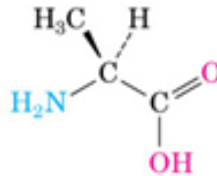
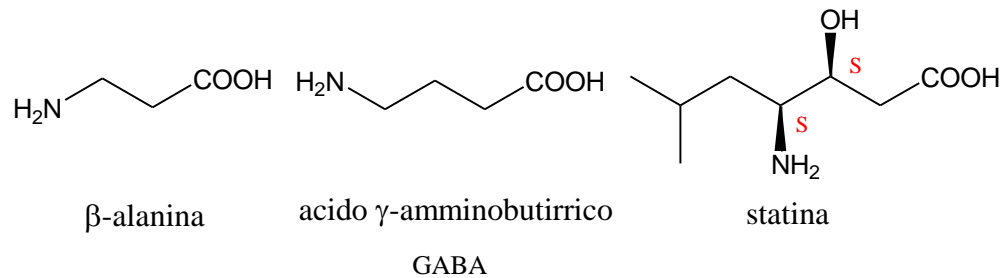


Amminoacidi

Sono molecole che contengono un gruppo amminico e un'acido carbossilico. Sono stati identificati più di 700 AA diversi. Vengono classificati in funzione della posizione relativa della funzione amminica e di quella acida: α , β , γ , etc. Hanno ruoli biologici molto diversi.



alanina: α -amminoacido proteinogenico

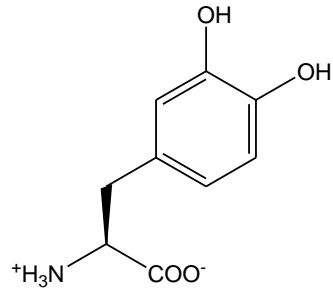


β -alanina: unità strutturale presente nel CoA.

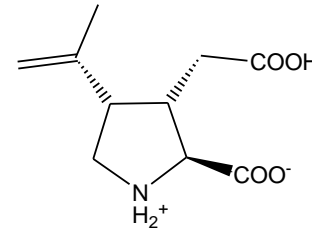
GABA: neurotrasmettitore ad azione inibitrice; ha azione ipertensiva

statina: componente di un pentapeptide che inibisce l'azione di una proteasi, la pepsina

Aminoacidi non proteinogenici

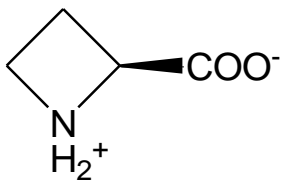


L-Dopa
(anti-Parkinson's)



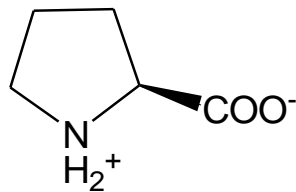
Acido kainico
Eccitante (funghi)

Aminoacidi non proteinogenici incorporati in proteine

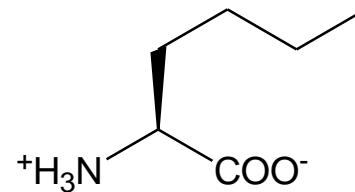


Ac. Azetidini-
2-carbossilico

per

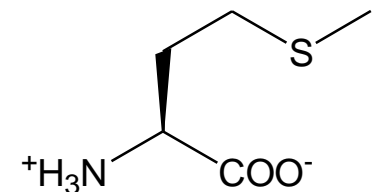


Pro



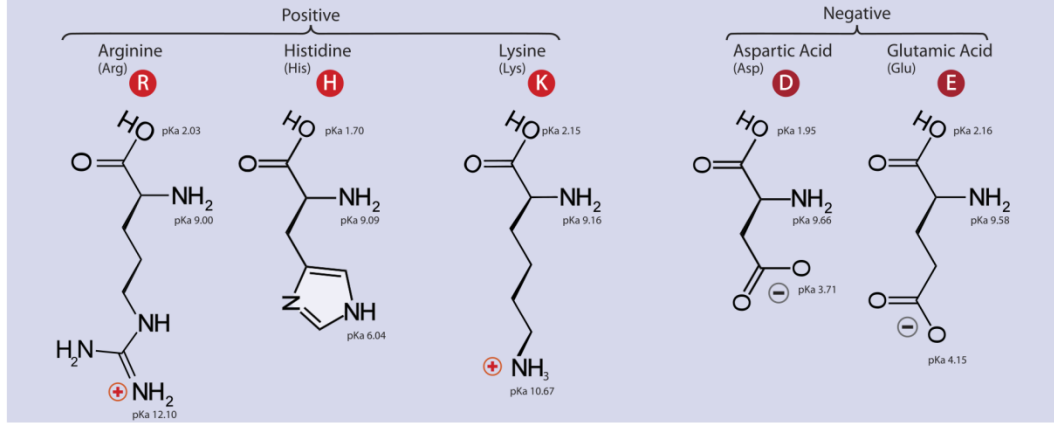
Norleucina

per

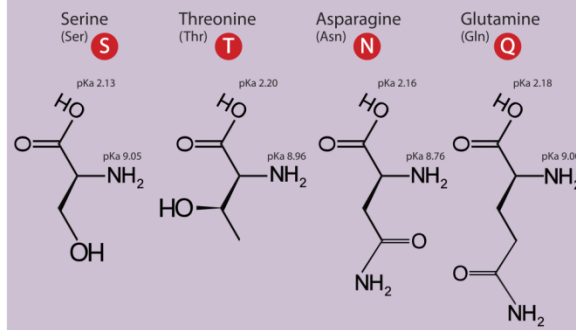


Met

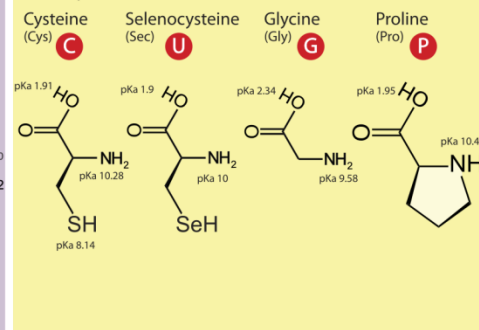
A. Amino Acids with Electrically Charged Side Chains



