. benzoico

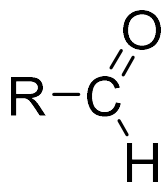


*ac. metanoico
(ac. formico)*

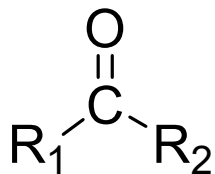


*ac. etanoico
(ac. acetico)*

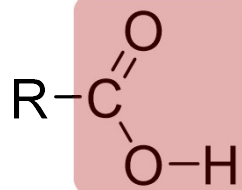
composti carbonilici



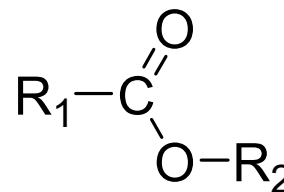
aldeidi



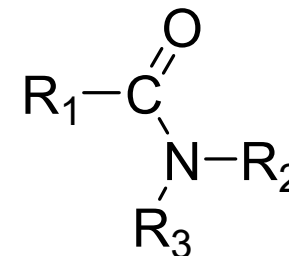
chetoni



*acidi
carbossilici*



esteri

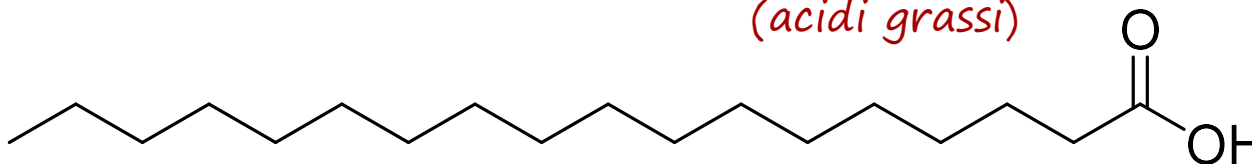


ammidi

nomenclatura

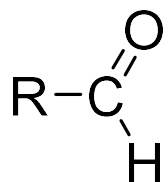
acido (n° carboni) - oico

(acidi grassi)

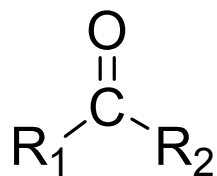


*ac. octadecanoico
(ac. stearico)*

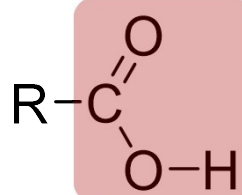
composti carbonilici



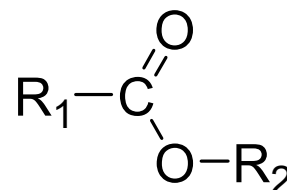
aldeidi



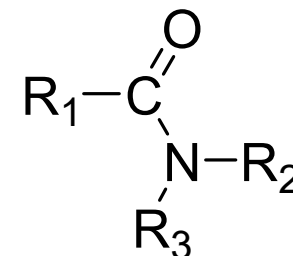
chetoni



*acidi
carbossilici*



esteri

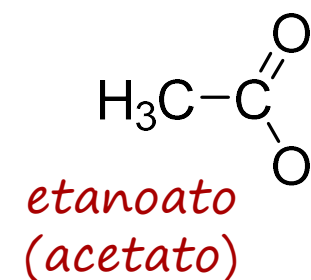
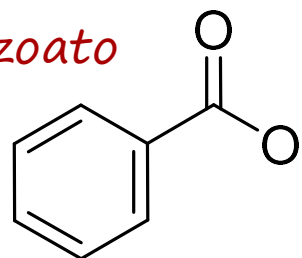


ammidi

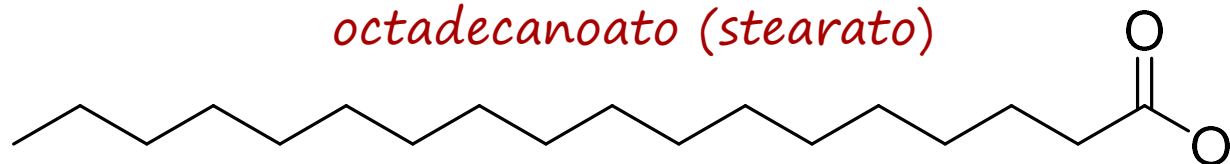
nomenclatura

(n° carboni) - oato

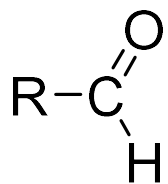
benzoato



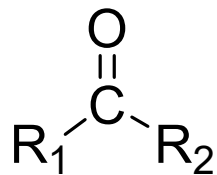
octadecanoato (stearato)



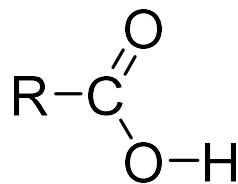
composti carbonilici



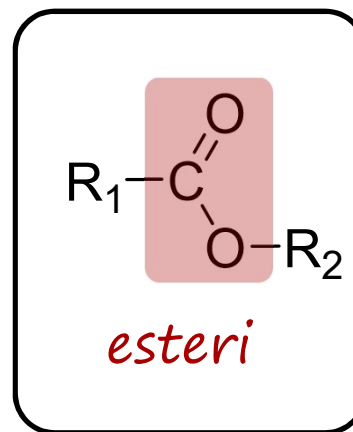
aldeidi



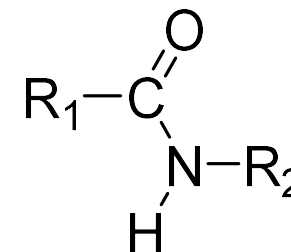
chetoni



*acidi
carbossilici*



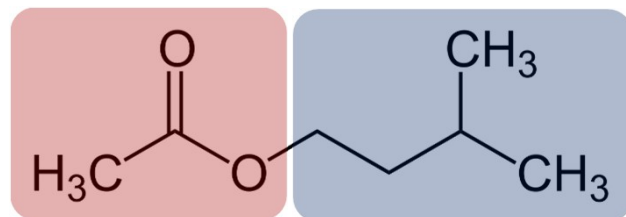
esteri



ammidi

nomenclatura

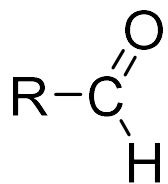
*(n° carboni) - **ato** di (residuo alchilico/arilico)*



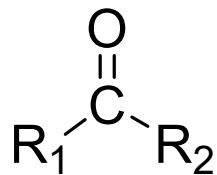
etanoato (acetato) di isopentile

*(odori gradevoli,
aromi della frutta)*

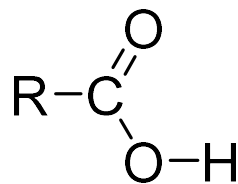
composti carbonilici



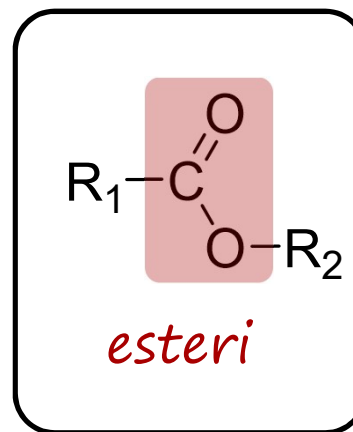
aldeidi



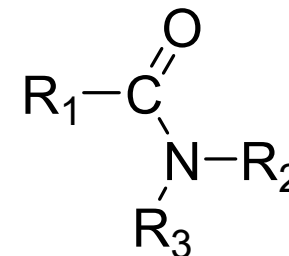
chetoni



*acidi
carbossilici*



esteri

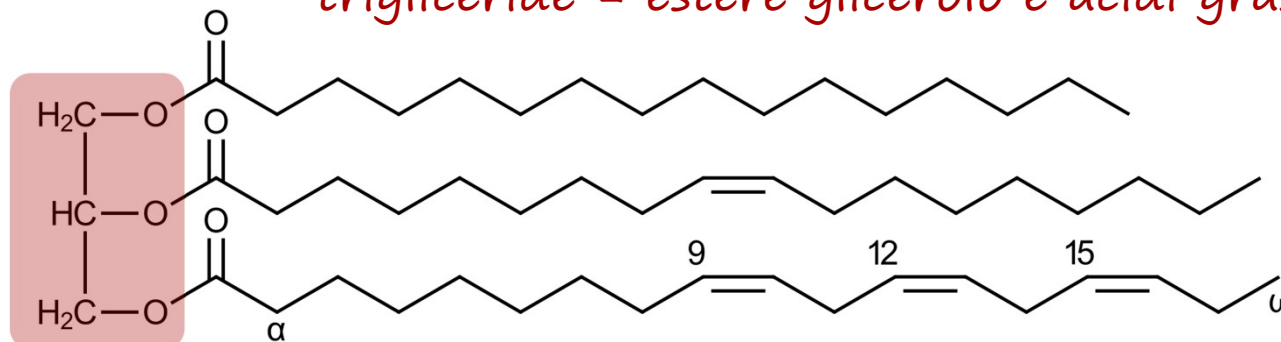


ammidi

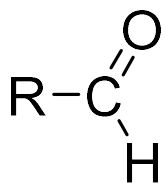
nomenclatura

*(n° carboni) - **ato** di (residuo alchilico/arilico)*

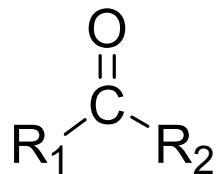
trigliceride = estere glicerolo e acidi grassi



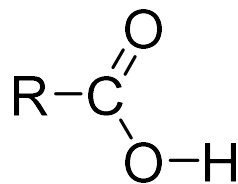
composti carbonilici



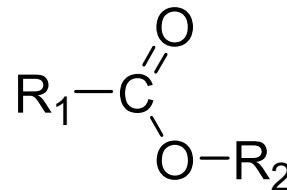
aldeidi



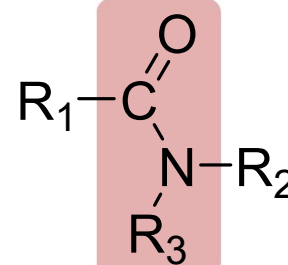
chetoni



*acidi
carbossilici*



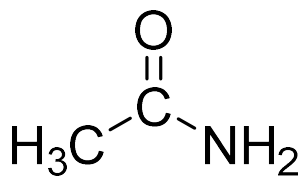
esteri



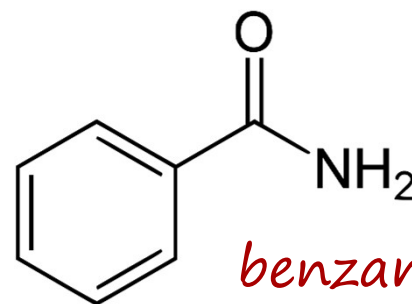
ammidi

nomenclatura

(n° carboni) - amide



etanamide

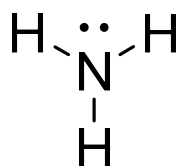


benzamide

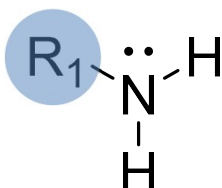
ammine

nomenclatura

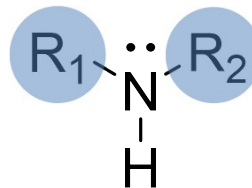
(n° carboni) -ammina



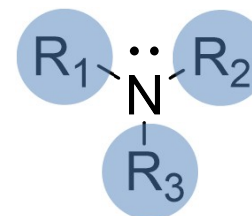
ammoniaca



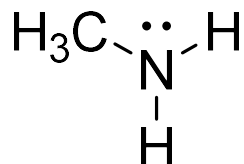
*ammina
primaria*



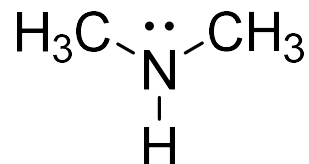
*ammina
secondaria*



*ammina
terziaria*



metilammina

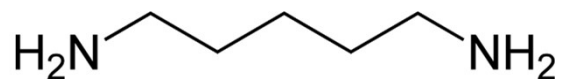


dimetilammina

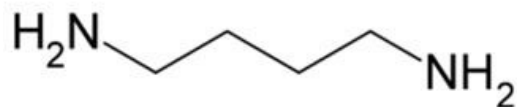
ammine

nomenclatura

(n° carboni) -ammina



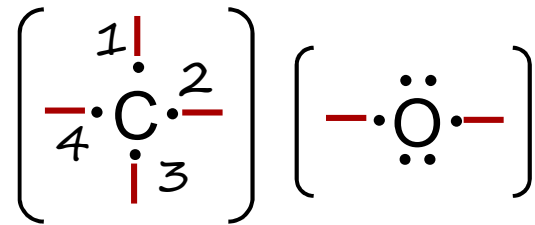
cadaverina



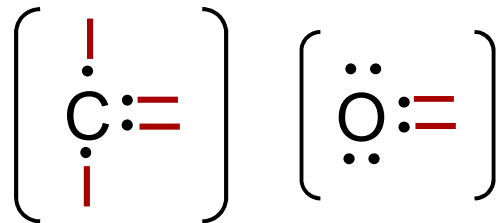
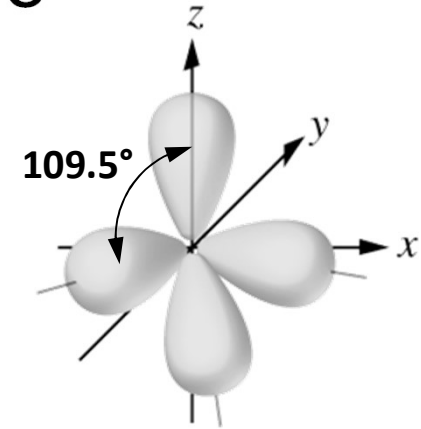
putrescina

*odori
sgradevoli*

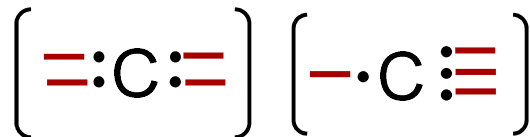
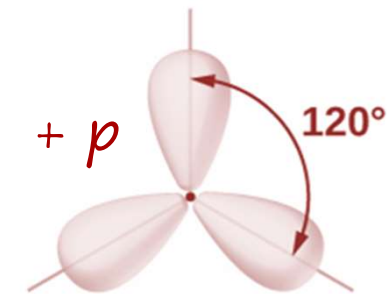
VBT e composti del carbonio



