

Alcoli, Eteri e Tioli

Struttura di Alcoli, Eteri e Tioli



etanolo



dietilere




etantiolo

"tio" viene dal greco
θειον (theion) che vuol
dire zolfo

Nomenclatura degli Alcoli

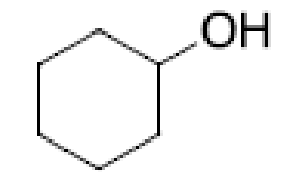
$\text{CH}_3\text{-OH}$
metanolo

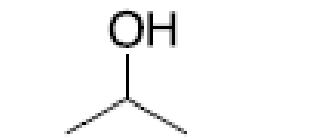

etanolo

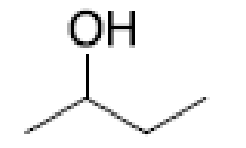

1-propanolo

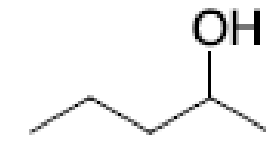

1-butanolo

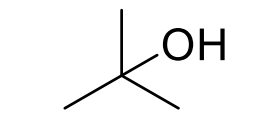

1-pentanololo

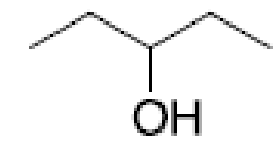

cicloesanololo


2-propanolo
(isopropanolo)

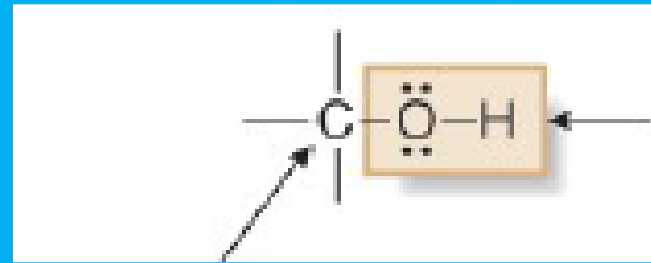

2-butanolo


2-pentanololo


tert-butanolo


3-pentanololo

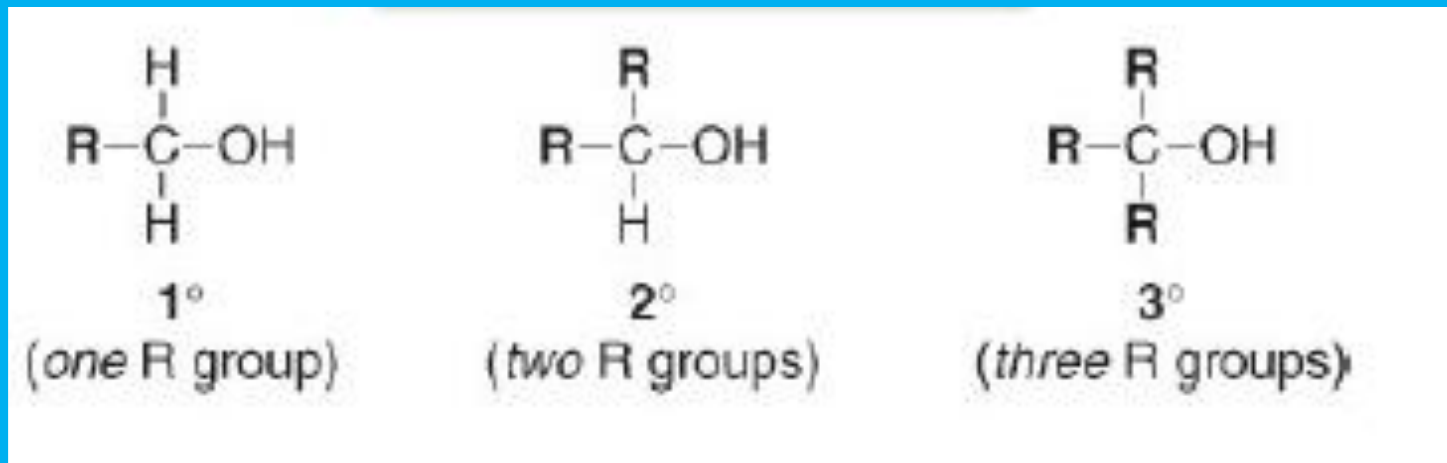
Alcoli



Gruppo ossidrilico

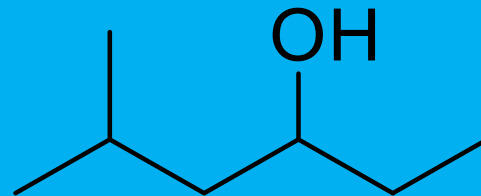
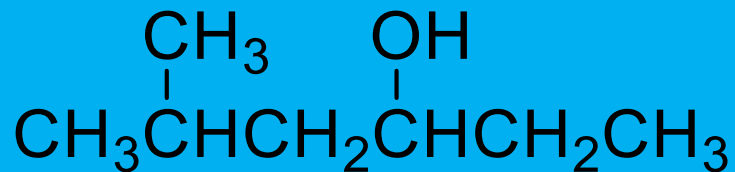
Carbonio ibridato sp^3

Classificazione degli alcoli



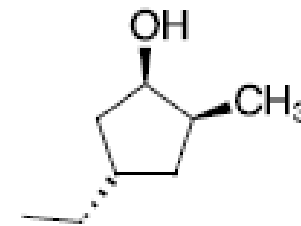
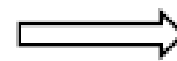
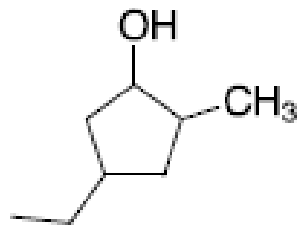
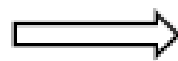
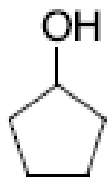
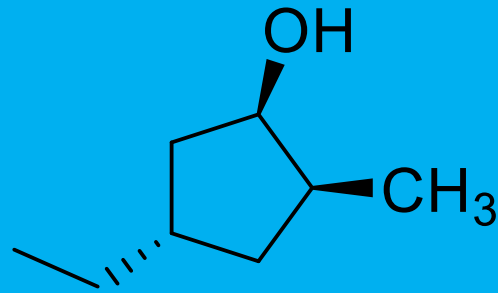
Alcoli primari, secondari e terziari

Nomenclatura degli alcoli



- 1) Trovare la catena carboniosa più lunga che contenga il gruppo ossidrilico: esano
- 2) Cambiare la desinenza in olo: esanolo
- 3) Numerare la catena in modo da assegnare al gruppo ossidrilico il numero più basso
- 4) Applicare le altre regole della nomenclatura