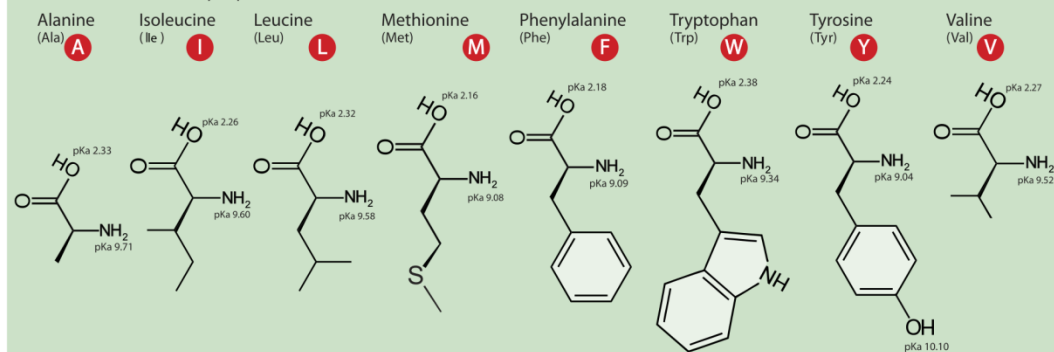
B. Amino Acids with Polar Uncharged Side Chains



C. Special Cases



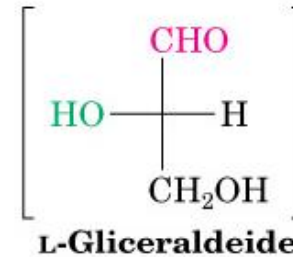
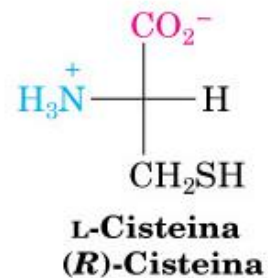
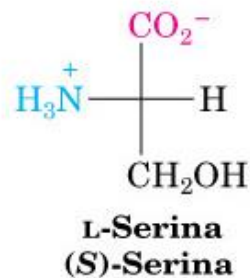
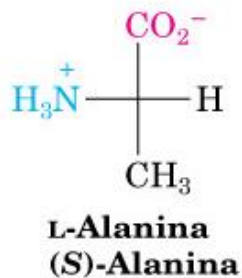
D. Amino Acids with Hydrophobic Side Chain



Aminoacidi

A parte la glicina tutti gli amminoacidi proteinogenici sono chirali e, negli organismi superiori, le proteine sono formate solo da amminoacidi della serie L.

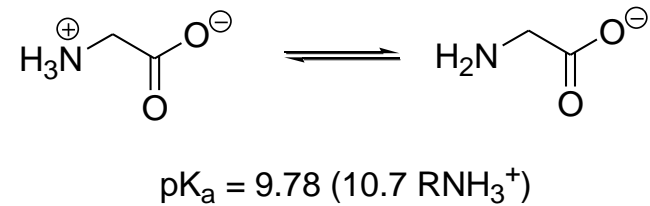
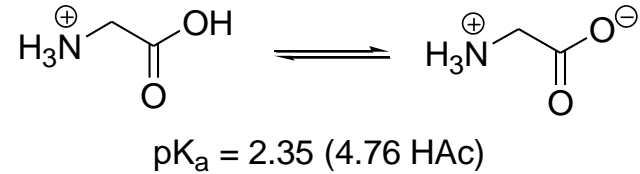
Negli organismi inferiori (batteri) si trovano anche amminoacidi della serie D e amminoacidi non chirali come l'AiB (acido α -amminoisobutirrico)



Aminoacidi

TABELLA 27.2 VALORI DEI pK_a PER I GRUPPI IONIZZABILI DEGLI AMMINOACIDI

Amminoacido	pK_a α -CO ₂ H	pK_a α -NH ₃ ⁺	pK_a catena laterale	punto isoelettrico (pI)
alanina	2.35	9.87	—	6.11
arginina	2.01	9.04	12.48	10.76
asparagina	2.02	8.80	—	5.41
acido aspartico	2.10	9.82	3.86	2.98
cisteina	2.05	10.25	8.00	5.02
acido glutammico	2.10	9.47	4.07	3.08
glutammina	2.17	9.13	—	5.65
glicina	2.35	9.78	—	6.06
istidina	1.77	9.18	6.10	7.64
isoleucina	2.32	9.76	—	6.04
leucina	2.33	9.74	—	6.04
lisina	2.18	8.95	10.53	9.74
metionina	2.28	9.21	—	5.74
fenilalanina	2.58	9.24	—	5.91
prolina	2.00	10.60	—	6.30
serina	2.21	9.15	—	5.68
treonina	2.09	9.10	—	5.60
triptofano	2.38	9.39	—	5.88
tirosina	2.20	9.11	10.07	5.63
valina	2.29	9.72	—	6.00