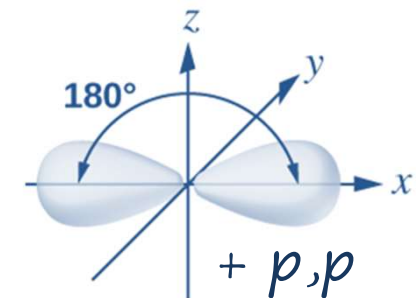
4 gruppi di
coppie
elettroniche



3 gruppi di
coppie
elettroniche

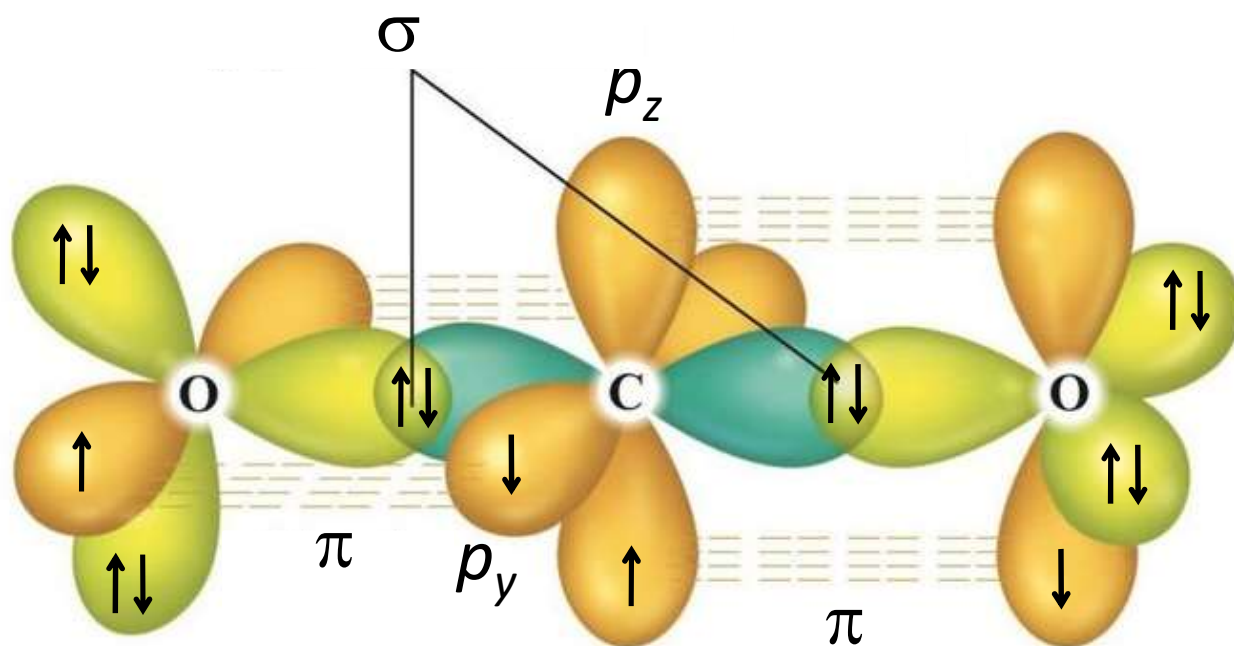
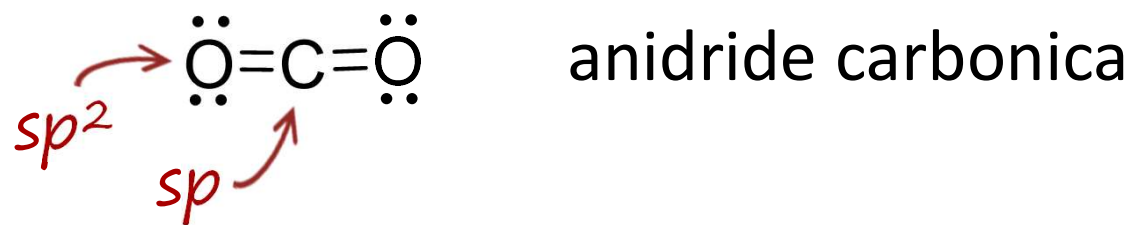


2 gruppi di
coppie
elettroniche

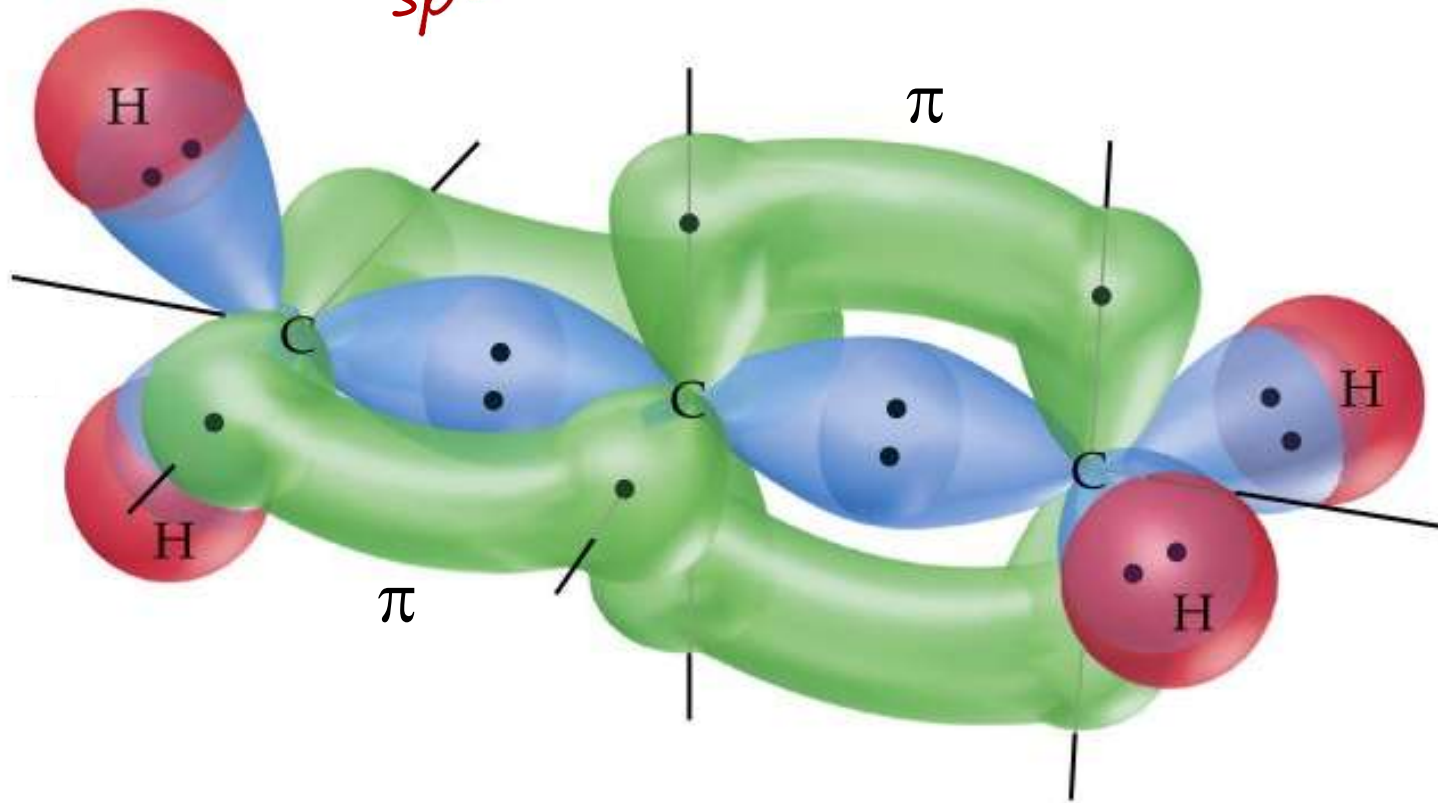
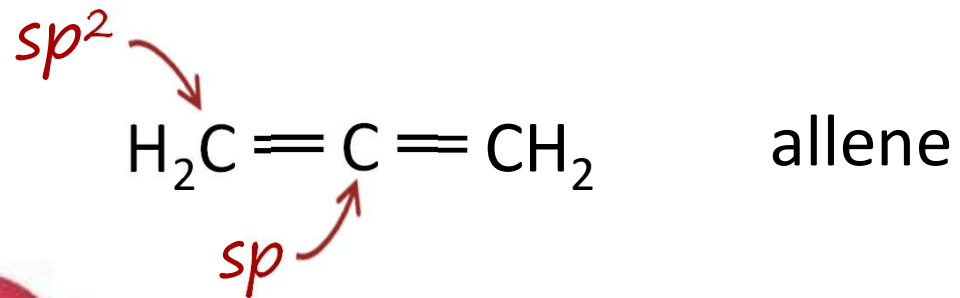


N.B. per ogni legami multiplo, devo avere elettroni p liberi

VBT e composti del carbonio

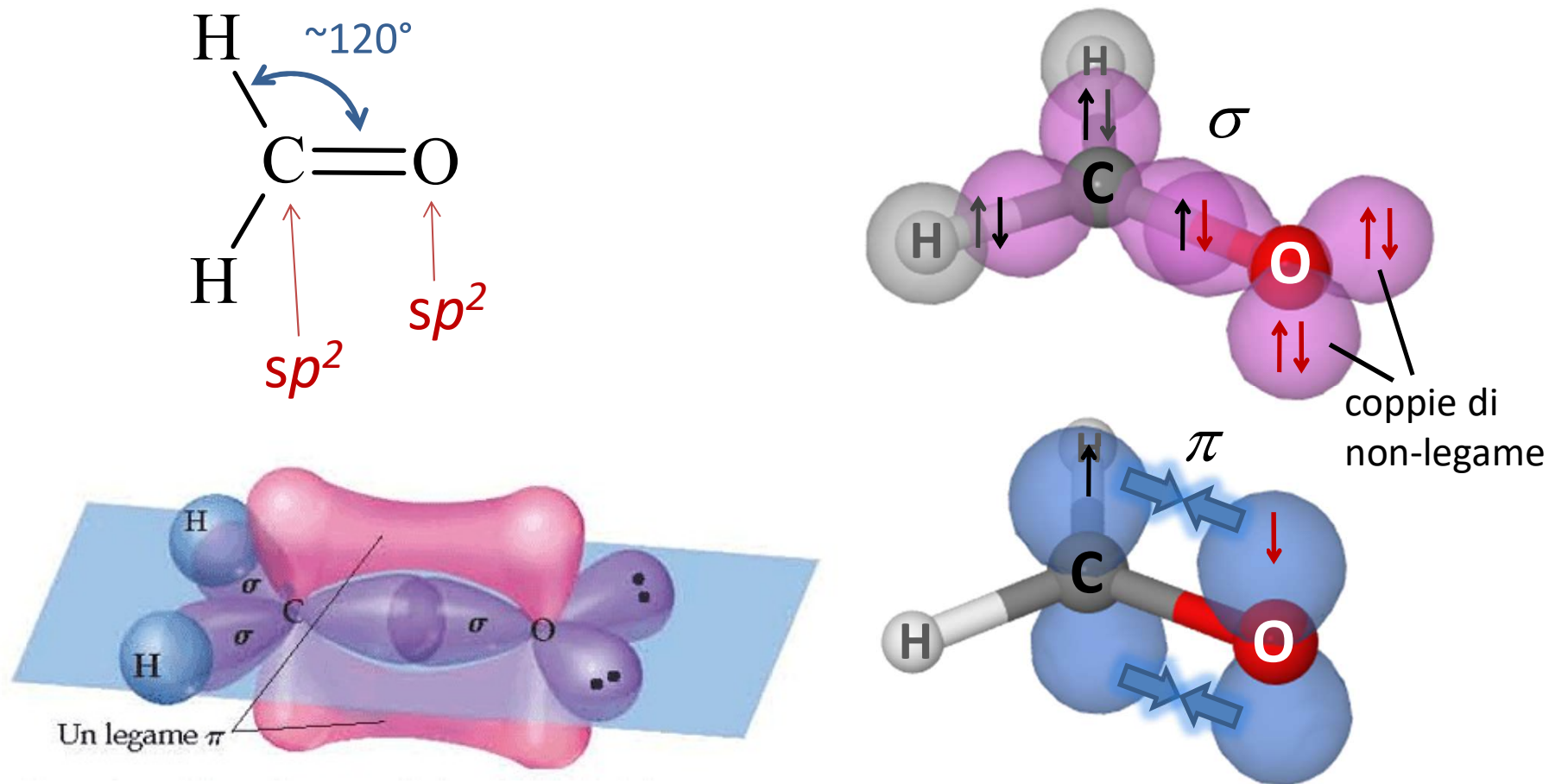


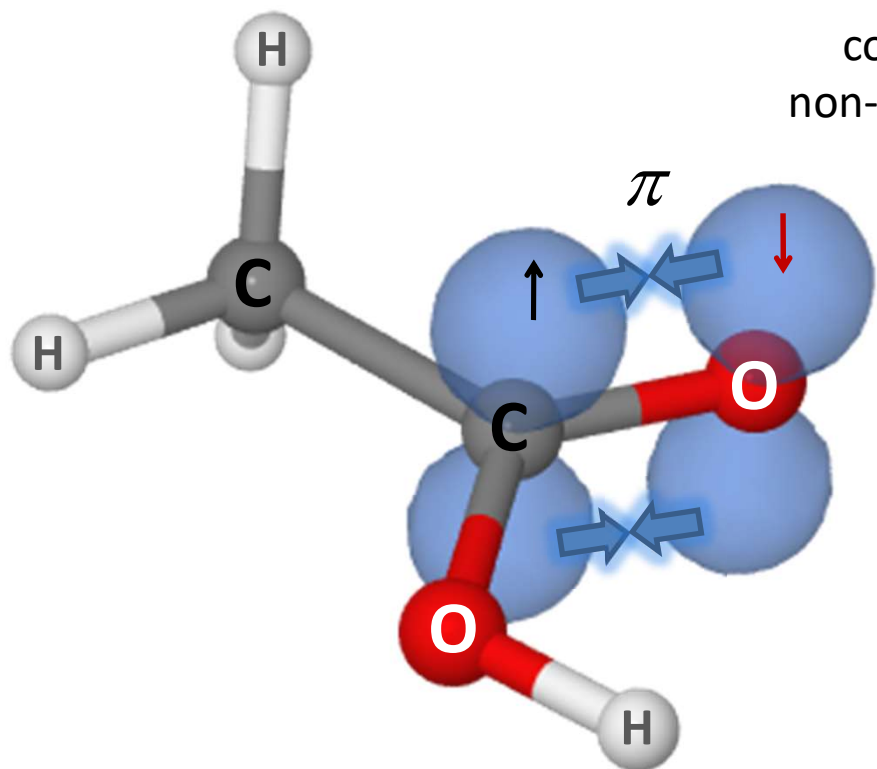
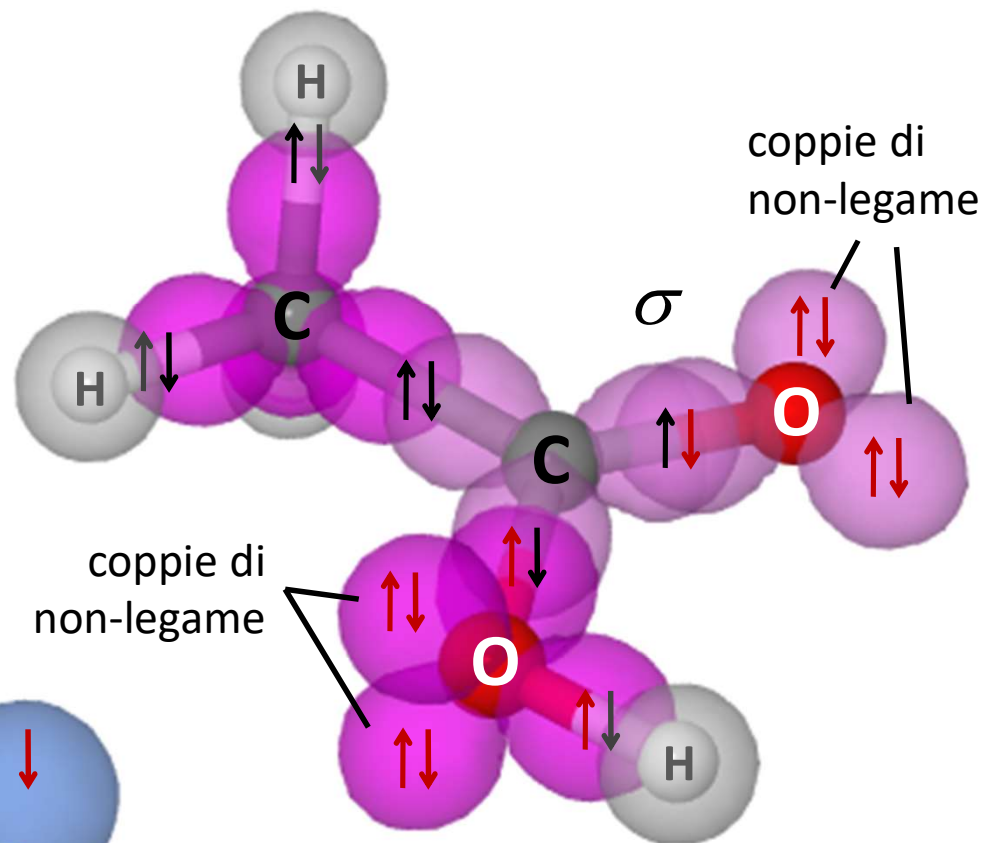
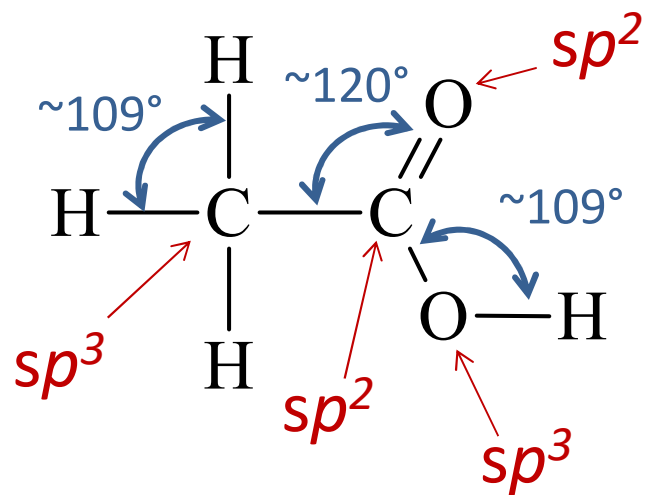
VBT e composti del carbonio