5-metil-3-esanolo



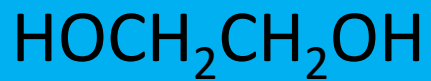
ciclopentanol

4-etil-2-metilciclopentanol

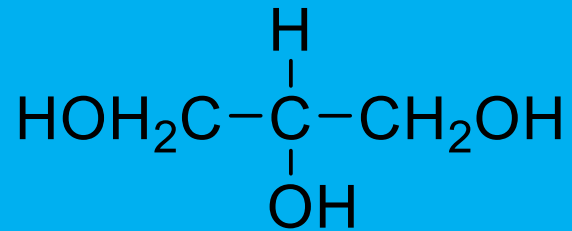
(1R,2S,4S)-4-etil-2-metilciclopentanol

Nomenclatura degli alcoli

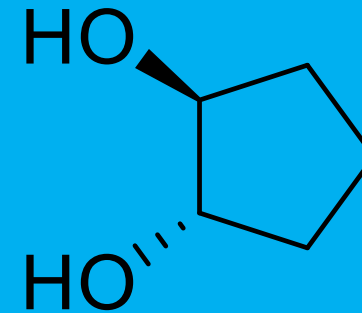
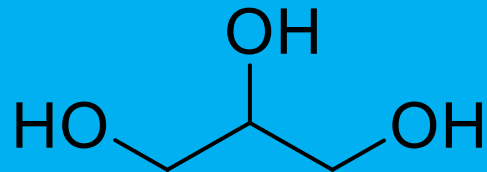
Composti con due gruppi ossidrilici sono detti dioli o glicoli.
Composti con tre gruppi ossidrilici sono detti trioli



Glicol etilenico
1,2-etandiolo

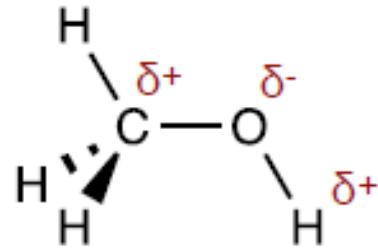


Glicerolo o glicerina
1,2,3-propantriolo

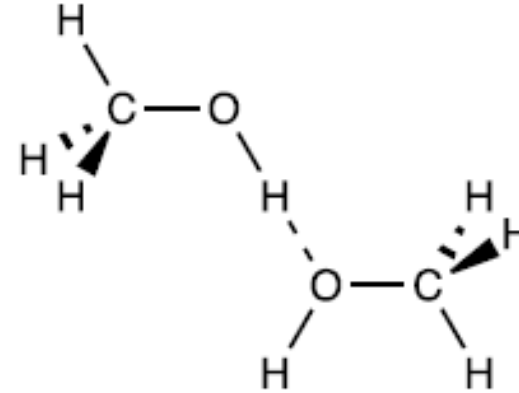


trans-1,2-ciclopentandiolo

Proprietà Fisiche



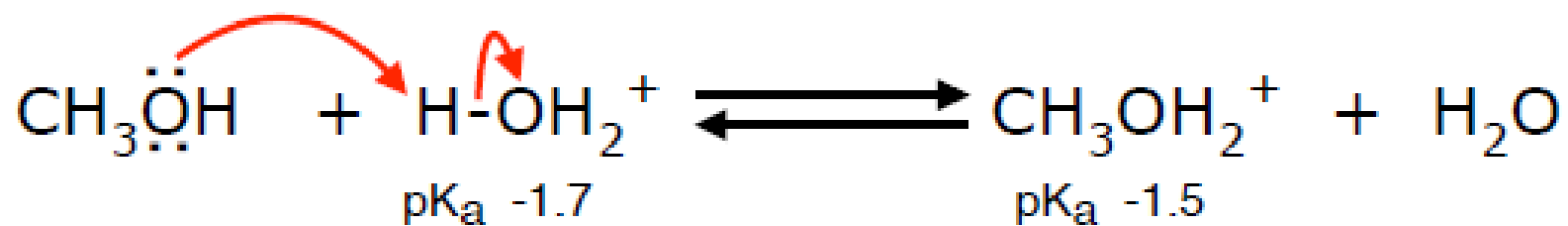
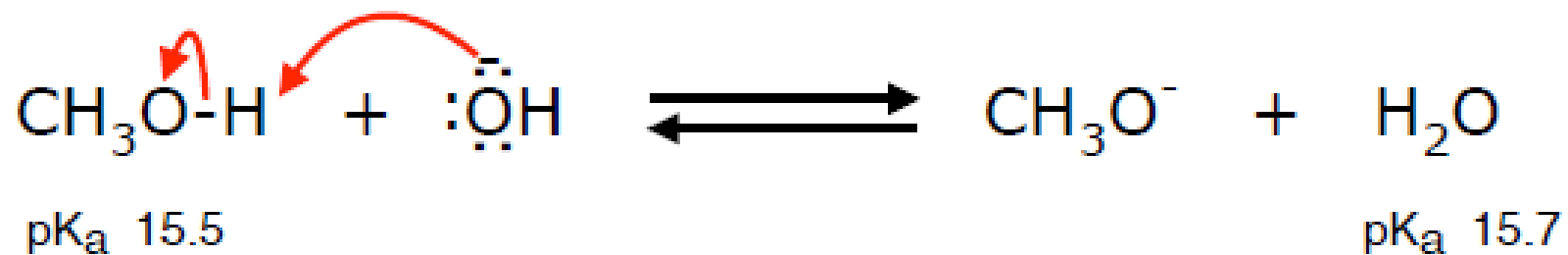
interazioni dipolo-dipolo



legami idrogeno

	esano	1-pentanol	2,4-butandiolo
peso molecolare	86	88	90
punto di ebollizione	69 °C	138 °C	230 °C
solubilità in H ₂ O	insolubile	parzialmente	completamente