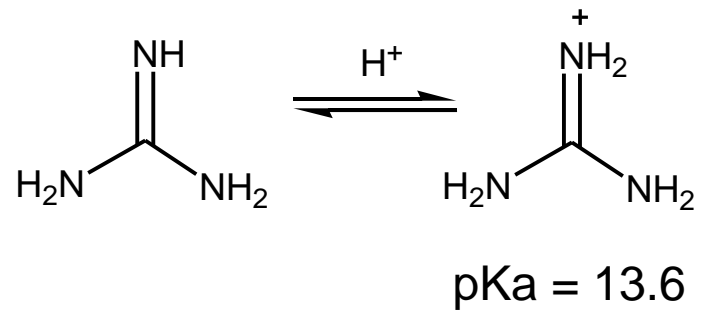
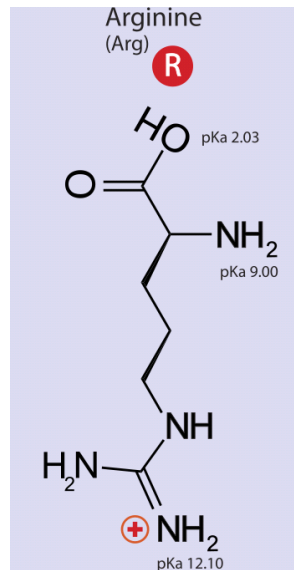
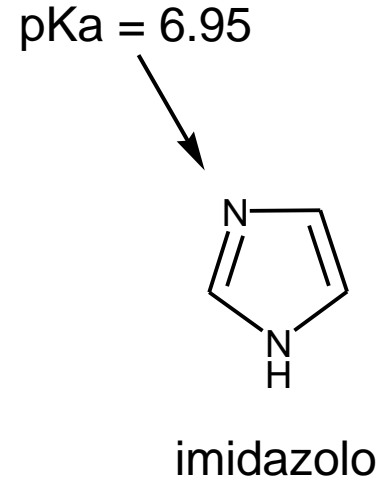
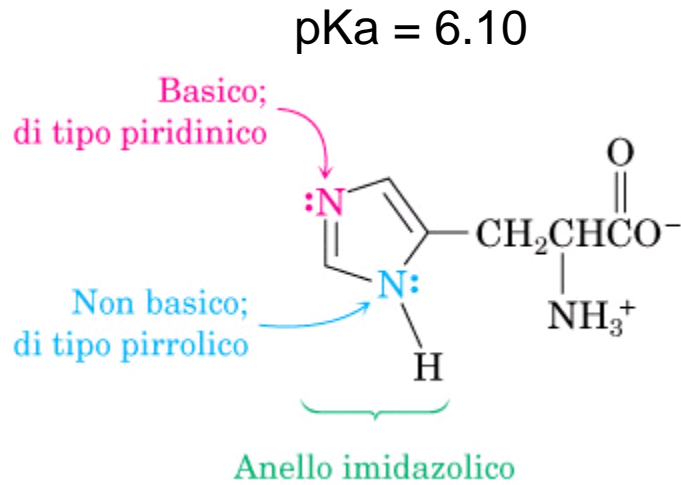
Punto Isoelettrico (pI)

E' il valore di pH al quale la carica netta di una certa specie elementare è zero.

Il pI è la media dei valori di pK_a dei gruppi carbossilico e ammonio.

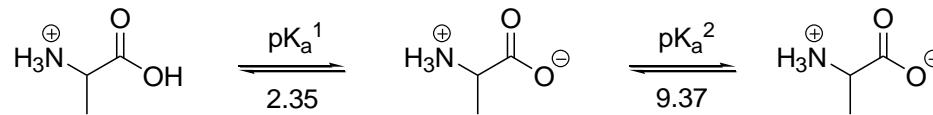
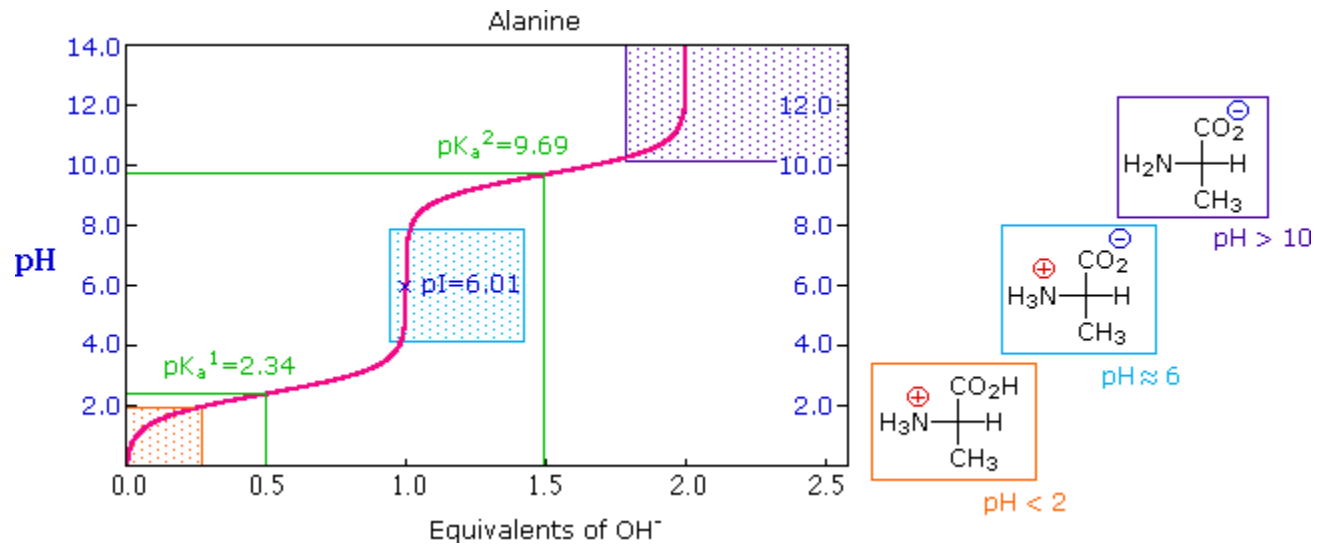
$$(9.78 + 2.35) / 2 = 6.06$$