VBT e composti del carbonio

formaldeide CH_2O

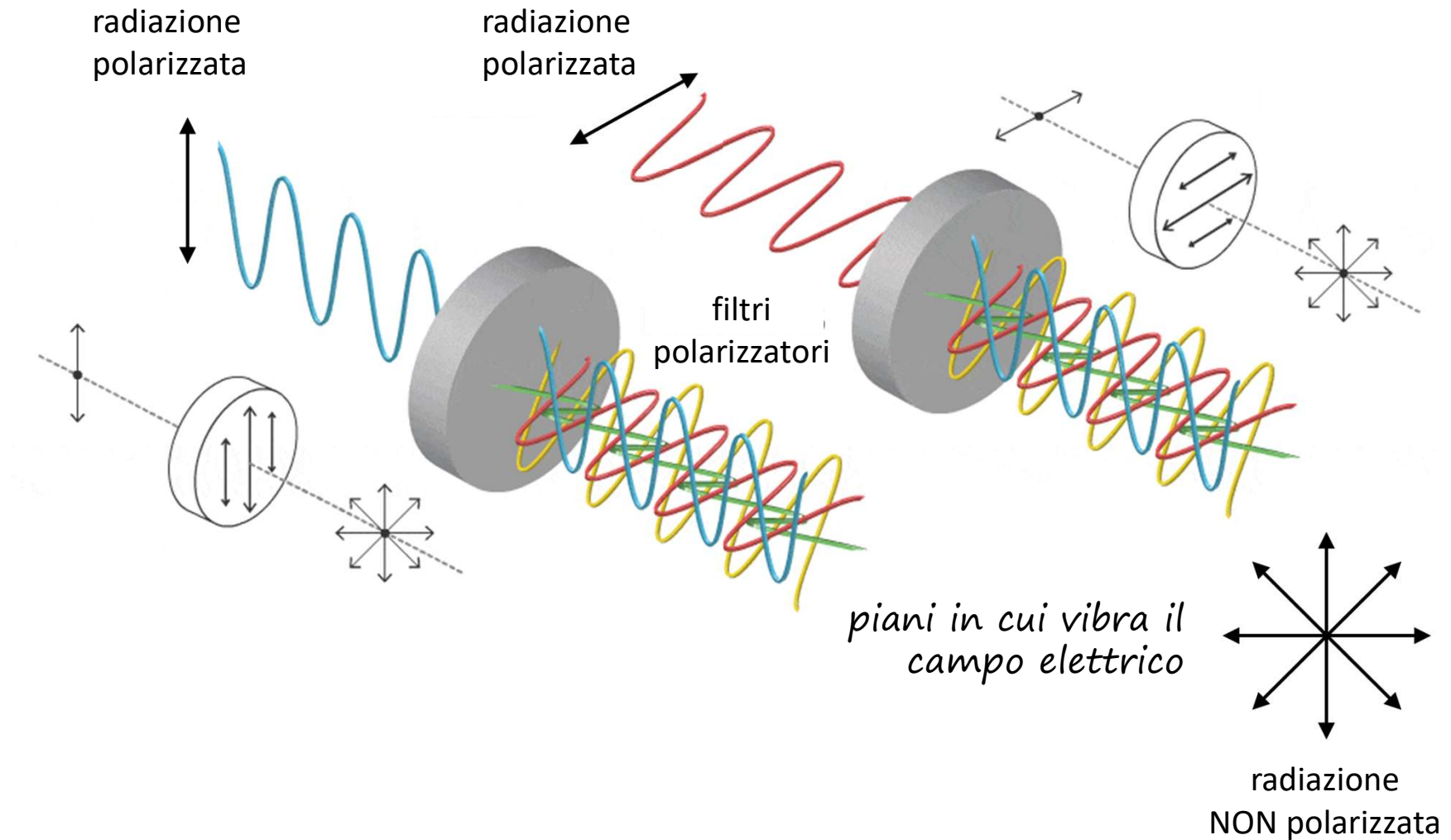




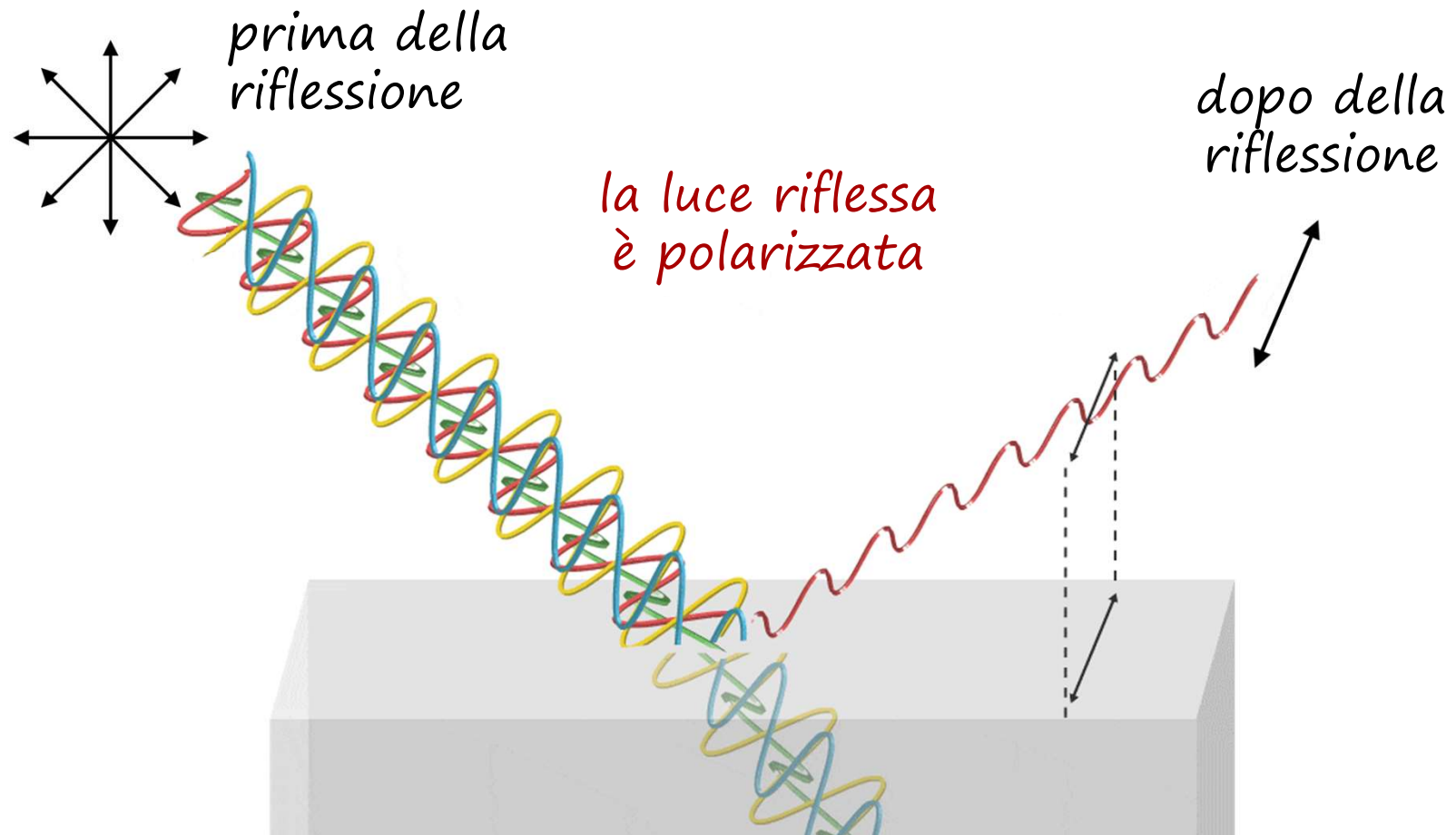
acido acetico
 CH_3COOH

polarizzazione della luce

*vibra in un
solo piano*



polarizzazione della luce

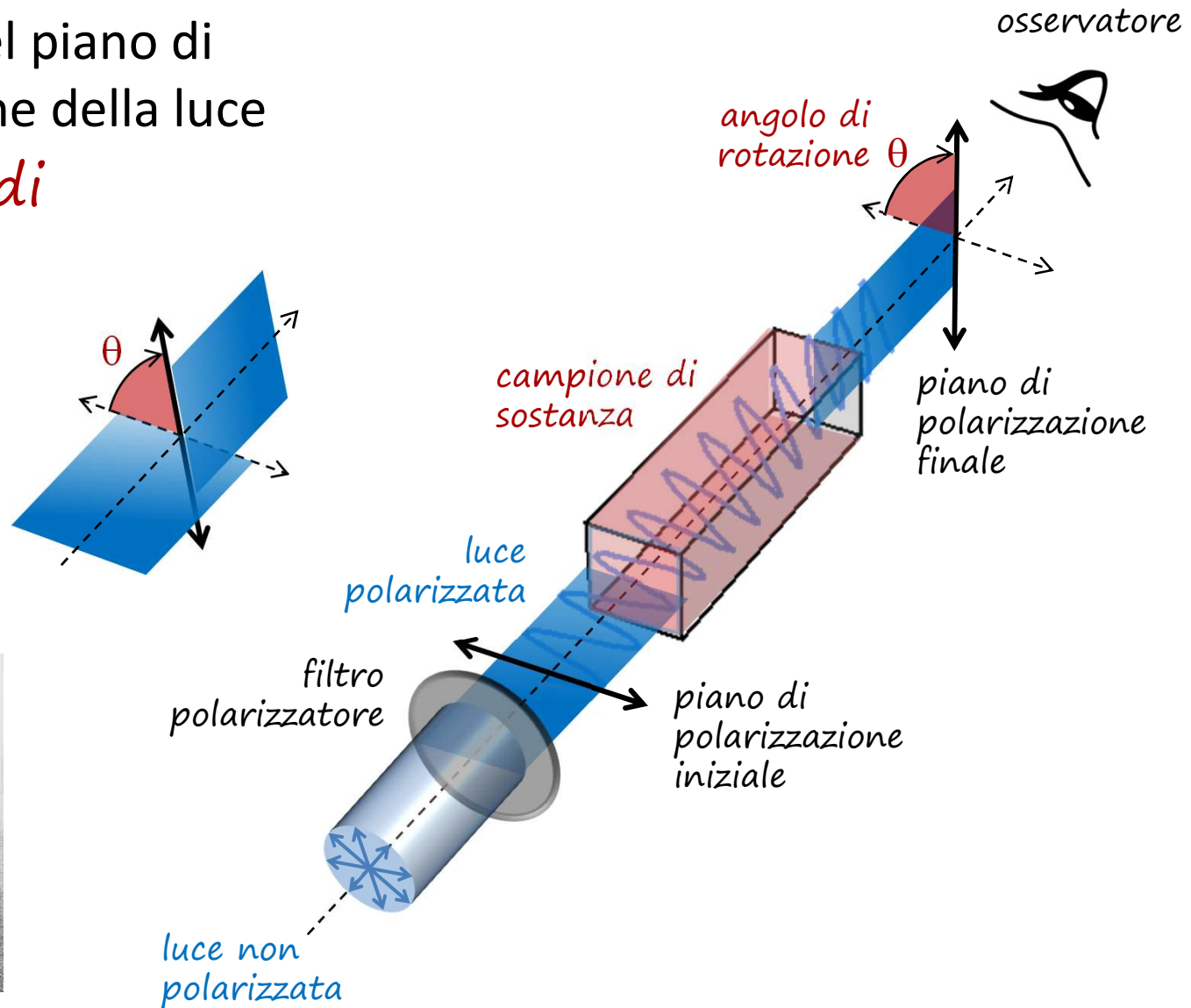


attività ottica

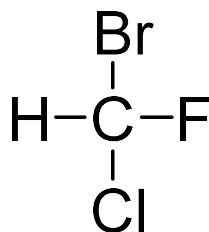
rotazione del piano di
polarizzazione della luce

*da parte di
alcune
sostanze*

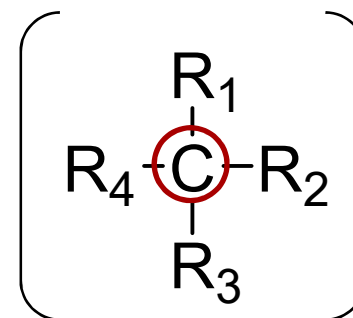
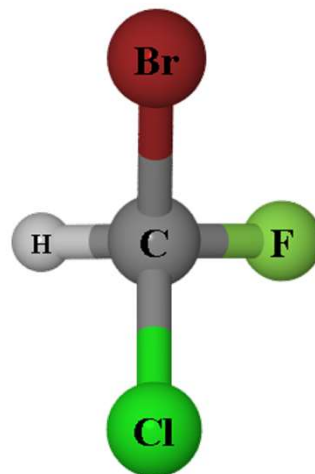
J.B. Biot



isomeria ottica



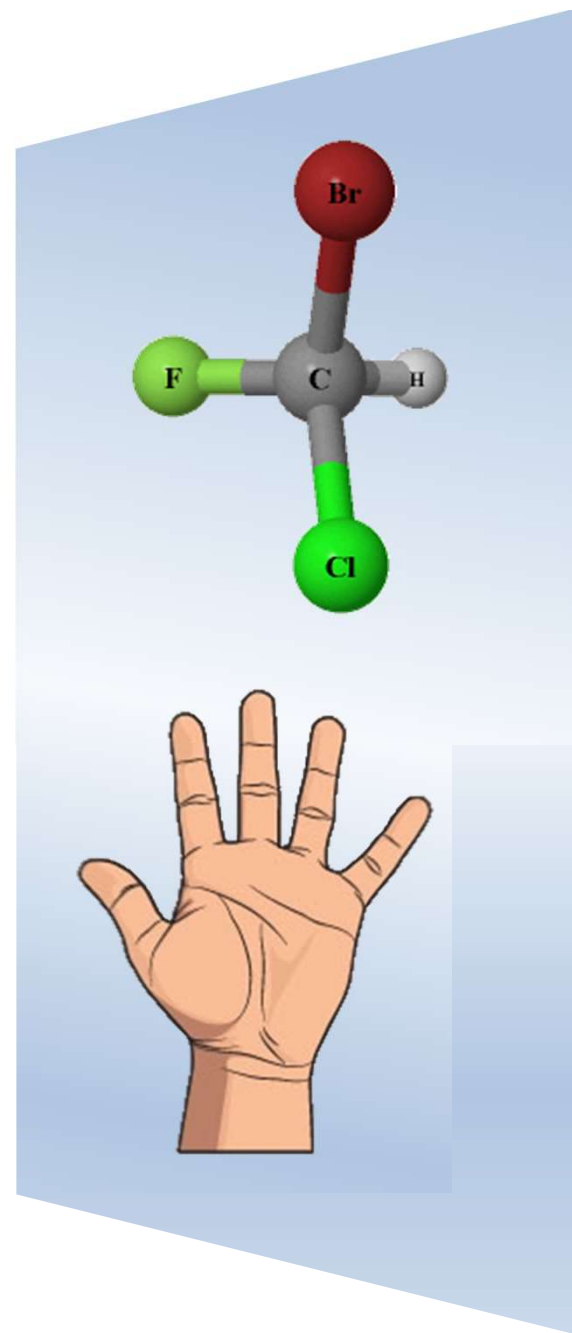
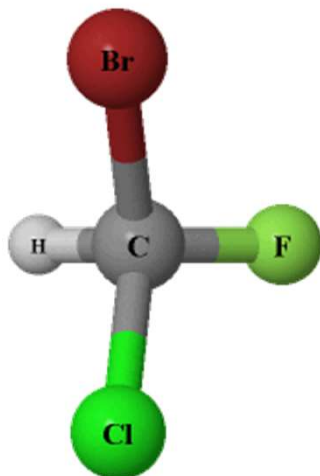
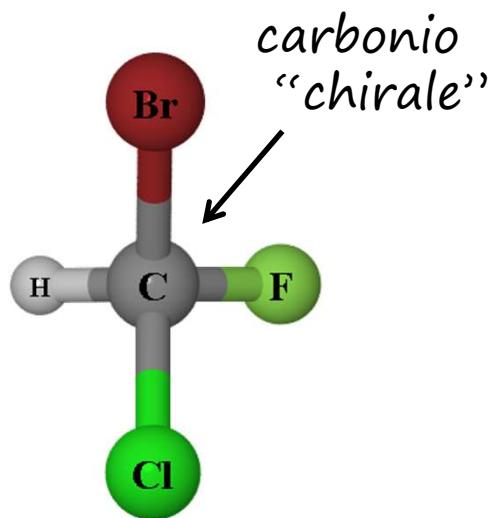
(bromo-cloro-fluoro-metano)