Acidità e Basicità



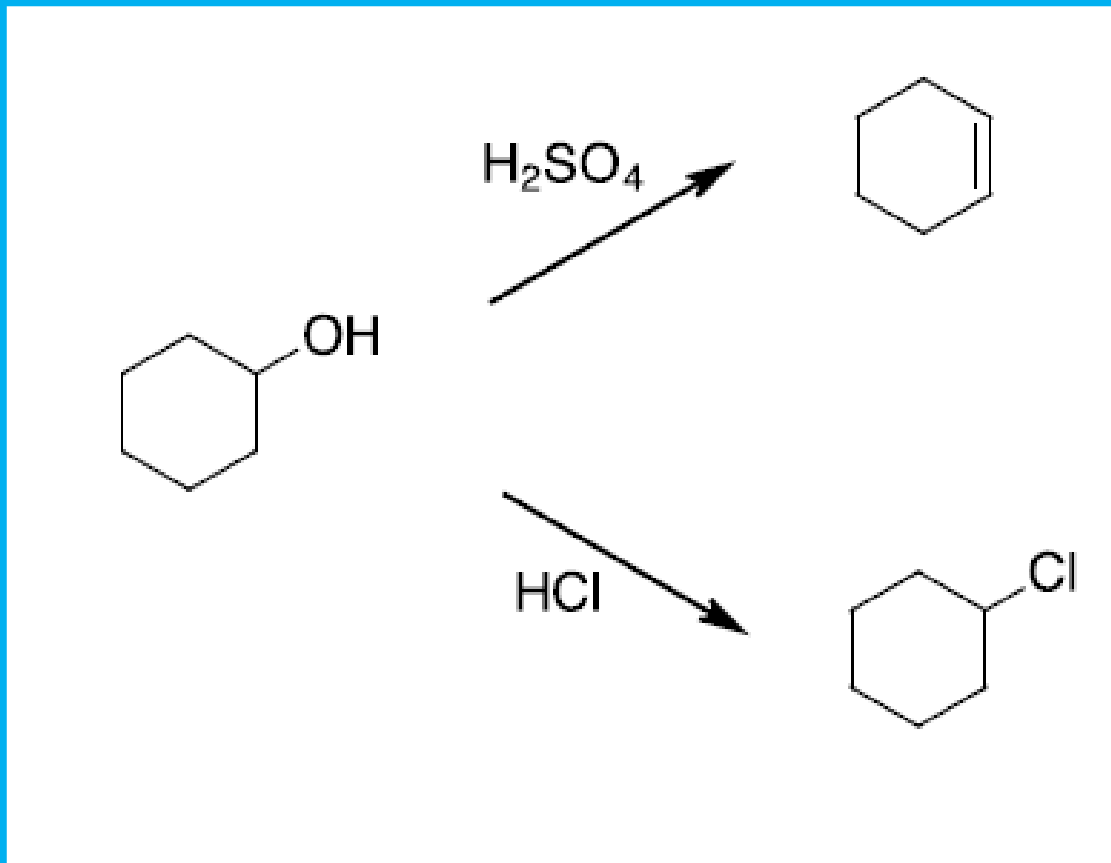
Sintesi degli alcossidi



Ossidoriduzione : quale specie si ossida e quale si riduce?

Reazioni degli alcoli

OH come gruppo uscente



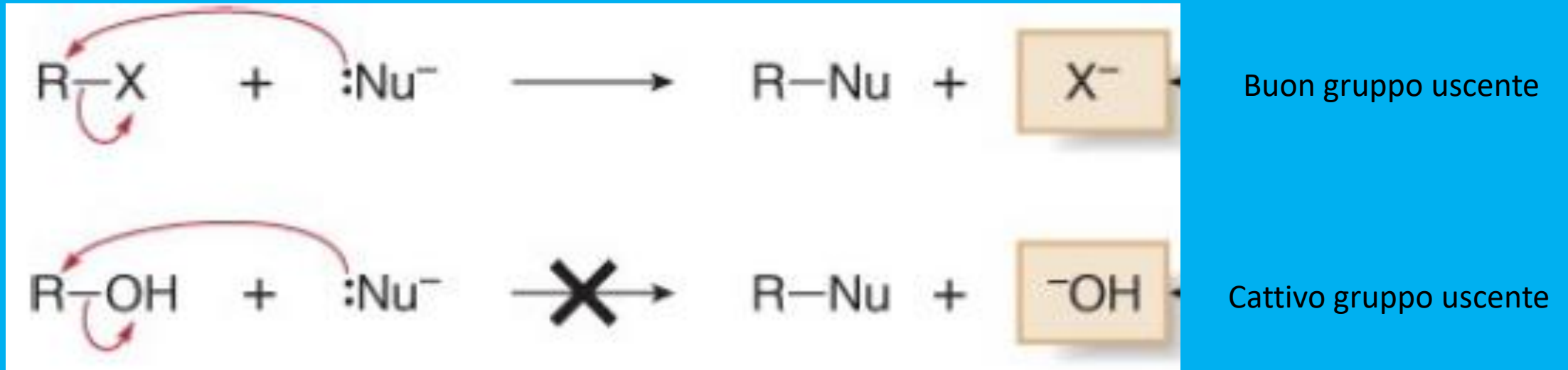
Eliminazione

Sostituzione

Reazioni degli alcoli

OH come gruppo uscente

- L' OH è un cattivo gruppo uscente



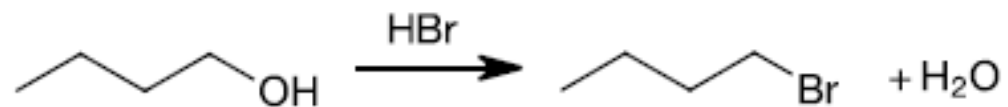
Ma usando un acido -OH si converte in $-\overset{+}{\text{O}}\text{H}_2$ e diventa un buon gruppo uscente