Aminoacidi: istidina e arginina



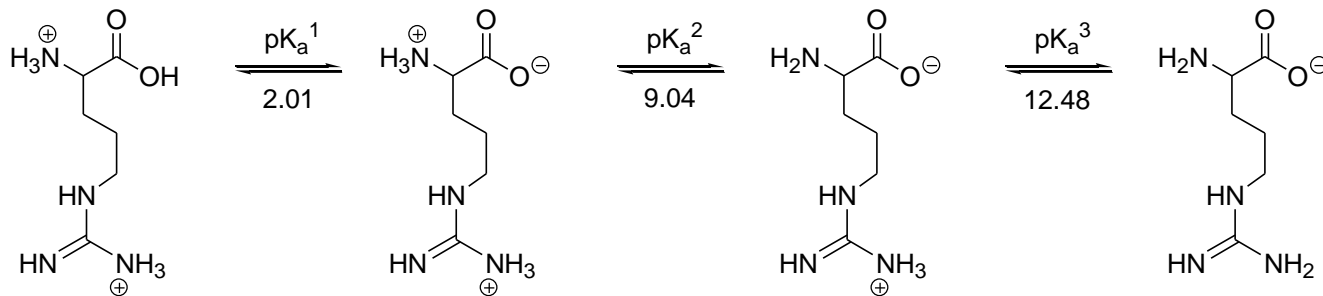
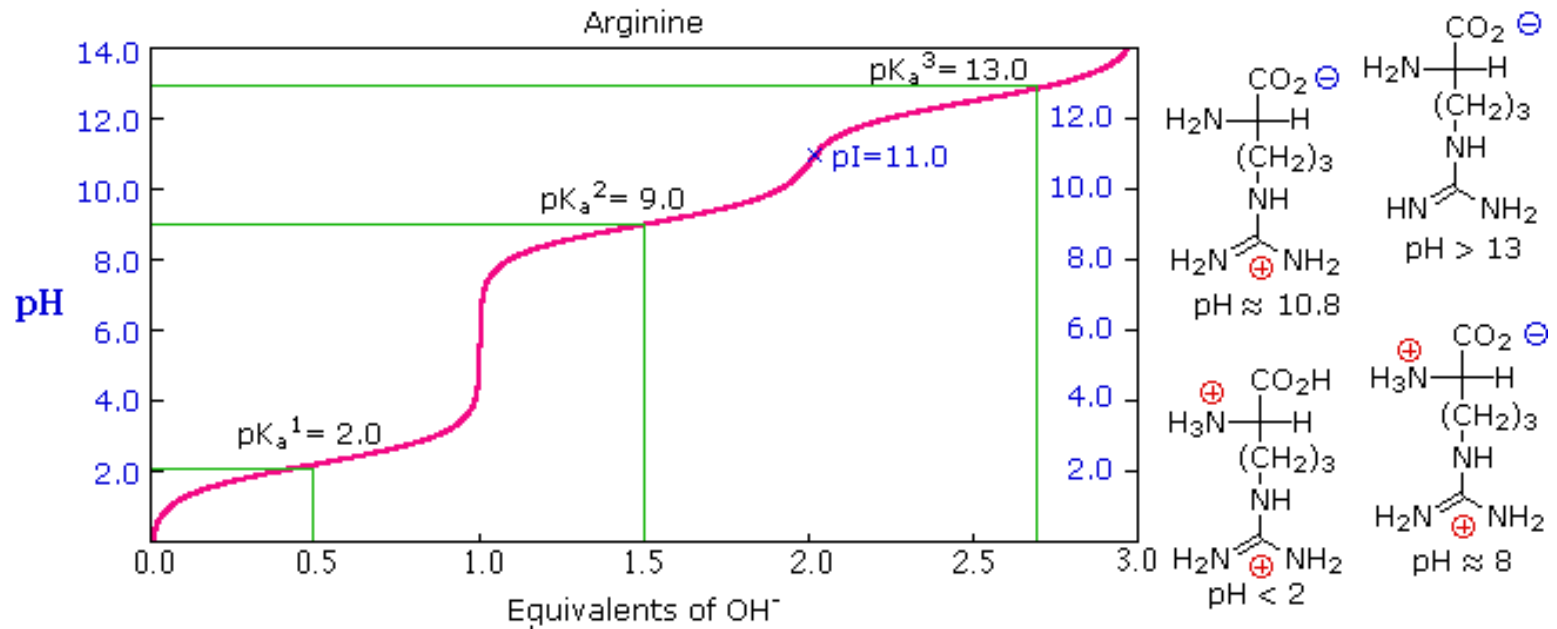
TEA pKa = 10.75