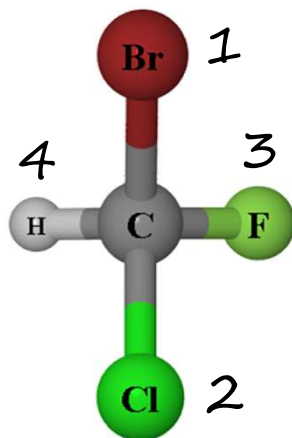
*carbonio
quaternario
legato a 4
sostituenti diversi*

isomeria ottica

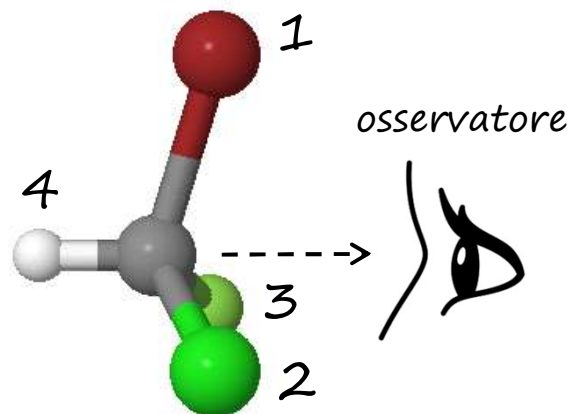
2 forme possibili
enantiomeri



isomeria ottica (*nomenclatura Cahn-Ingold-Prelog*)

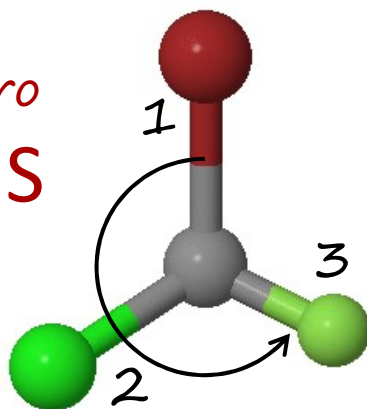


1. numera sostituenti in ordine decrescente di numero atomico

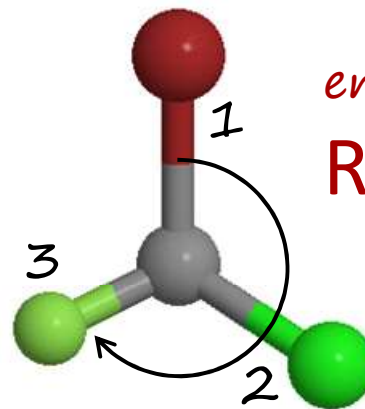


2. disporre sostituenti con numero più basso opposto all'osservatore

enantiomero
(lat. *Sinister*) **S**

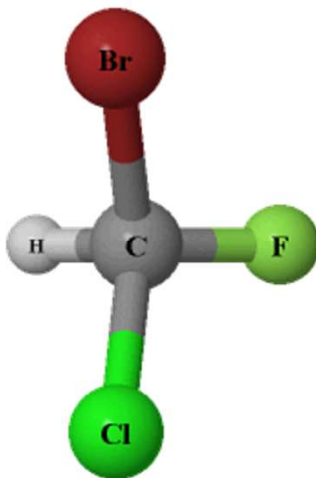


enantiomero
R (lat. *Rectus*)

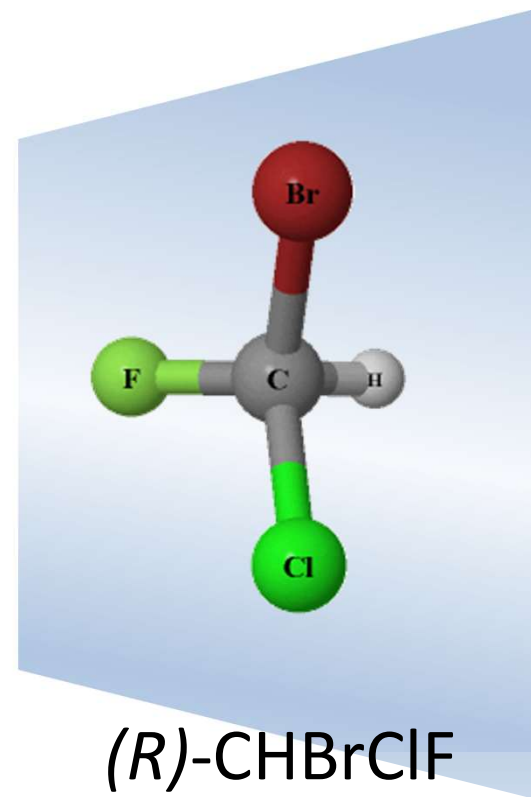


isomeria ottica

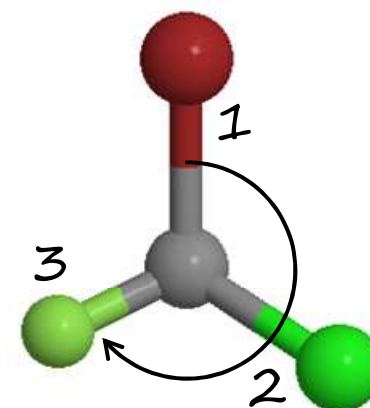
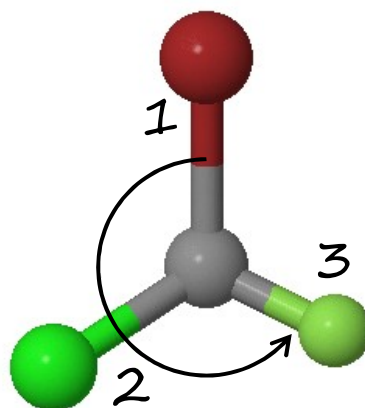
2 forme possibili
enantiomeri



(S)-CHBrClF

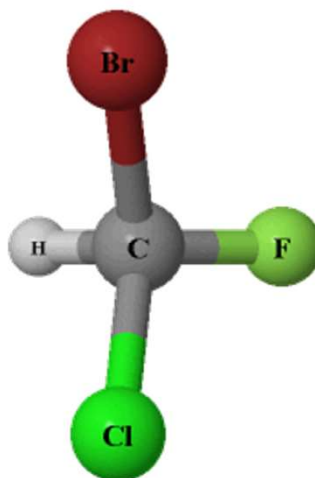


(R)-CHBrClF

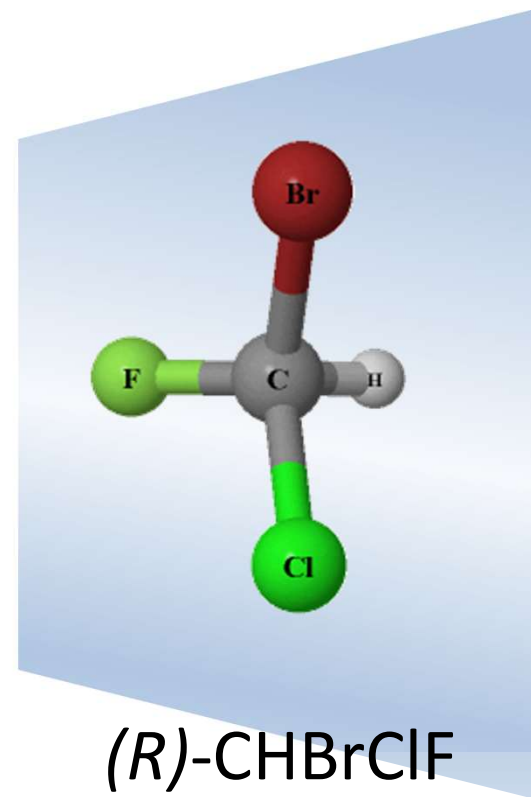


isomeria ottica

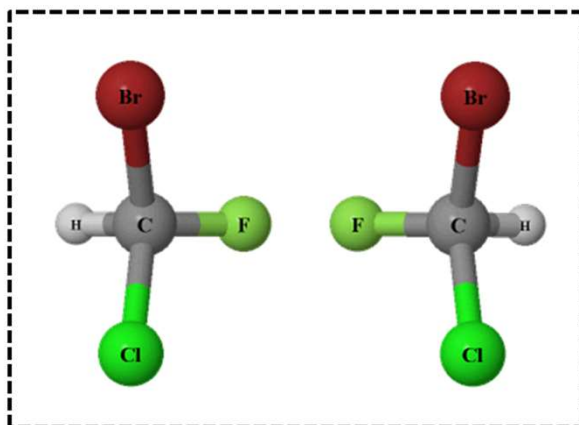
2 forme possibili
enantiomeri



(S)-CHBrClF

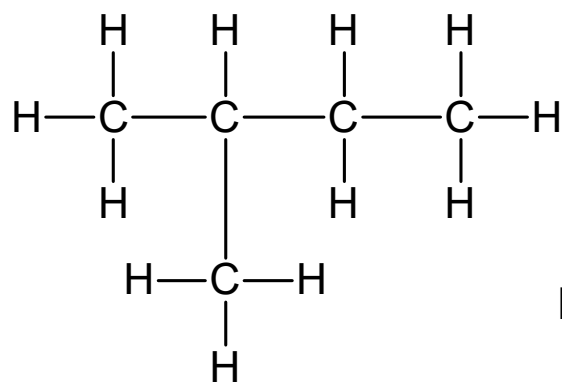


(R)-CHBrClF

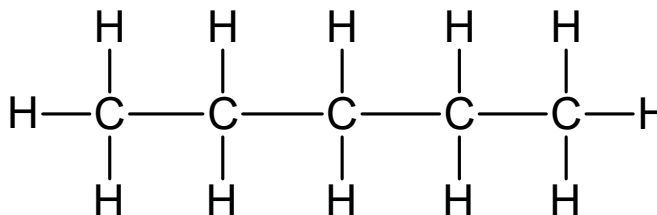


quando presenti
entrambe le forme:
'racemo'

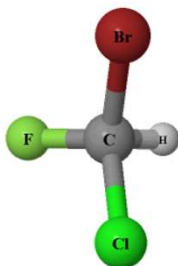
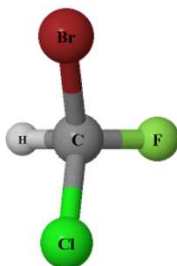
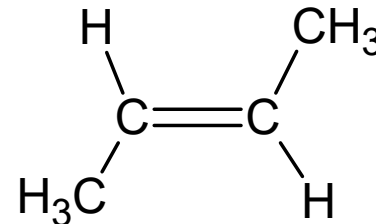
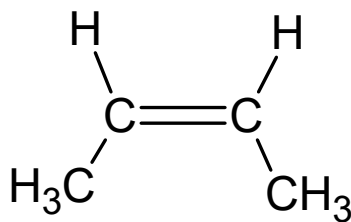
diversi tipi di isomeria



isomeria strutturale
(o costituzionale)



isomeria geometrica
(o cis-trans)

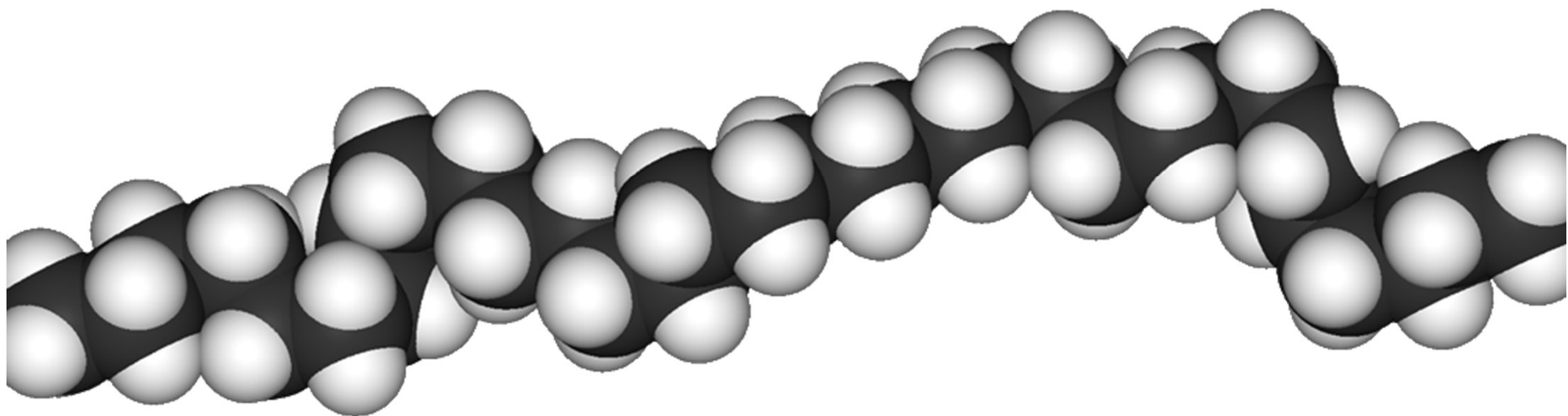
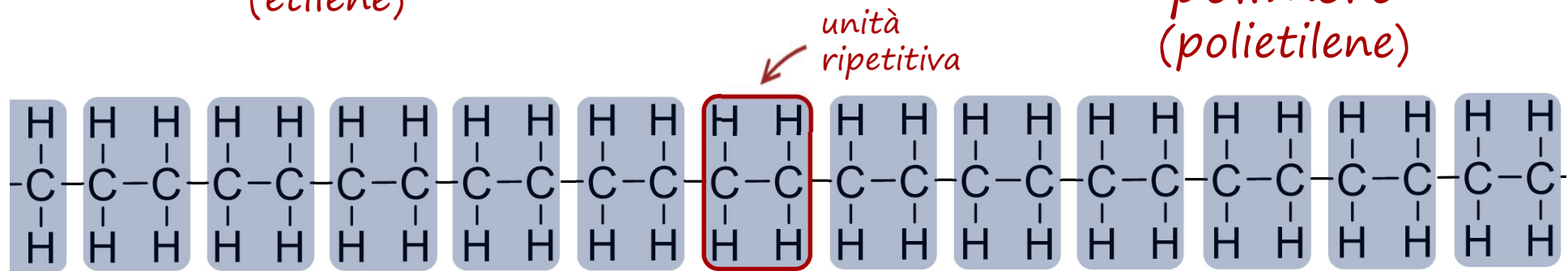
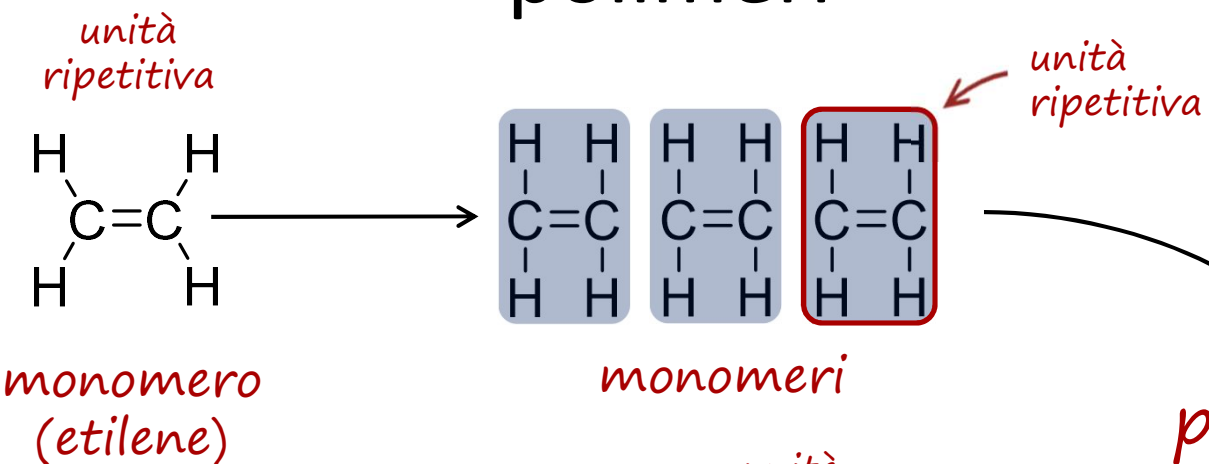