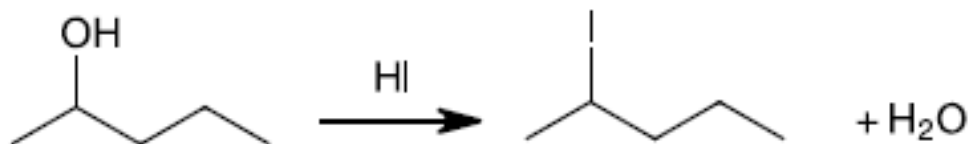
Acido forte

Conversione di alcoli in alogenuri alchilici

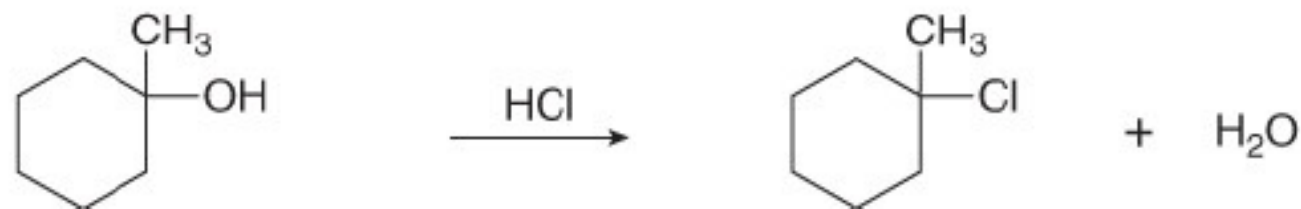
Alcol primario



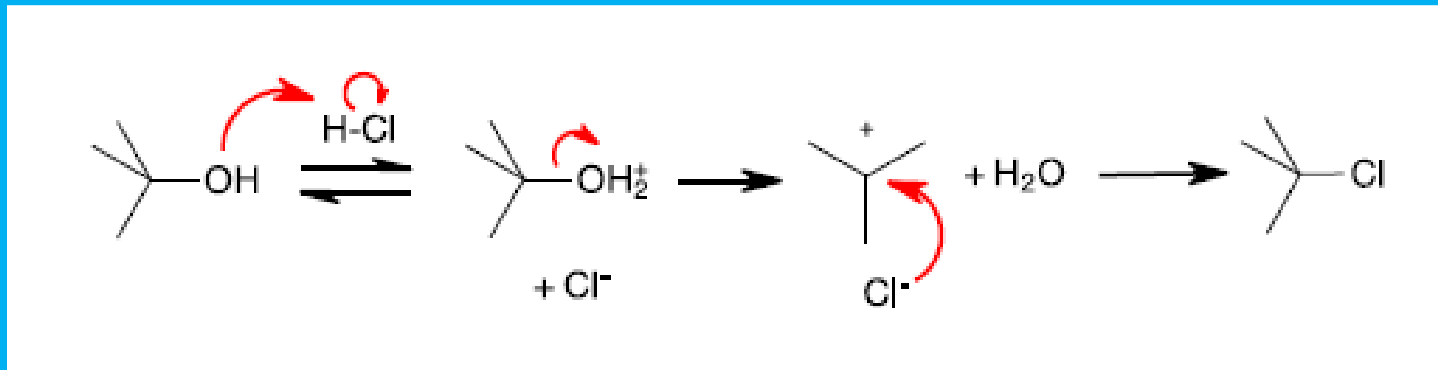
Alcol secondario



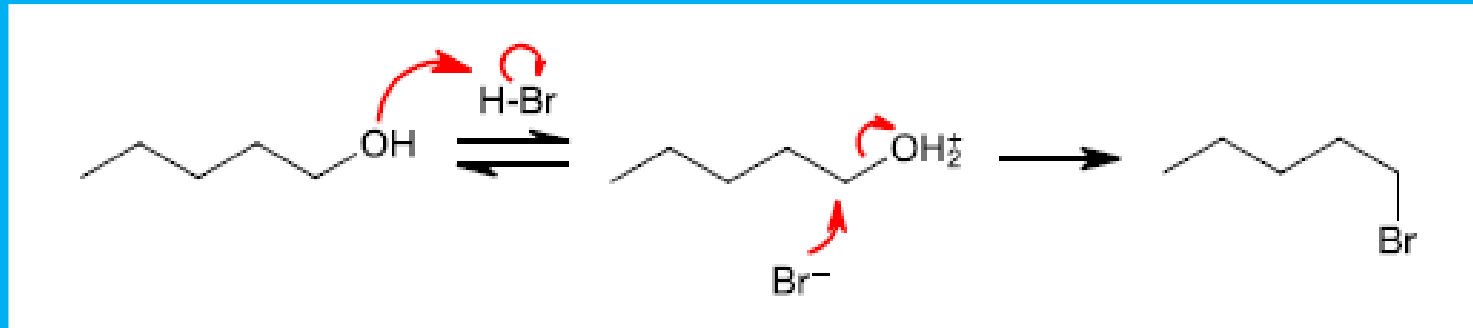
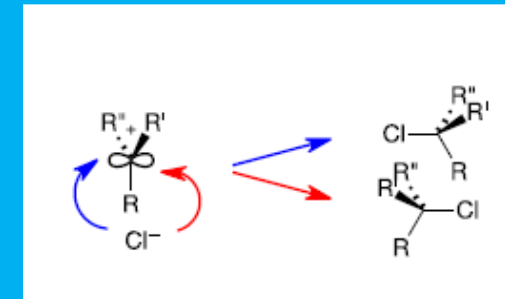
Alcol terziario



Conversione di alcoli in alogenuri alchilici



Alcoli terziari S_N1
Racemizzazione se chirale



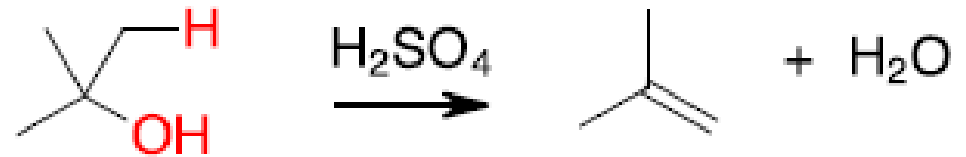
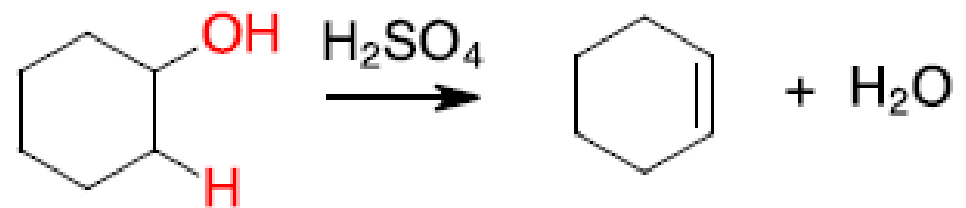
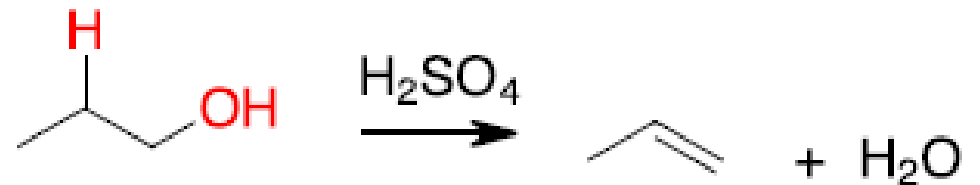
Alcoli primari S_N2

Alcoli secondari S_N1 o S_N2

Reazione degli alcoli- Disidratazione

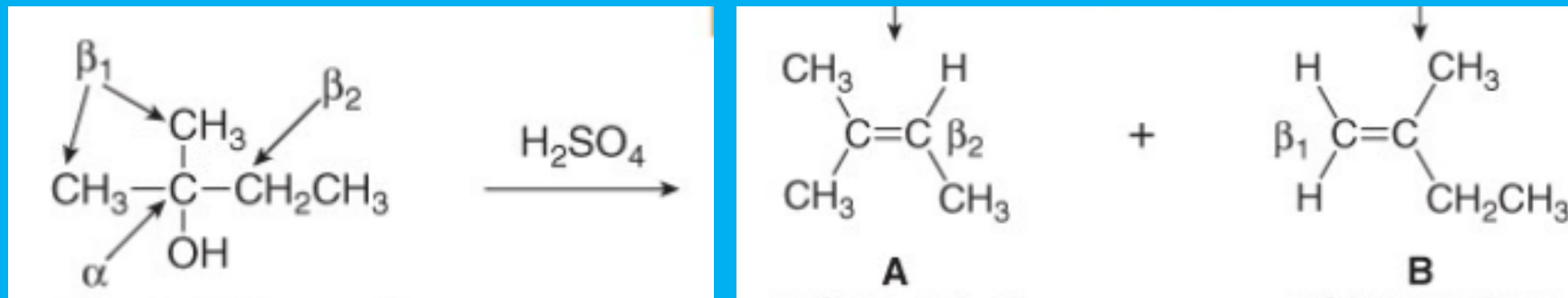
La disidratazione degli alcoli, come la deidroalogenazione, è una reazione di β -eliminazione nella quale l'OH e l'H sono rimossi dai carboni α e β rispettivamente