Titolazioni di amminoacidi: ALANINA



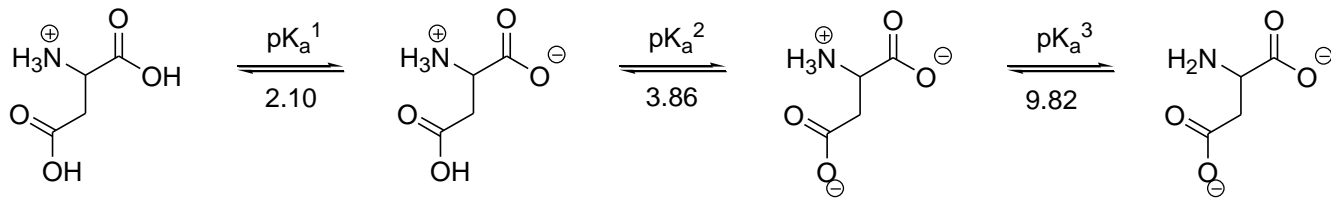
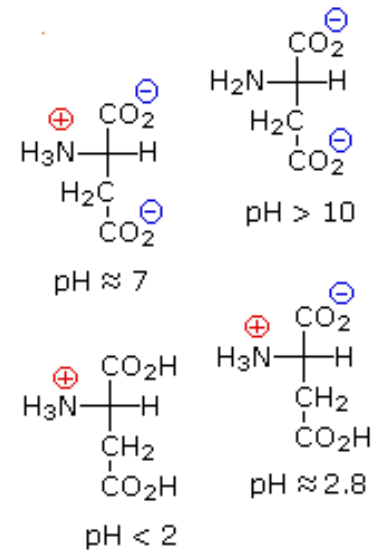
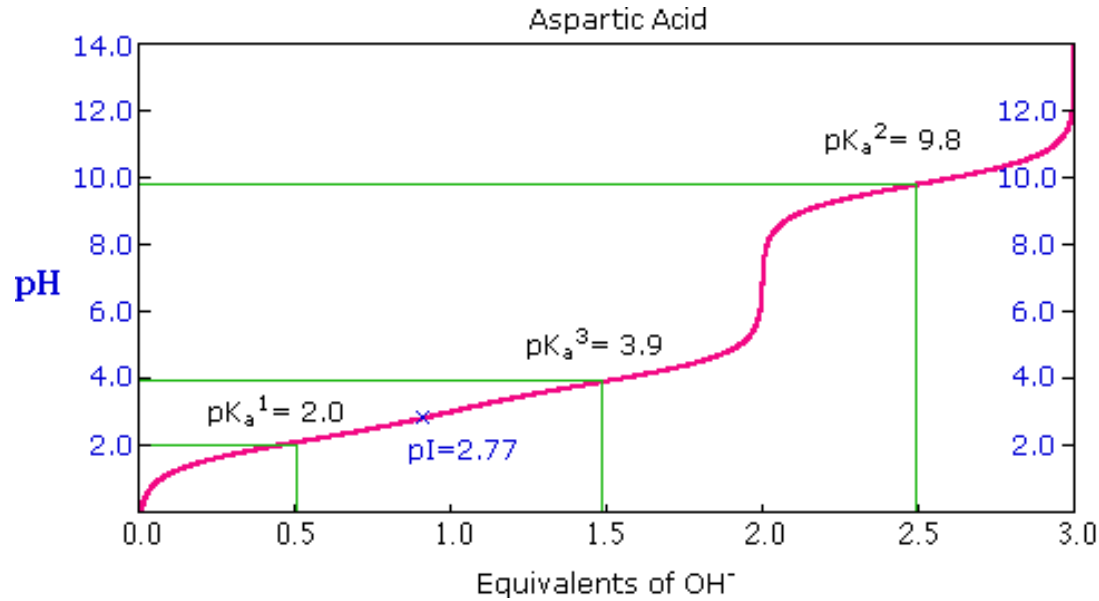
$\text{pI} = 6.11$