isomeria ottica

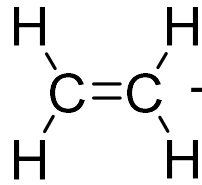
polimeri (*plastiche*)



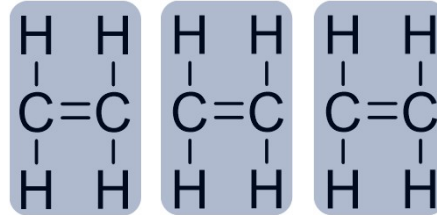
polimeri



polimeri

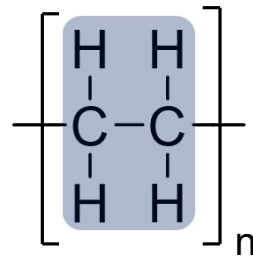
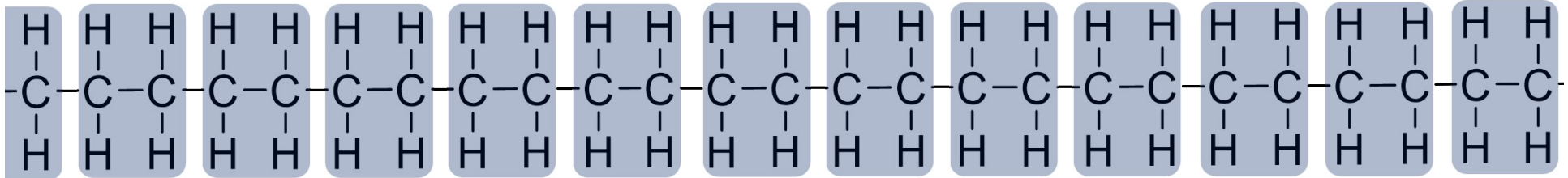


*monomero
(etilene)*



monomeri

*polimero
(polietilene)*

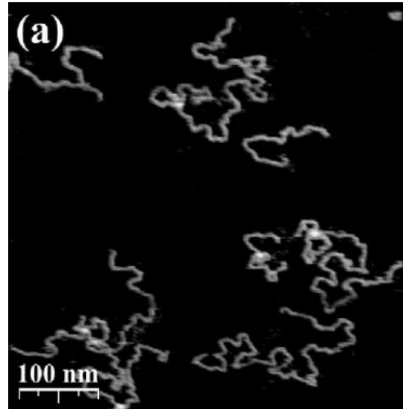


*polimero = ripetizione
unità monomeriche*

polimeri

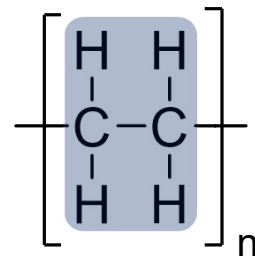
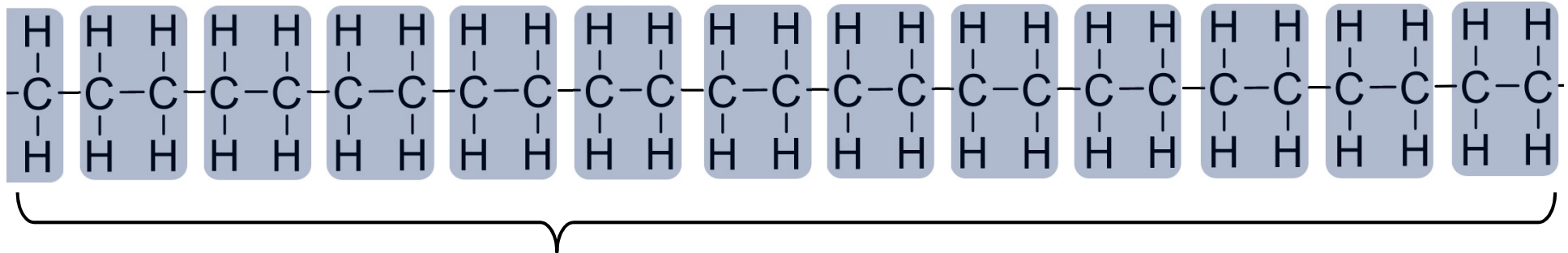
immagini
AFM
di polimeri

(Roiter et al Polymer 2006 47 2493)



catene anche con 200.000
unità monomeriche, con pesi
fino a 6.000.000 Da

polimero
(polietilene)



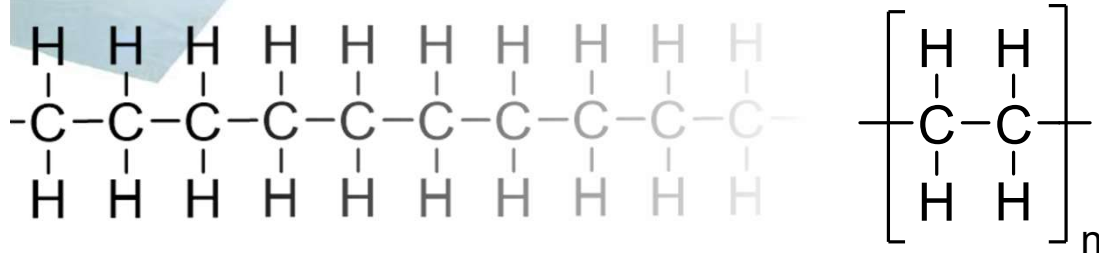
polimero = ripetizione
unità monomeriche

polimeri - classificazione





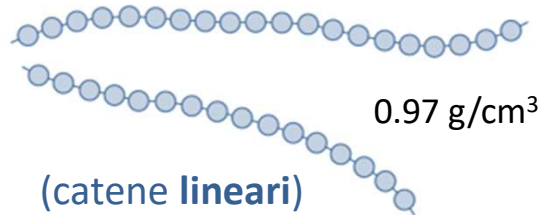
plastiche



polietilene

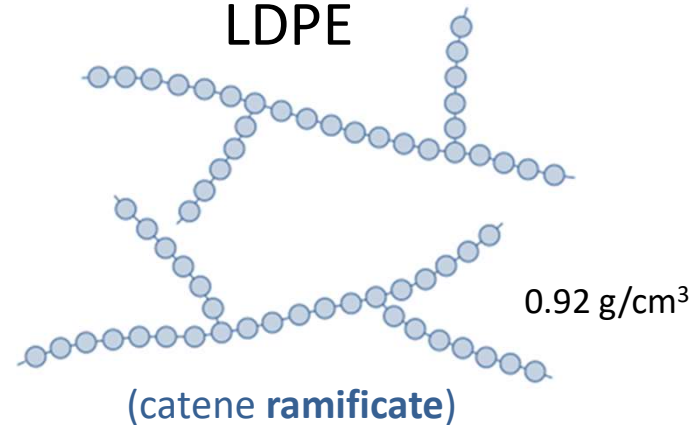
(High Density)

HDPE



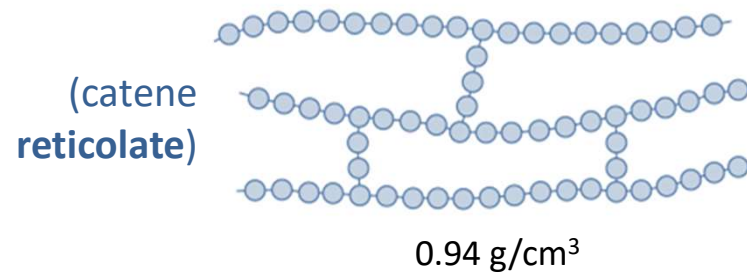
(Low Density)

LDPE



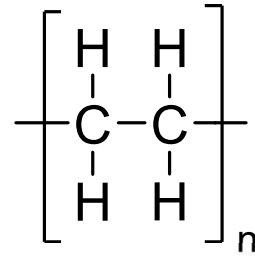
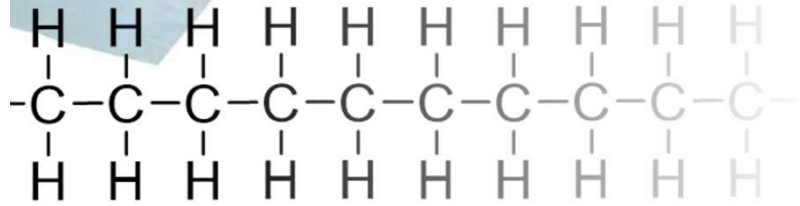
(Cross-Linked)

CLPE



proprietà
dipendono da
struttura

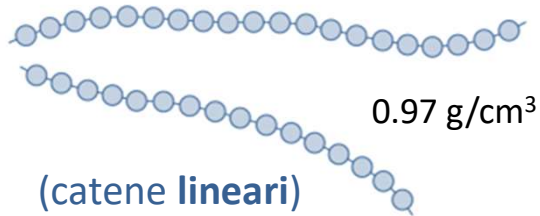
plastiche



polietilene

(High Density)

HDPE

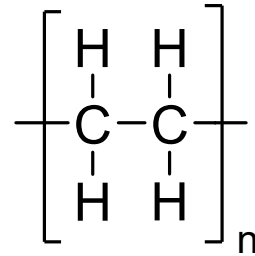
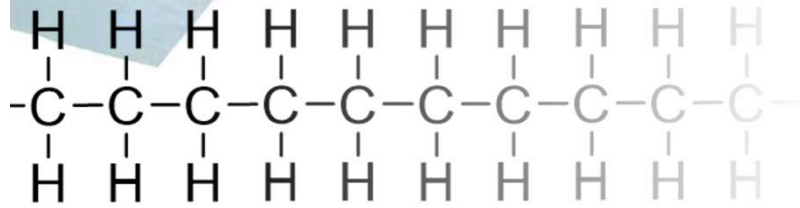


*più duro e
resistente*





plastiche



polietilene

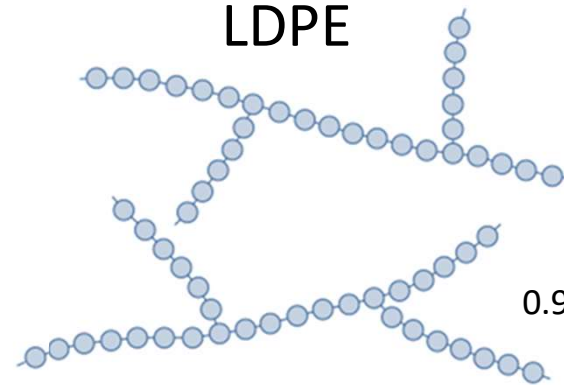


*più morbido
e flessibile*



(Low Density)

LDPE

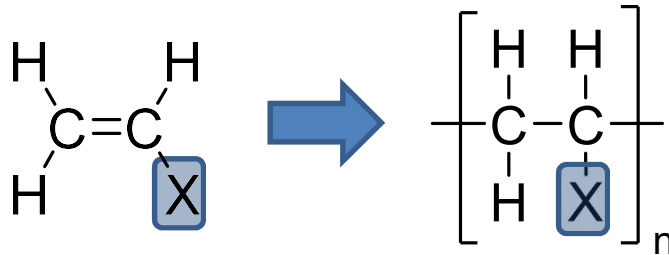


0.92 g/cm³

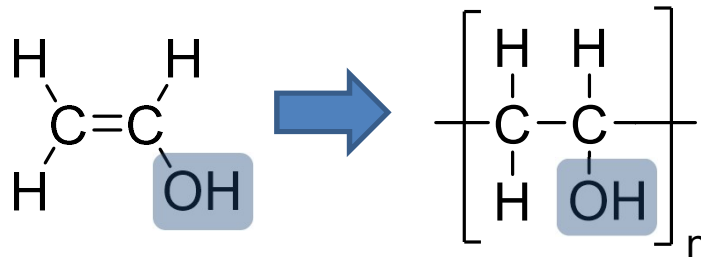
(catene **ramificate**)

plastiche

*derivati
dell'etilene*

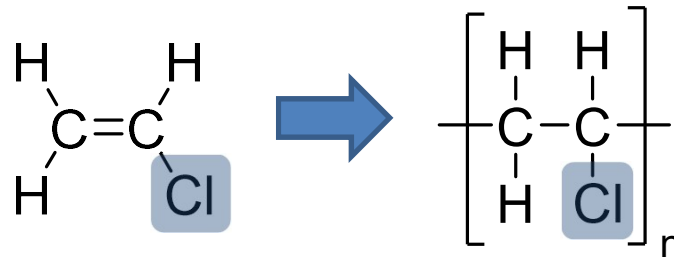


*alcol
vinilico*



*alcol
polivinilico*

*cloruro
di vinile*

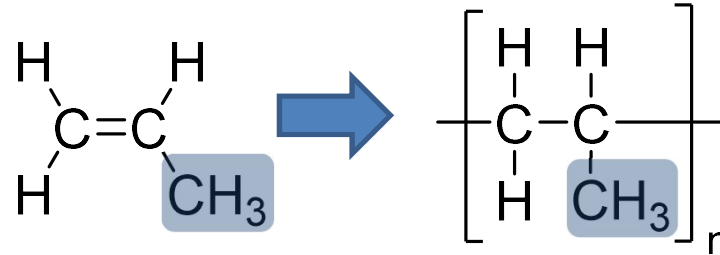


*polivinilcloruro
(PVC)*

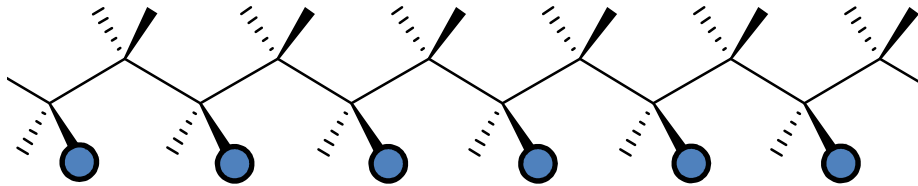


plastiche

propilene



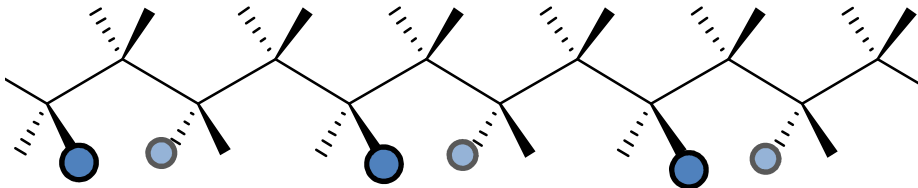
polipropilene
(PP)