Gli acidi utilizzati sono H_2SO_4 e H_3PO_4



Reazione degli alcoli- Disidratazione

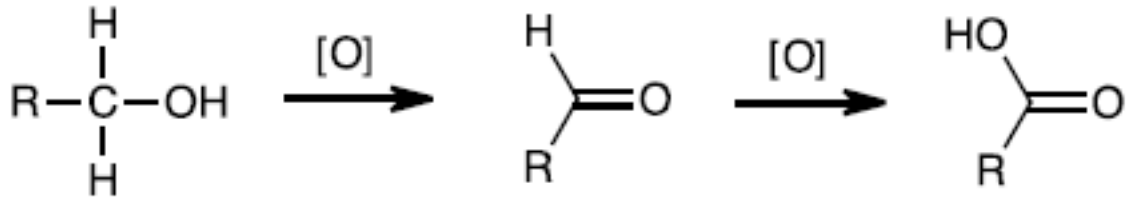
- La disidratazione è regioselettiva, segue la regola di Zaitsev e porta alla formazione dell'alchene più sostituito



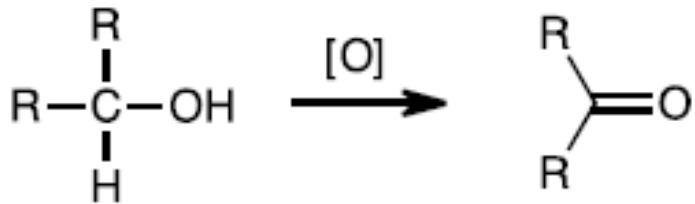
A: Prodotto che si forma in percentuale maggiore

B: Prodotto che si forma in percentuale minore

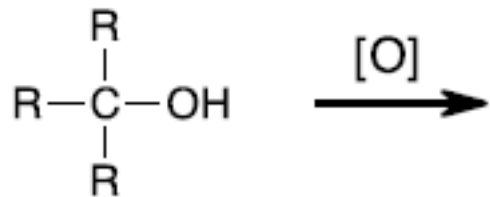
Ossidazione degli alcoli



Alcol primario viene ossidato ad aldeide e poi ad acido carbossilico



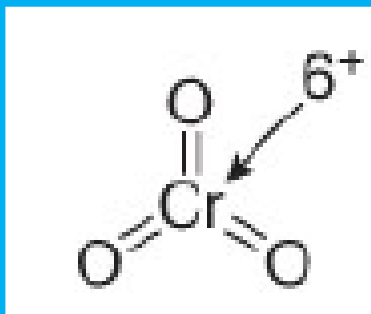
Alcol secondario viene ossidato a chetone



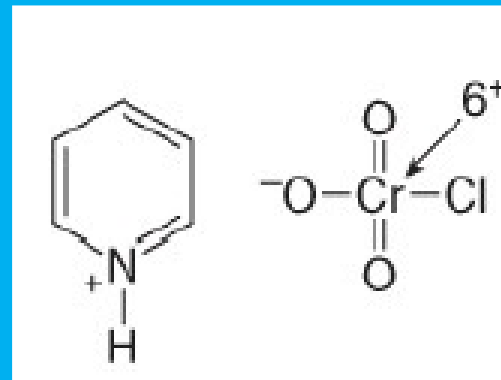
Alcol terziario non dà nessuna reazione

Ossidazione degli alcoli

- L'ossidazione di alcoli a composti carbonilici viene fatta in genere con ossidanti del Cr(VI) che viene ridotto a Cr(III)
- CrO_3 , $\text{Na}_2\text{Cr}_2\text{O}_7$ e $\text{K}_2\text{Cr}_2\text{O}_7$ sono ossidanti forti, non selettivi usati in soluzioni acquose acide ($\text{H}_2\text{SO}_4 + \text{H}_2\text{O}$)
- Piridinio clorocromato (PCC) è solubile in CH_2Cl_2 (diclorometano) e può essere usato in assenza di acidi forti. E' più selettivo ed è un debole ossidante, permette di ossidare alcoli primari ad aldeidi

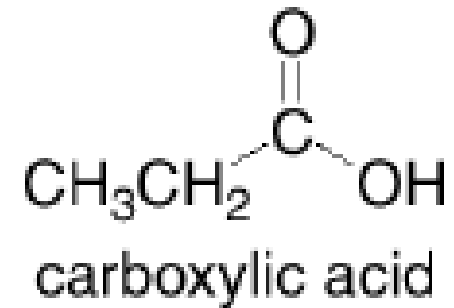
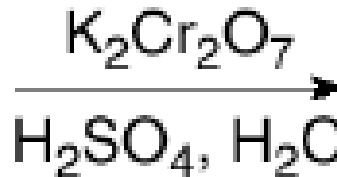
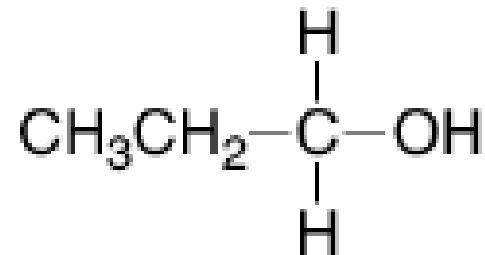
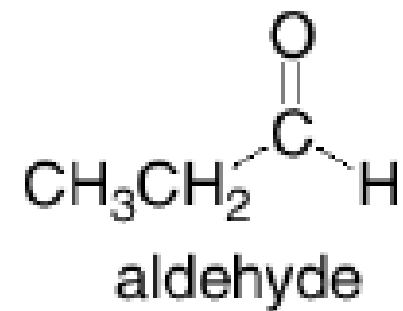
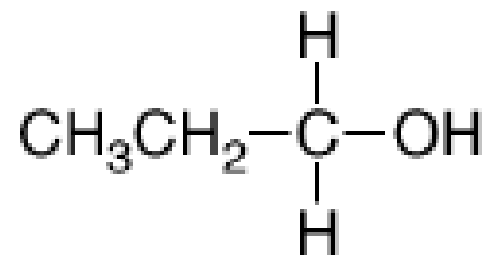


CrO_3



PCC

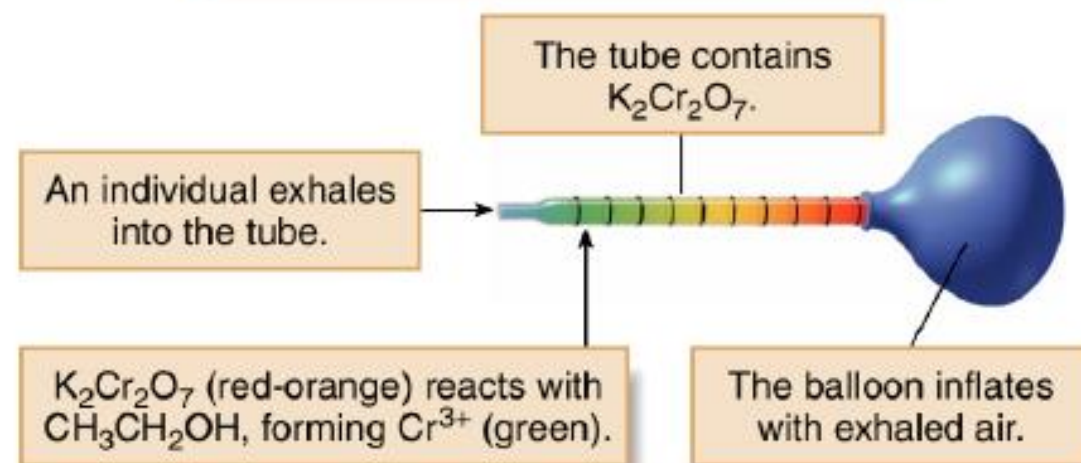
Ossidazione degli alcoli



The Alcohol Test

The oxidation of $\text{CH}_3\text{CH}_2\text{OH}$ with $\text{K}_2\text{Cr}_2\text{O}_7$ to form CH_3COOH and Cr^{3+} was the first available method for the routine testing of alcohol concentration in exhaled air. Some consumer products for alcohol screening are still based on this technology.