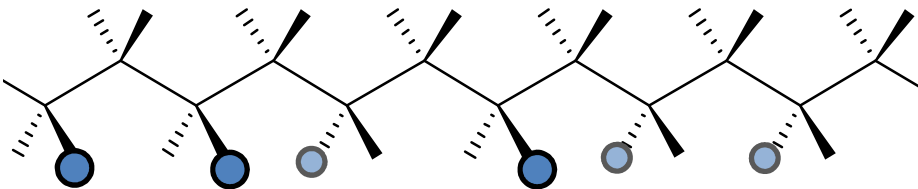
isotattico

T_{fus} più alta
migliori
proprietà
meccaniche

polimeri
STEREOREGOLARI



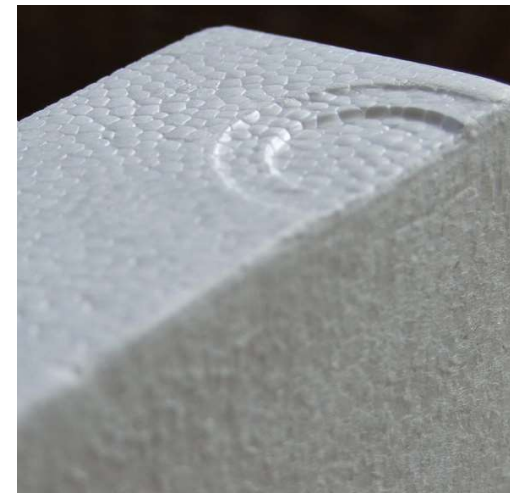
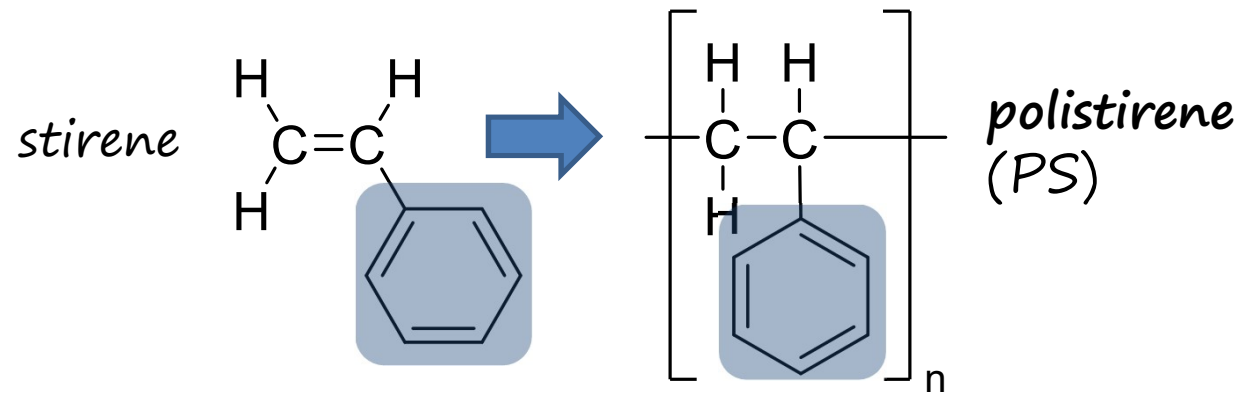
sindiotattico



atattico



plastiche



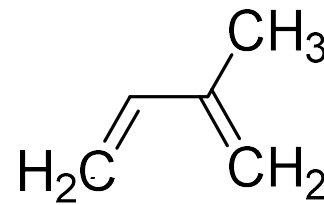
(polistirolo espanso)

elastomeri (o gomme)

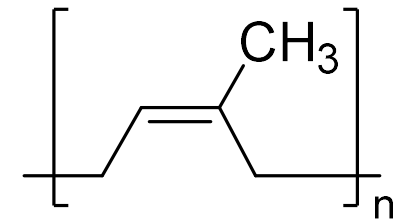
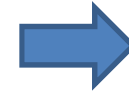
← si deformano quando sottoposti a carico per poi riassumere forma originale



caucciù
(gomma naturale)



isoprene



cis-poliisoprene

utilizzo limitato:
poco resistente,
morbida e appiccicosa,
dura e fragile a basse T

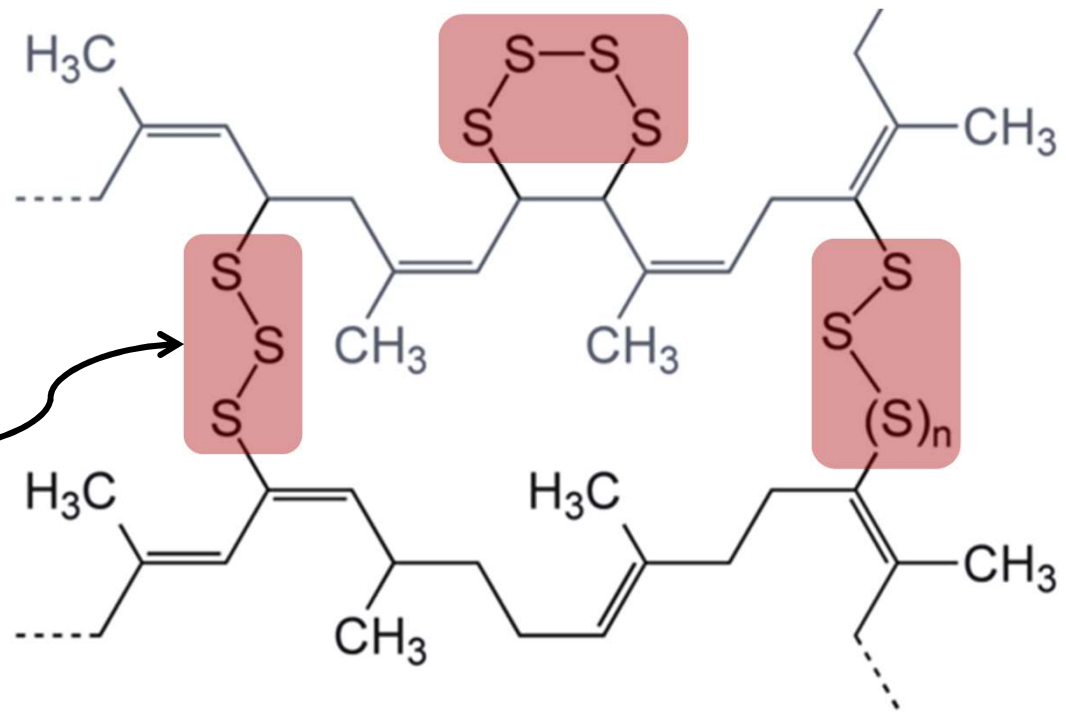
elastomeri



Charles Goodyear

vulcanizzazione
(1839)

*formazione
ponti solfuro*



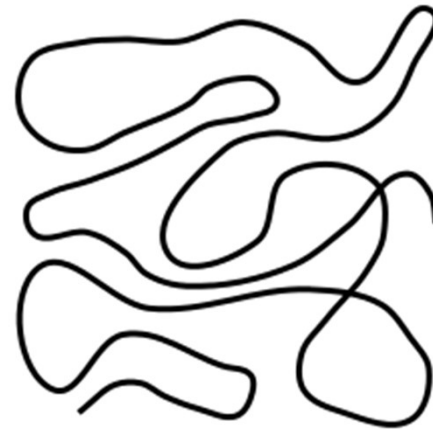
elastomeri



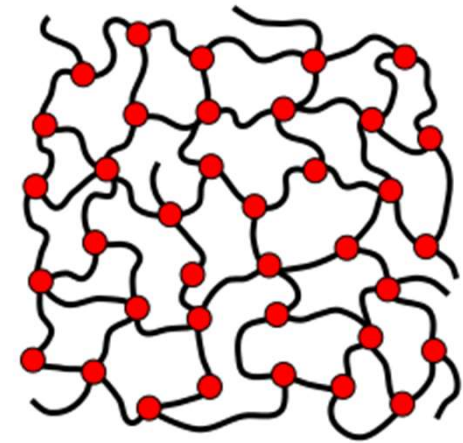
Charles Goodyear

*formazione
ponti solfuro*

vulcanizzazione
(1839)



catene lineari

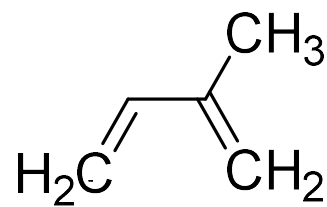


catene reticolate
(● = ponti solfuro)

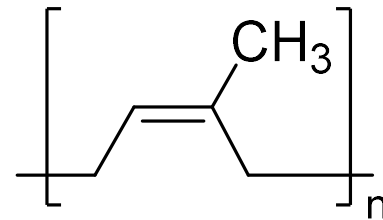
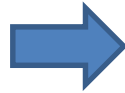
*più duro e
resistente!*

elastomeri

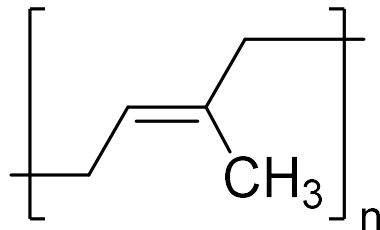
*oggi cis-poliisoprene prodotto sinteticamente
(produzione annua in milioni di tonnellate)*



isoprene



cis-poliisoprene



trans-poliisoprene

*guttaperca
(origine naturale)*

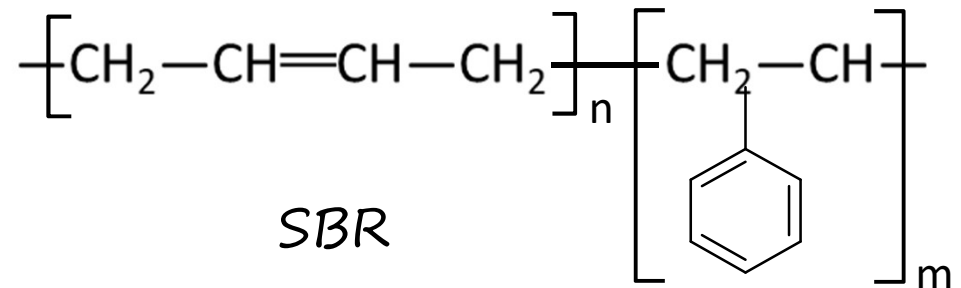
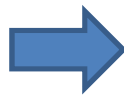
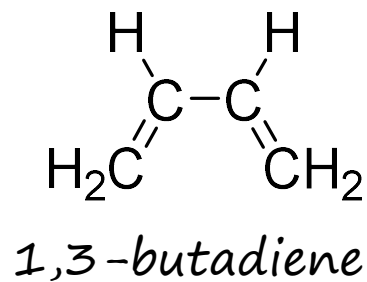
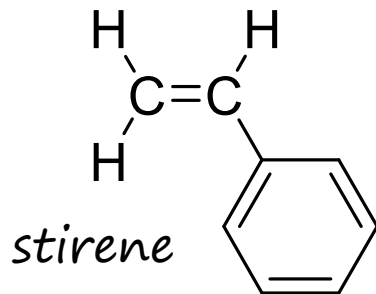
elastomeri



*formati da 2 o
più monomeri*

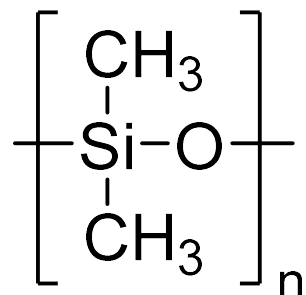
co-polimeri

*gomma stirene
butadiene (SBR)*



*più importante gomma
sintetica oggi*

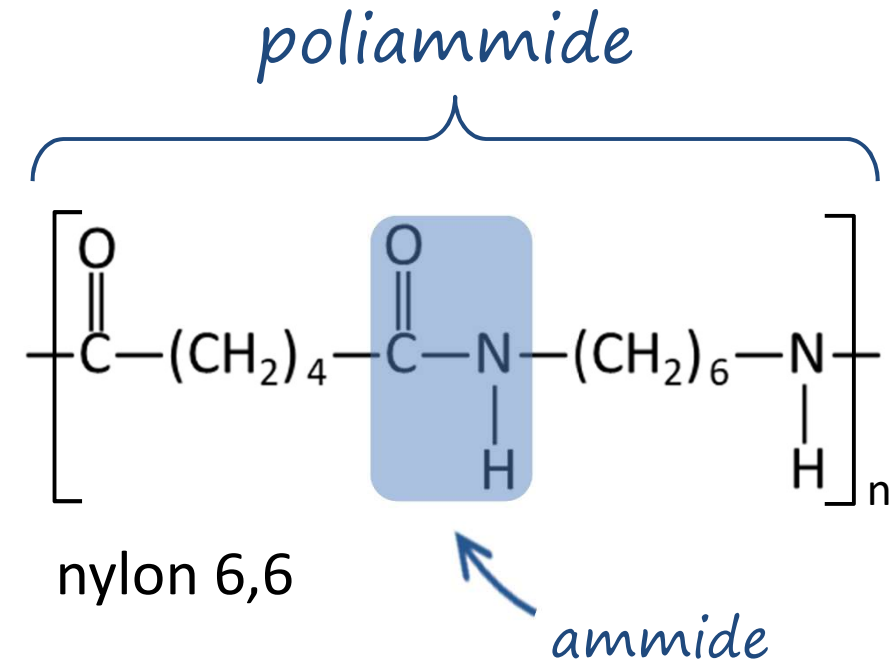
elastomeri



polisilossani
(siliconi, gomme siliconiche)