Schematic of an alcohol testing device

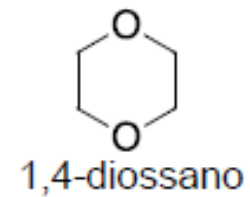
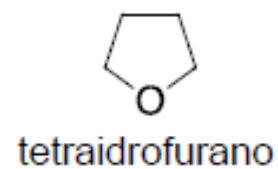
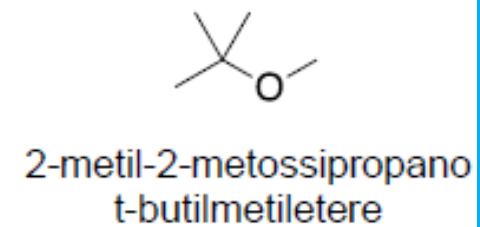
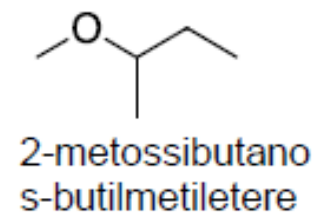
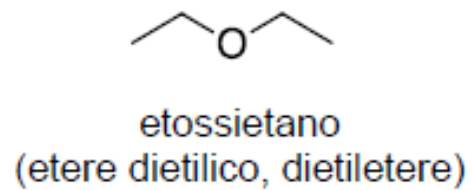
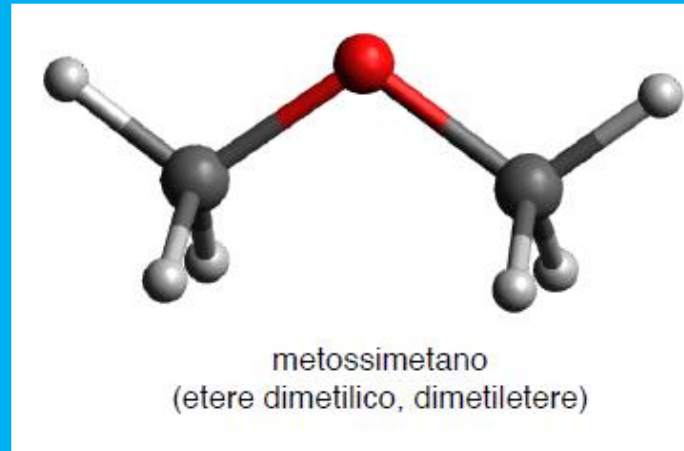


Consumer product



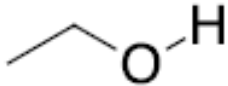
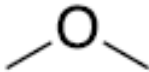
$\text{K}_2\text{Cr}_2\text{O}_7$

Struttura e Nomenclatura degli Eteri



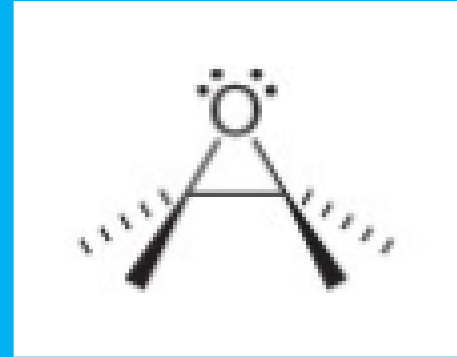
Proprietà Fisiche e Reattività degli Eteri

- Gli eteri sono inerti verso i comuni reagenti: per questo motivo sono frequentemente impiegati come solventi in laboratorio e nell'industria chimica

		
	etanolo	etere dimetilico
peso molecolare	46	46
punto di ebollizione	78 °C	-24 °C
solubilità in H ₂ O	completa	8g/100g
interazioni intermolecolari	legame idrogeno dipolo-dipolo	dipolo-dipolo

Struttura e Nomenclatura degli Epossidi

- Gli epossidi o ossirani sono eteri ciclici a tre termini



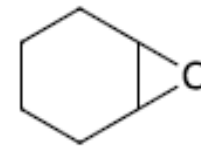
- L'angolo C—O—C negli epossidi é di circa 60° , molto distante dalla geometria tetraedrica ottimale (109.5°). Ciò rende gli epossidi molto più reattivi dei normali eteri