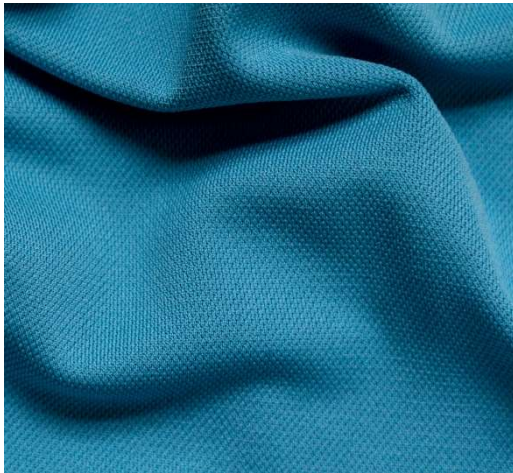
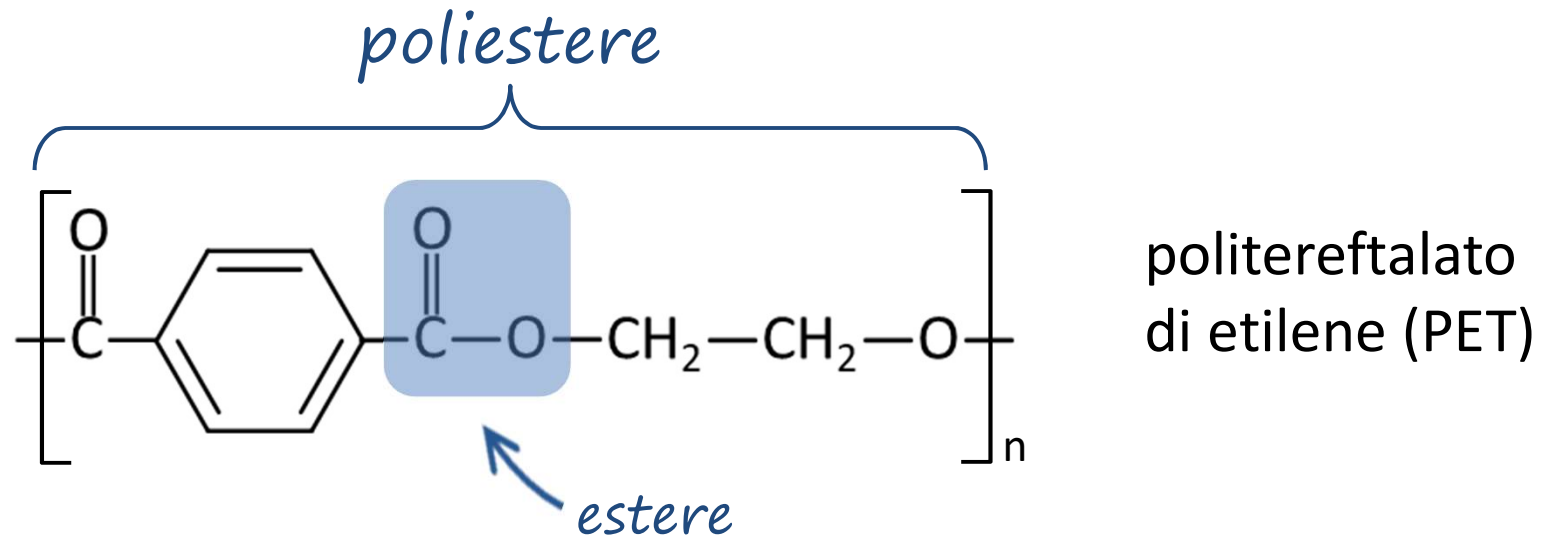


fibre polimeriche



*le poliammidi sono fibre
particolarmente resistenti*

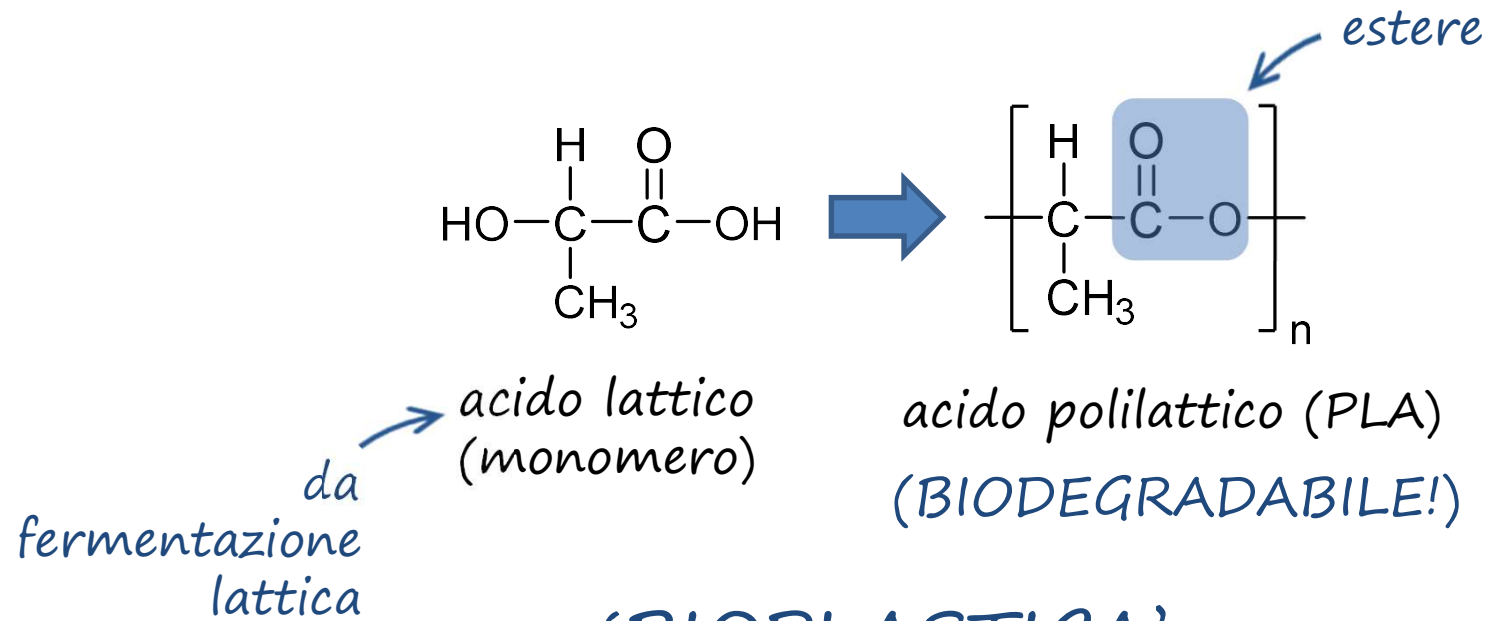
fibre polimeriche



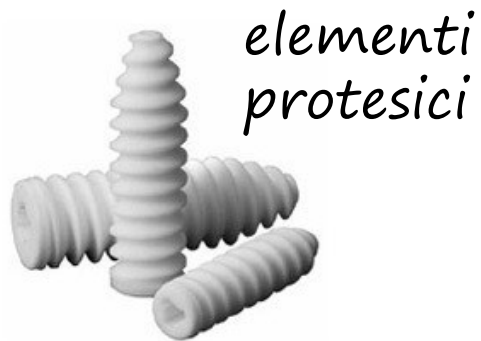
*PET ottimo sia come
fibra che come materia
plastica*

acido polilattico

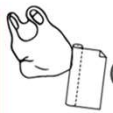
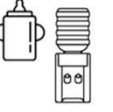
(un poliestere interessante)



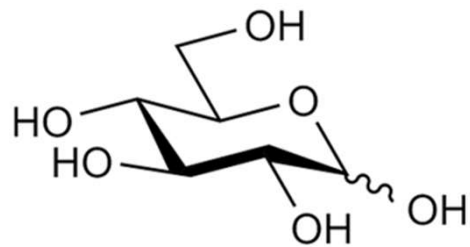
'BIOPLASTICA'



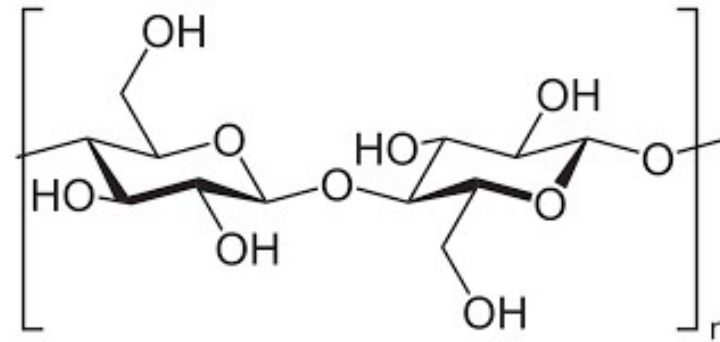
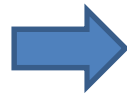
polimeri e *riciclo*

Symbol	Polymer	Common Uses	Properties	Recyclable?
 PETE	Polyethylene terephthalate	 Plastic bottles (water, soft drinks, cooking oil)	Clear, strong and lightweight	Yes; widely recycled
 HDPE	High-density polyethylene	 Milk containers, cleaning agents, shampoo bottles, bleach bottles	Stiff and hardwearing; hard to breakdown in sunlight	Yes; widely recycled
 PVC	Polyvinyl chloride	 Plastic piping, vinyl flooring, cabling insulation, roof sheeting	Can be rigid or soft via plasticizers; used in construction, healthcare, electronics	Often not recyclable due to chemical properties; check local recycling
 LDPE	Low-density polyethylene	 Plastic bags, food wrapping (e.g. bread, fruit, vegetables)	Lightweight, low-cost, versatile; fails under mechanical and thermal stress	No; failure under stress makes it hard to recycle
 PP	Polypropylene	 Bottle lids, food tubs, furniture, houseware, medical, rope, automobile parts	Tough and resistant; effective barrier against water and chemicals	Often not recyclable; available in some locations; check local recycling
 PS	Polystyrene	 Food takeaway containers, plastic cutlery, egg tray	Lightweight; structurally weak; easily dispersed	No; rarely recycled but check local recycling
 OTHER	Other plastics (e.g. acrylic, polycarbonate, polyactic fibres)	 Water cooler bottles, baby cups, fiberglass	Diverse in nature with various properties	No; diversity of materials risks contamination of recycling

biopolimeri

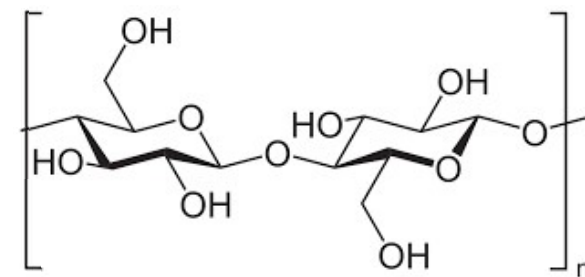
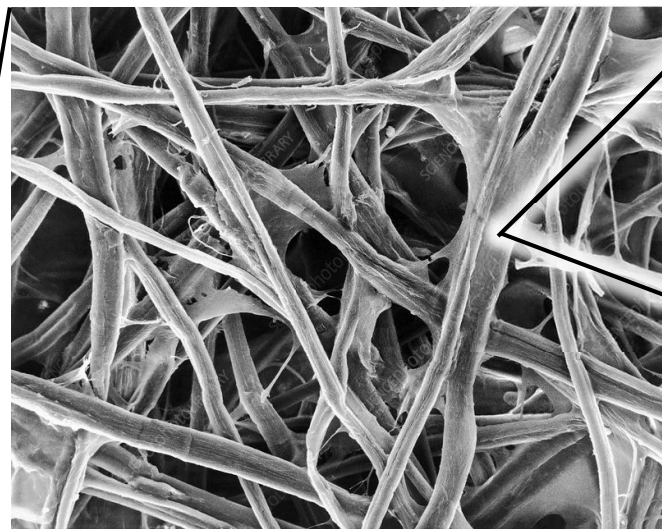


glucosio
(monomero)
(carboidrato)

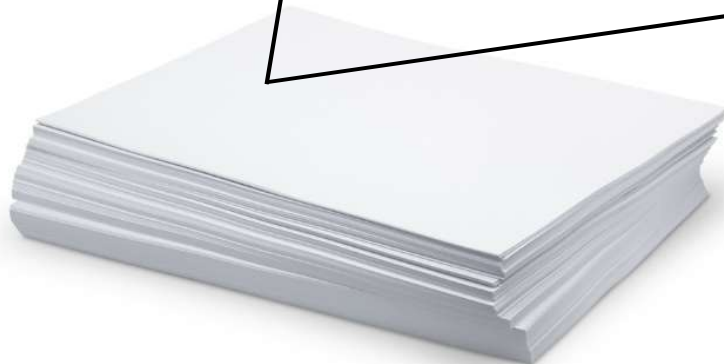


cellulosa
(polisaccaride)

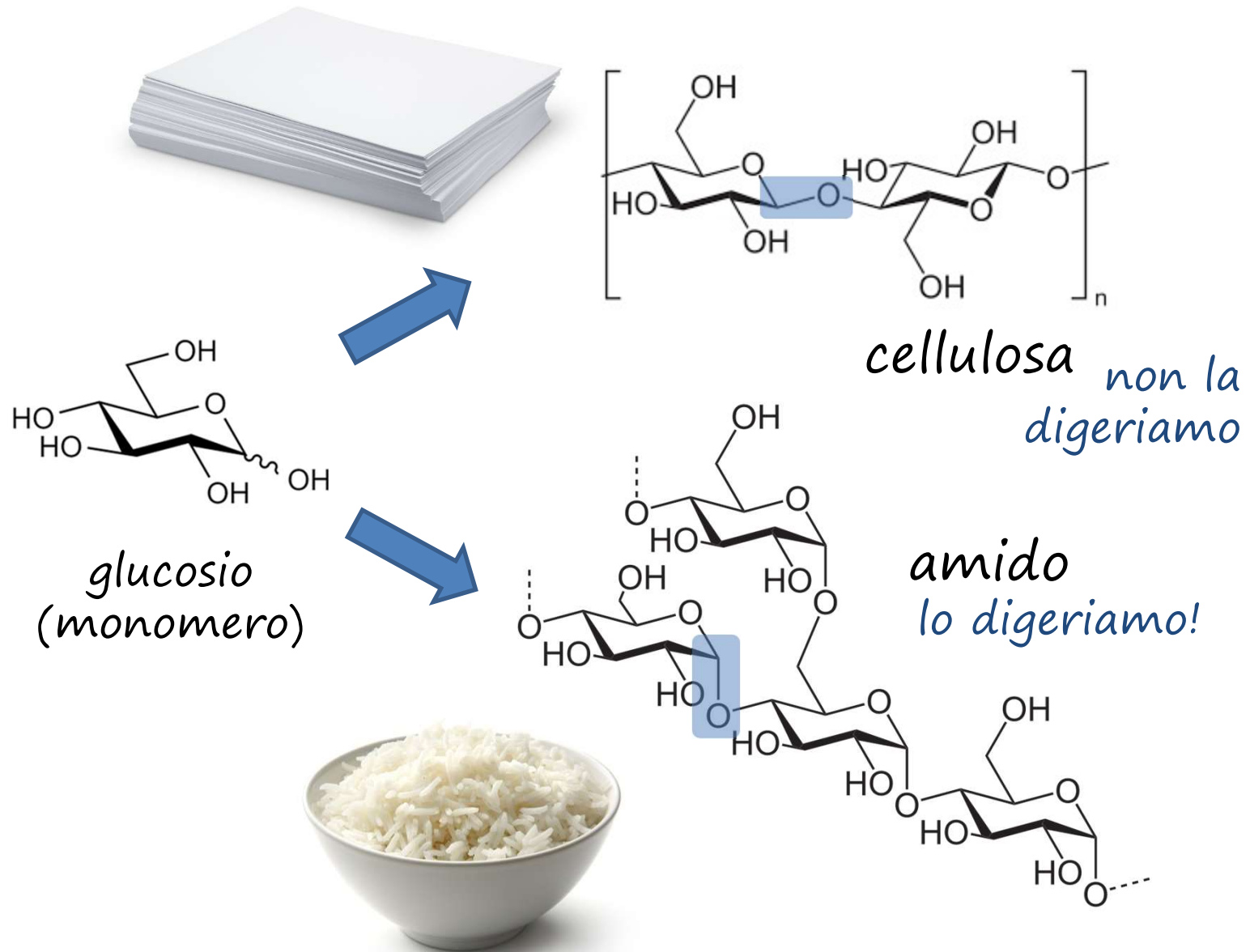
biopolimeri



*struttura
a fibre*

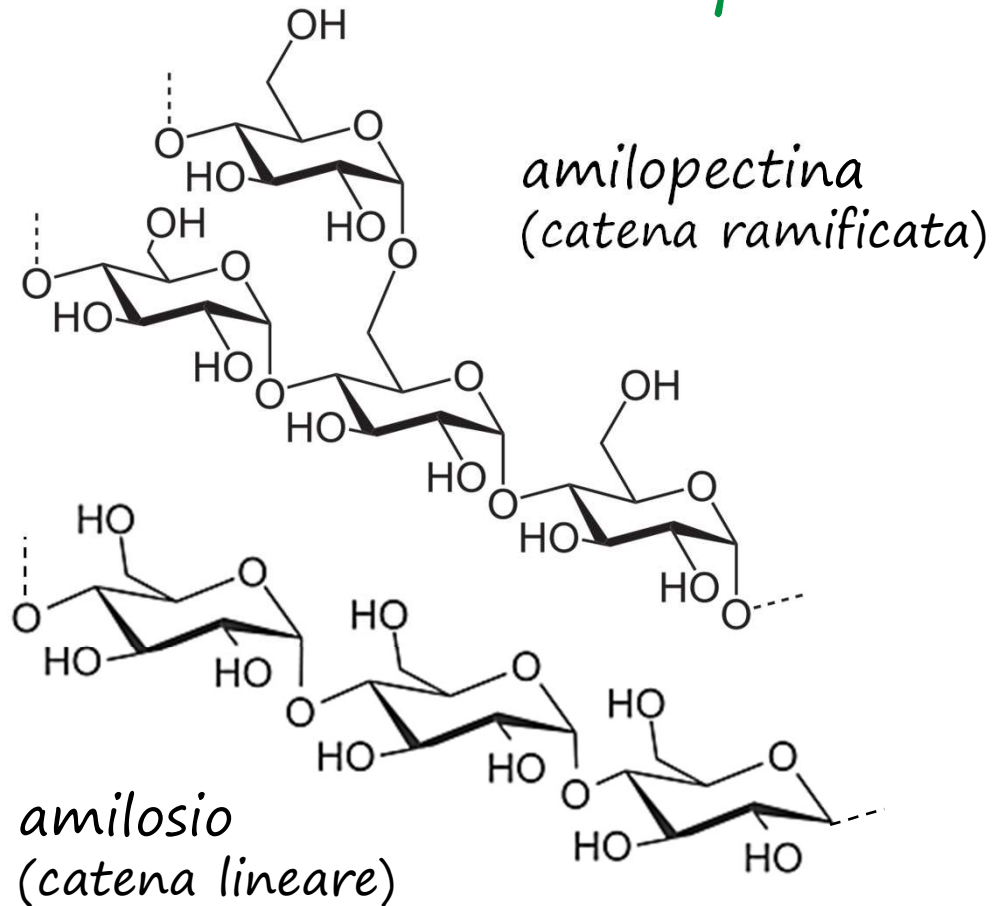


biopolimeri

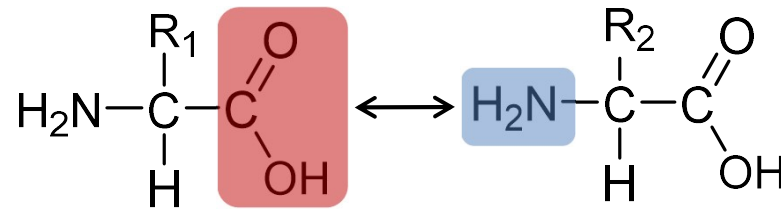


biopolimeri

bioplastiche

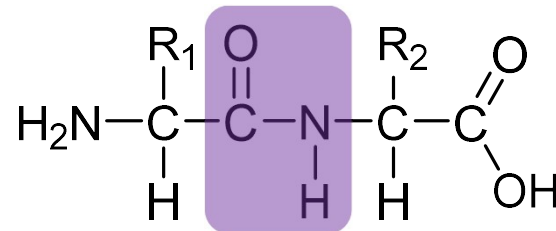


biopolimeri

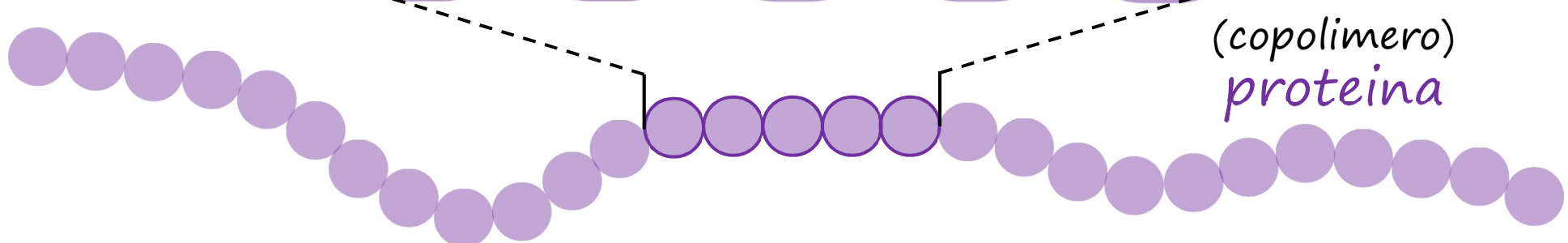
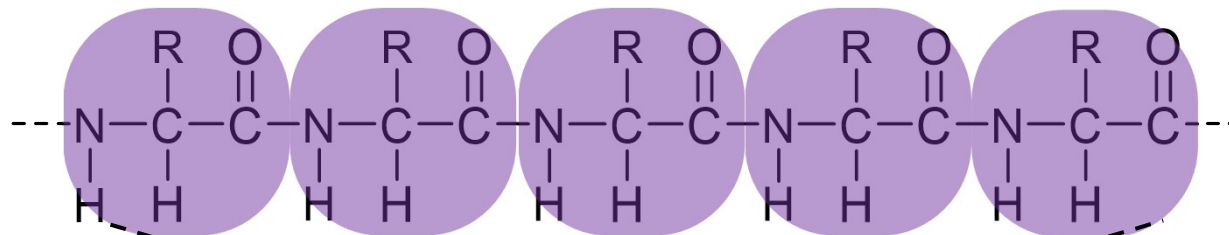


amino
acidi
(monomeri)

ce ne
sono 21
diversi

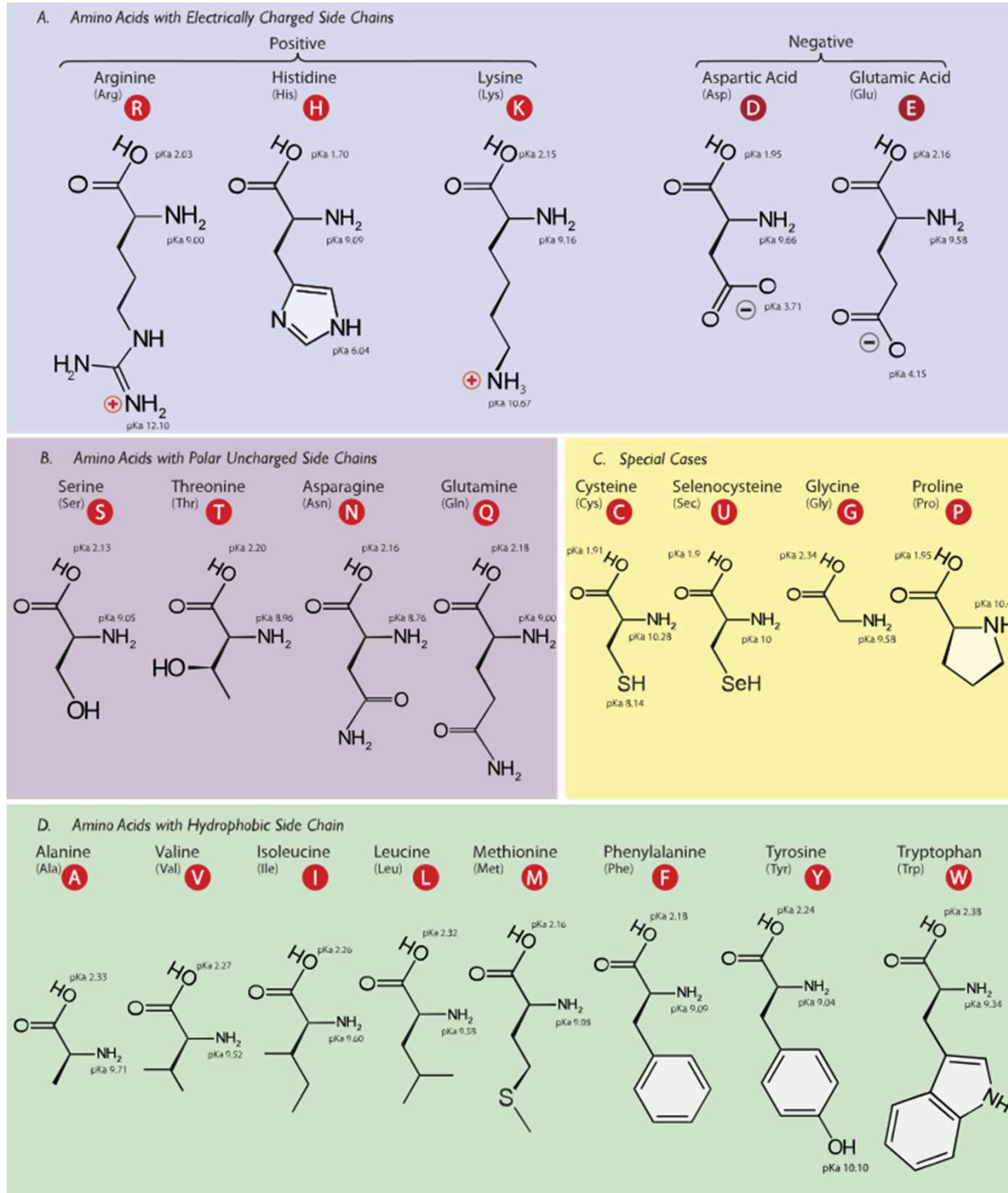


legame
peptidico
(ammidico)



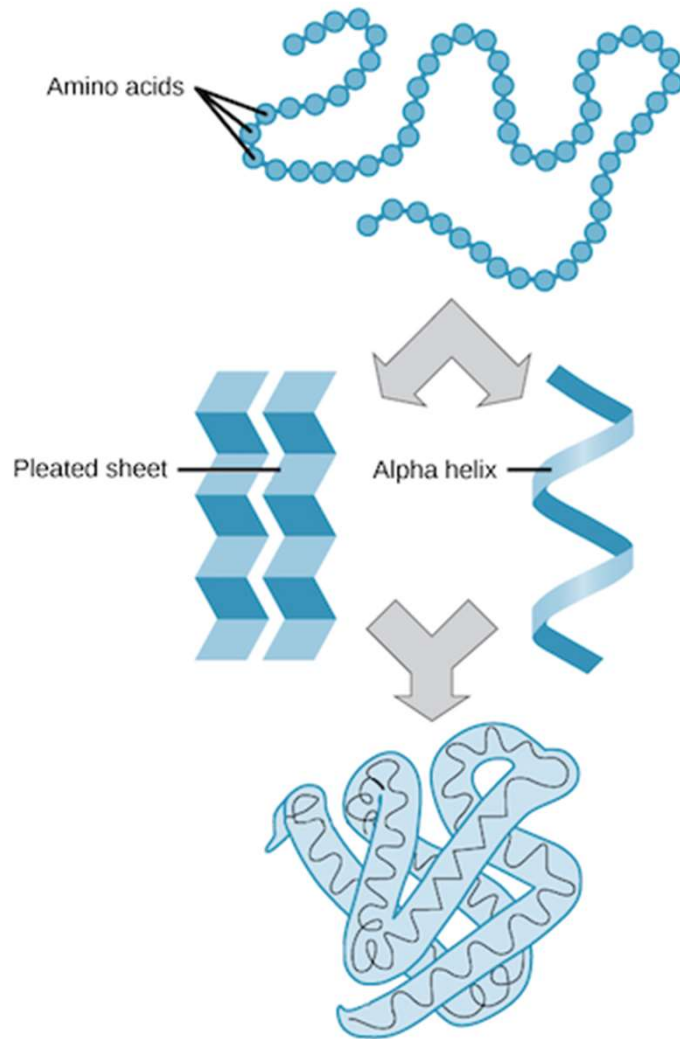
(copolimero)
proteina

biopolimeri



21
amino
acidi
principali

biopolimeri



sequenza di amino acidi



ripiegamento

struttura secondaria

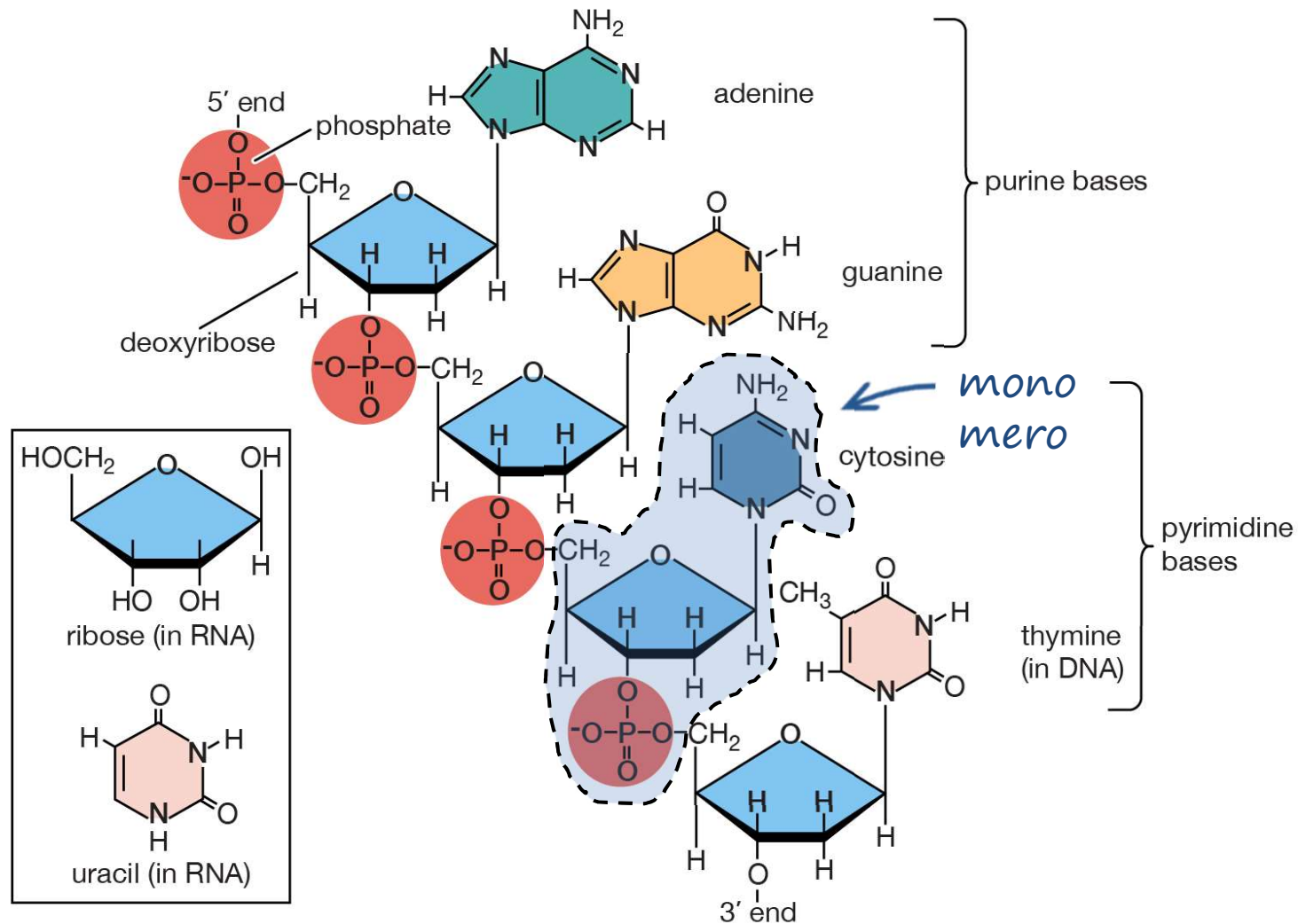


ripiegamento

struttura terziaria

biopolimeri

acidi nucleici (DNA, RNA) (copolimeri)



biopolimeri