etene ossido
epossietano
ossirano

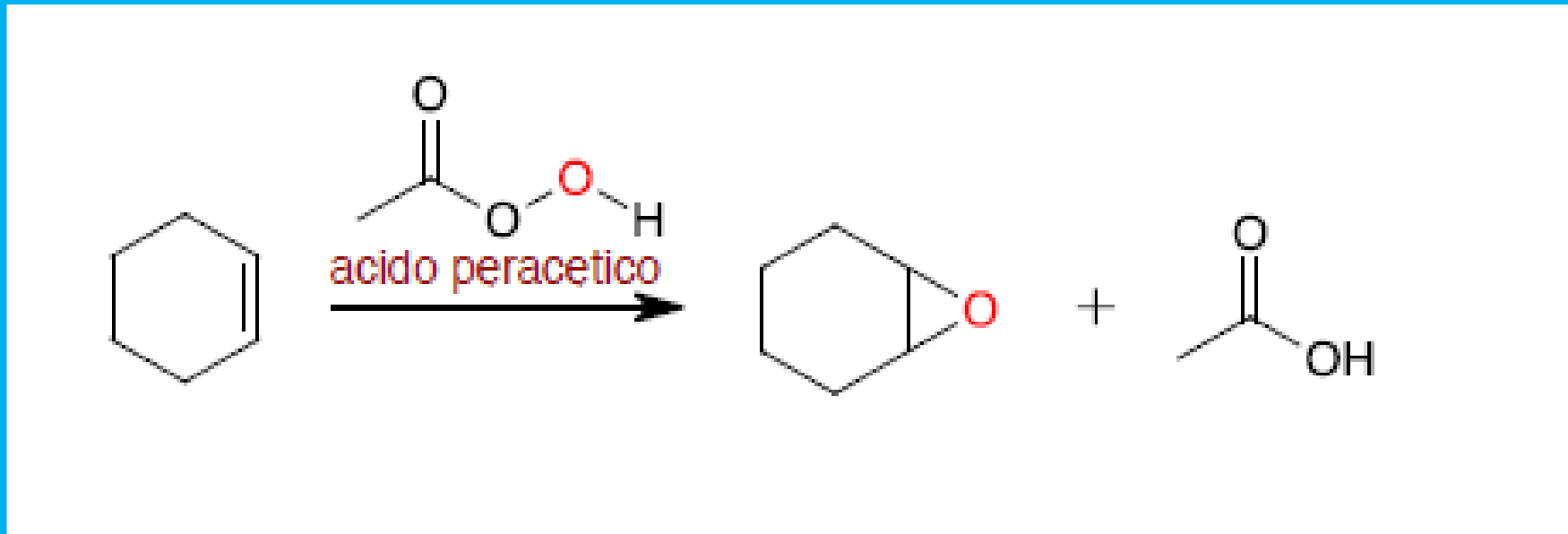


cis-2-butene ossido
cis-2,3-epossibutano
cis-2,3-dimetilossirano

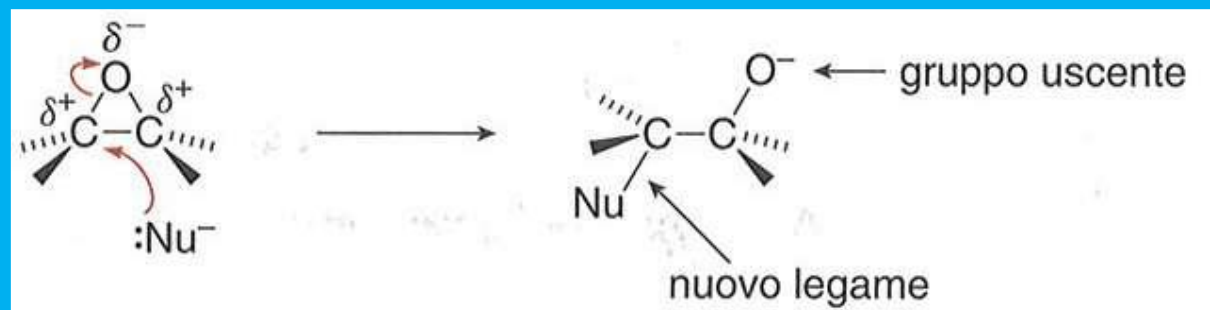


cicloesene ossido
1,2-epossicicloesano

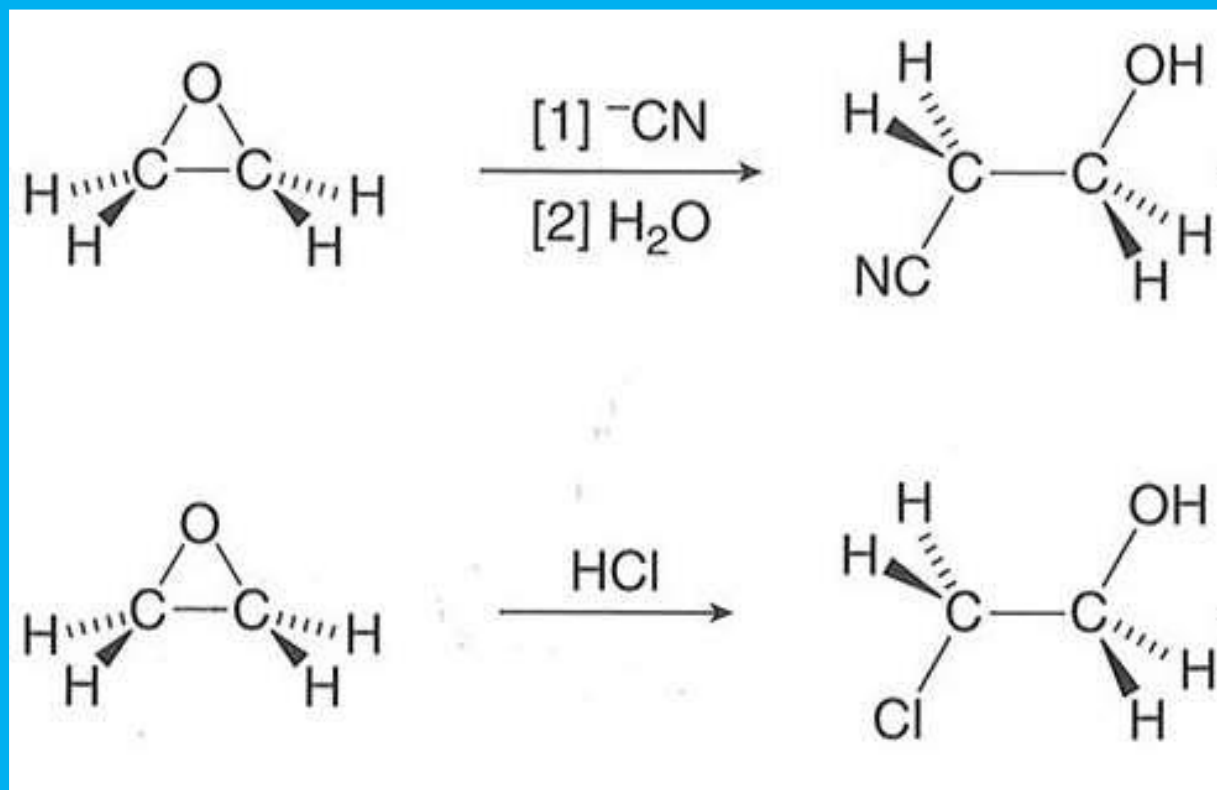
Eossidazione degli Alcheni con Perossiacidi



Reattività degli epossidi

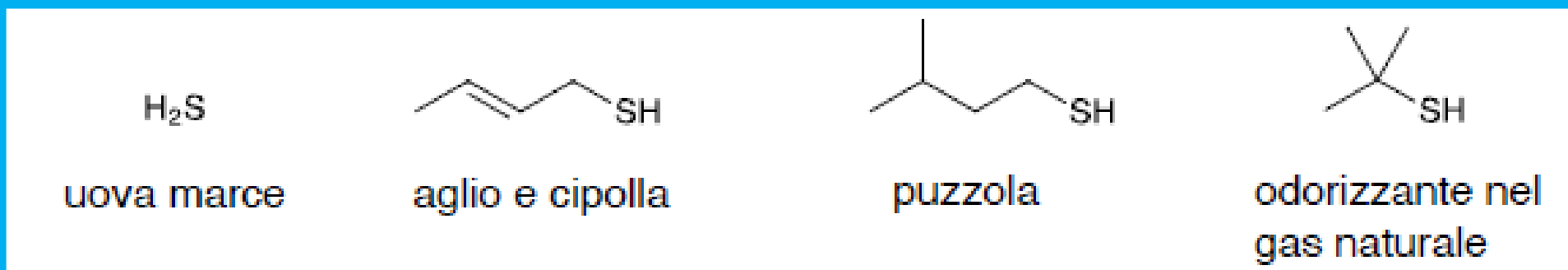


Reattività degli epossidi



Tioli o Mercaptani (R-SH)

- I composti solforati hanno odore sgradevole



Solfuro di idrogeno o acido solfidrico $\text{pK}_a = 7.0$

Tioli o Mercaptani (R-SH)

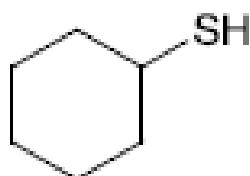
Nomenclatura



etantiolo
pKa = 8.5



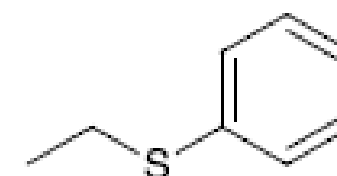
trans-2-buten-1-tiolo



cicloesantiolo



2-mercaptoetanolo
dimetil solfuro
(metiltiometano)



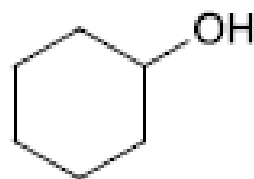
etil-fenil solfuro
(etiltiobenzene)



etanolo



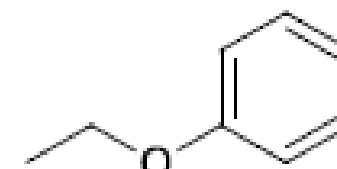
trans-2-buten-1-olo



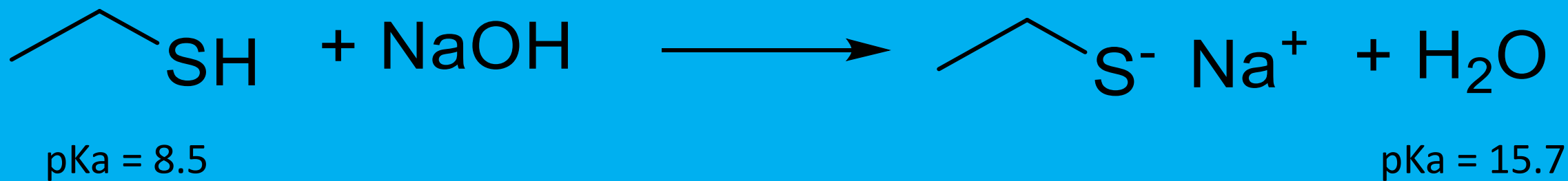
cicloesanololo



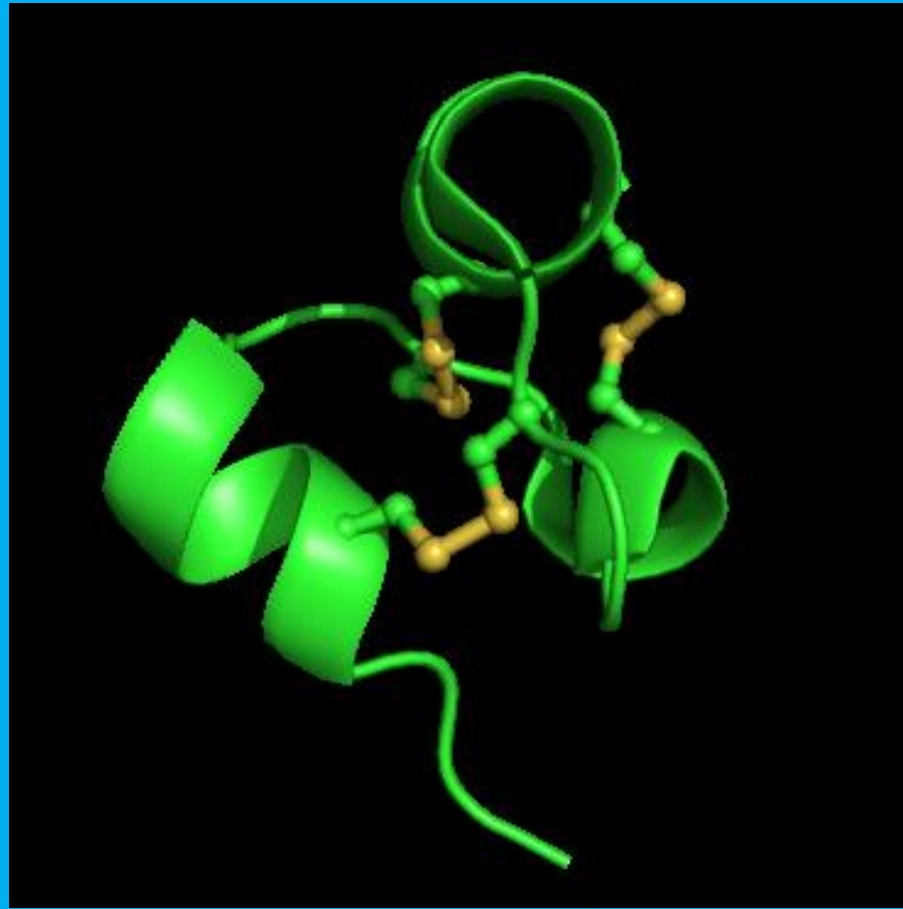
dimetil etere
(metossimetano)



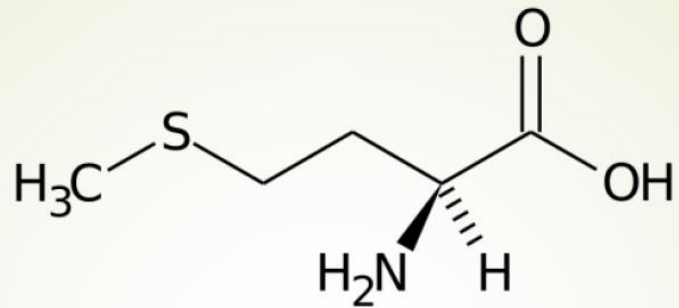
etil-fenil etere
(etossibenzene)



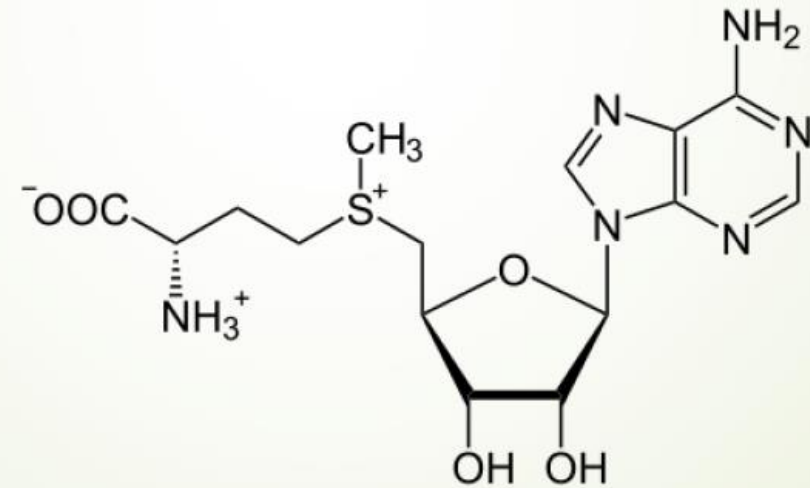
Ponti Disolfuro nelle Proteine



Lo zolfo in natura.....



Metionina (un amminoacido)



S-adenosilmetionina (SAM)

(Coenzima coinvolto nel trasferimento di gruppi metile)