Titolazioni di amminoacidi: Arginina



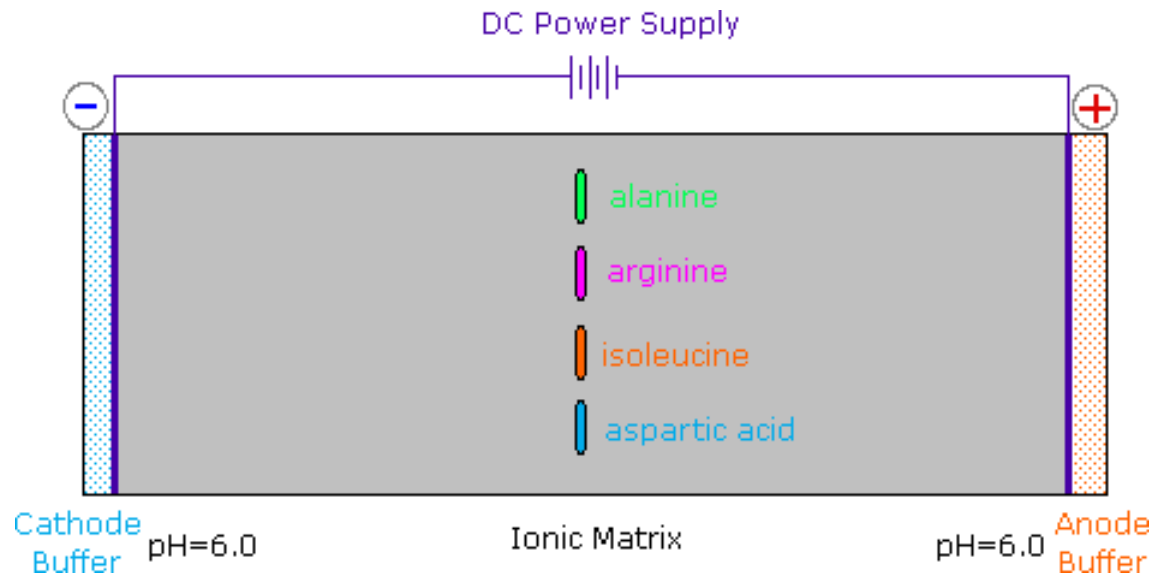
$pI = 10.7$

Titolazioni di amminoacidi: Acido Aspartico

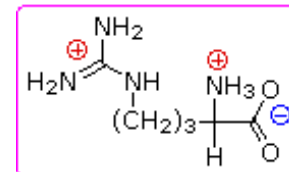


$pI = 2.98$

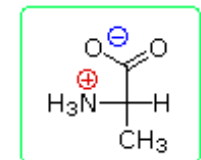
Elettroforesi



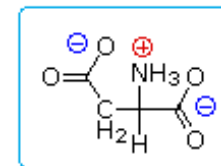
Predominant Species at pH=6.0



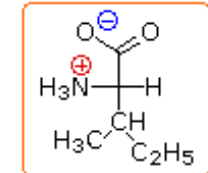
arginine $pI=10.77$



alanine $pI=6.01$



aspartic acid $pI=2.80$

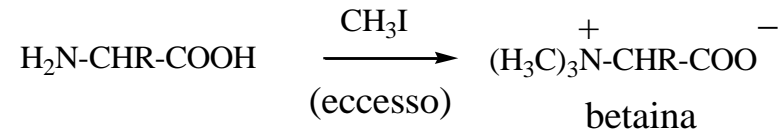


isoleucine $pI=6.02$

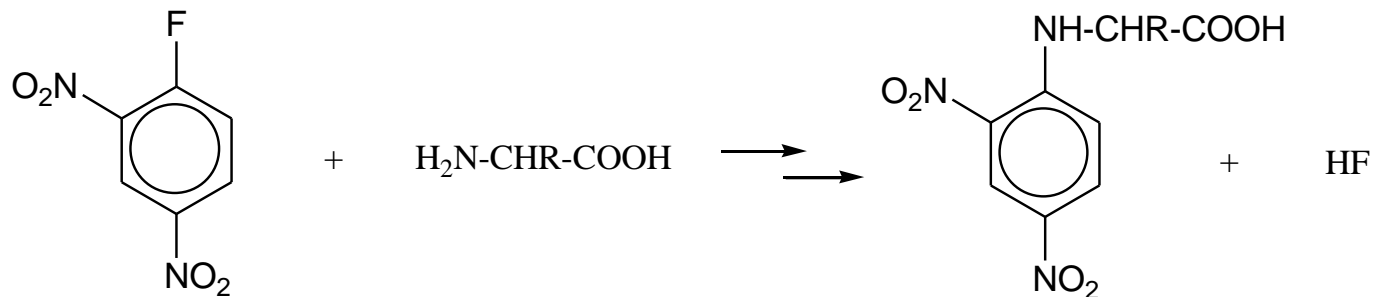
Amminoacidi: reazioni

Reazioni del gruppo amminico:

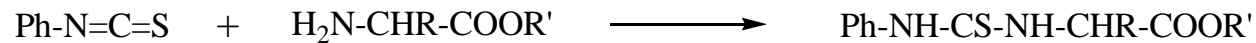
- acilazione
- alchilazione



- reazione di Sanger



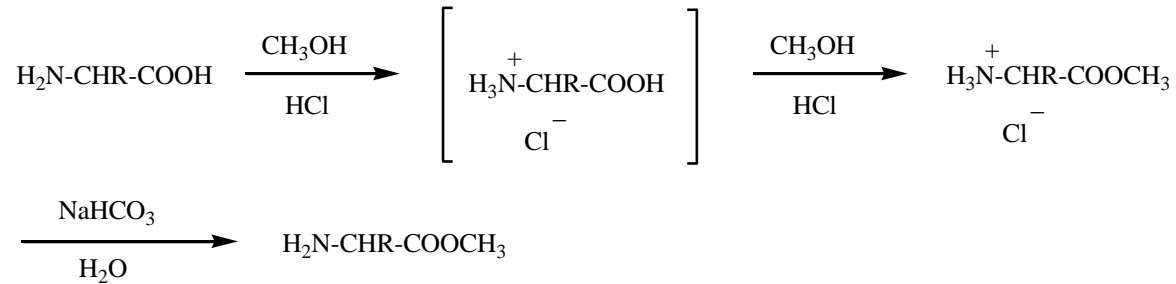
- reazione di Edman



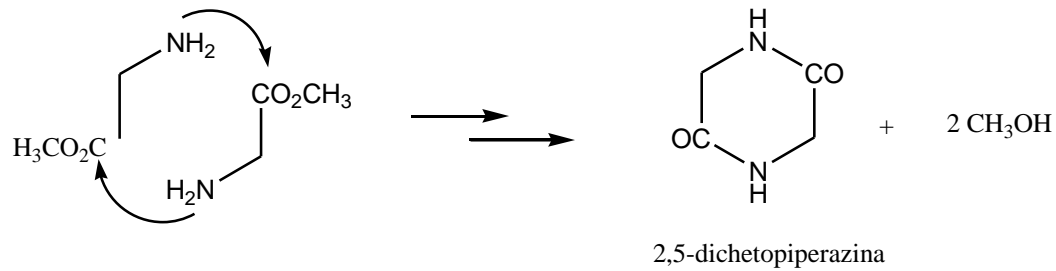
Amminoacidi: reazioni

Reazioni del gruppo carbossilico:

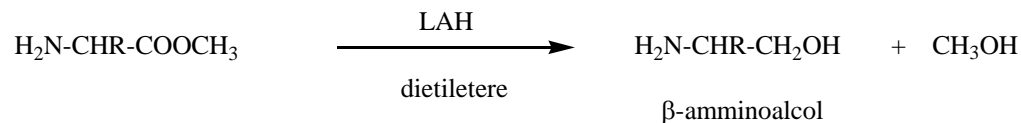
Formazione di esteri:



NB: gli esteri degli α -amminoacidi sono instabili. Più stabili i loro cloridrati.

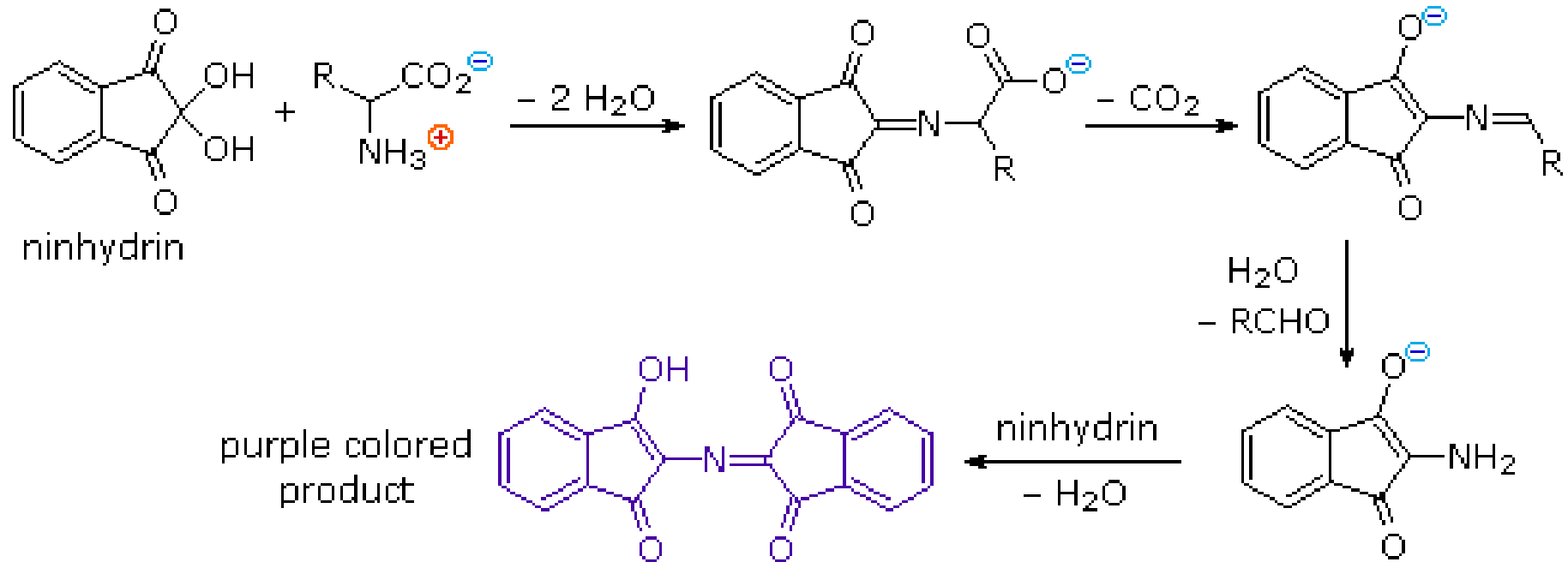


Riduzione del gruppo estereo:



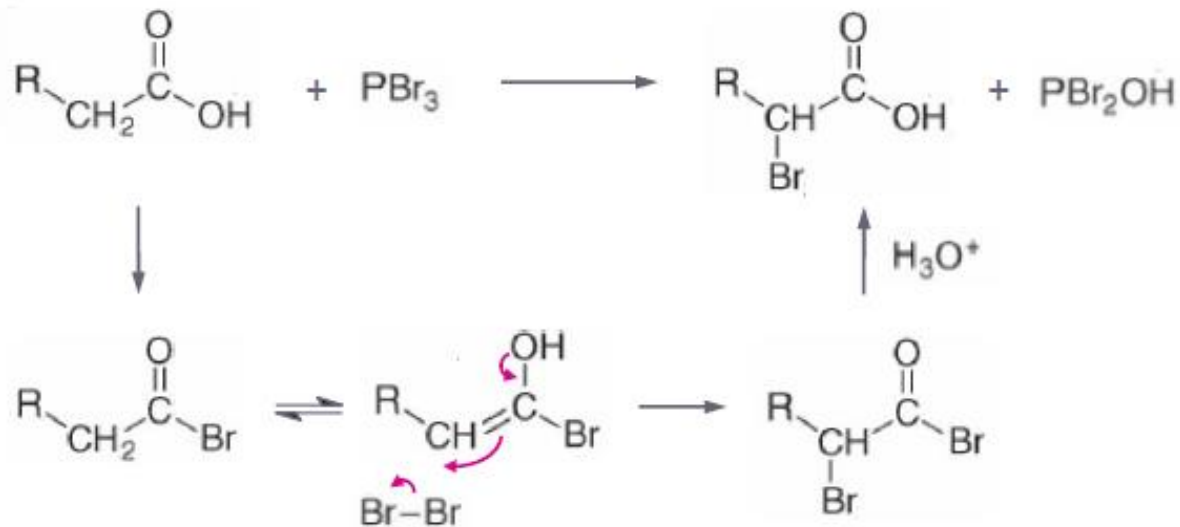
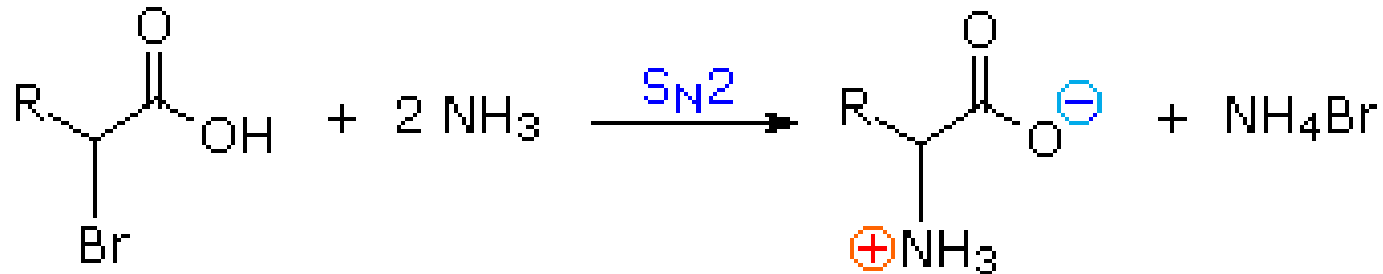
Amminoacidi: reazioni

Reazione con la ninidrina



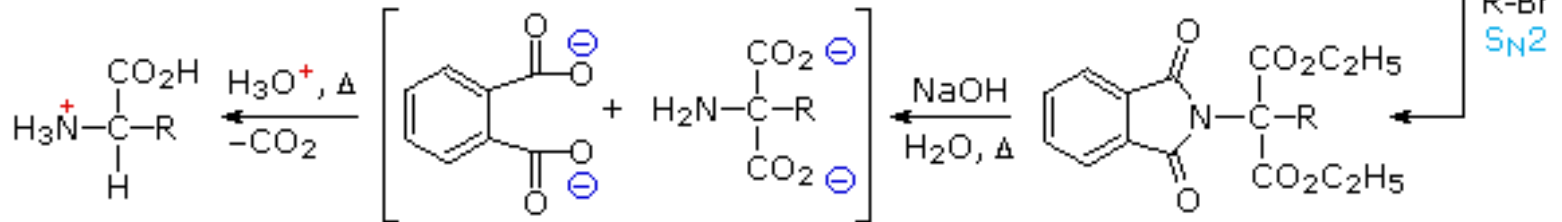
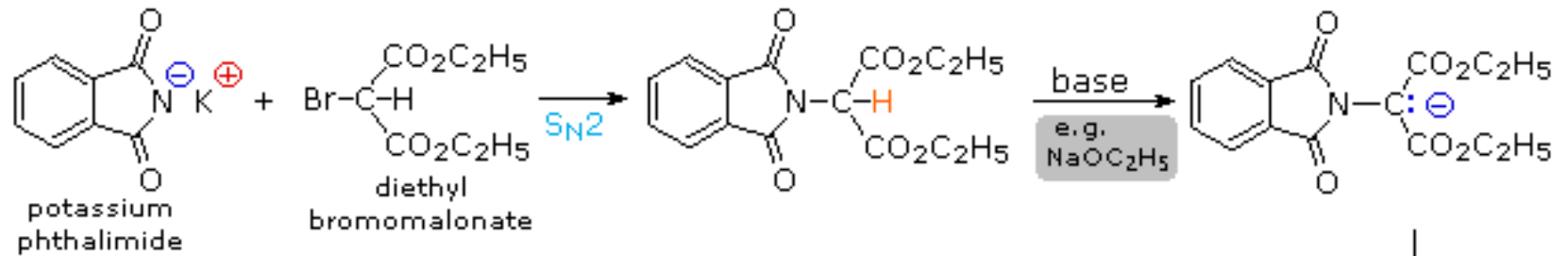
Amminoacidi: sintesi

Ammonolisi di acidi α -bromocarbossilici

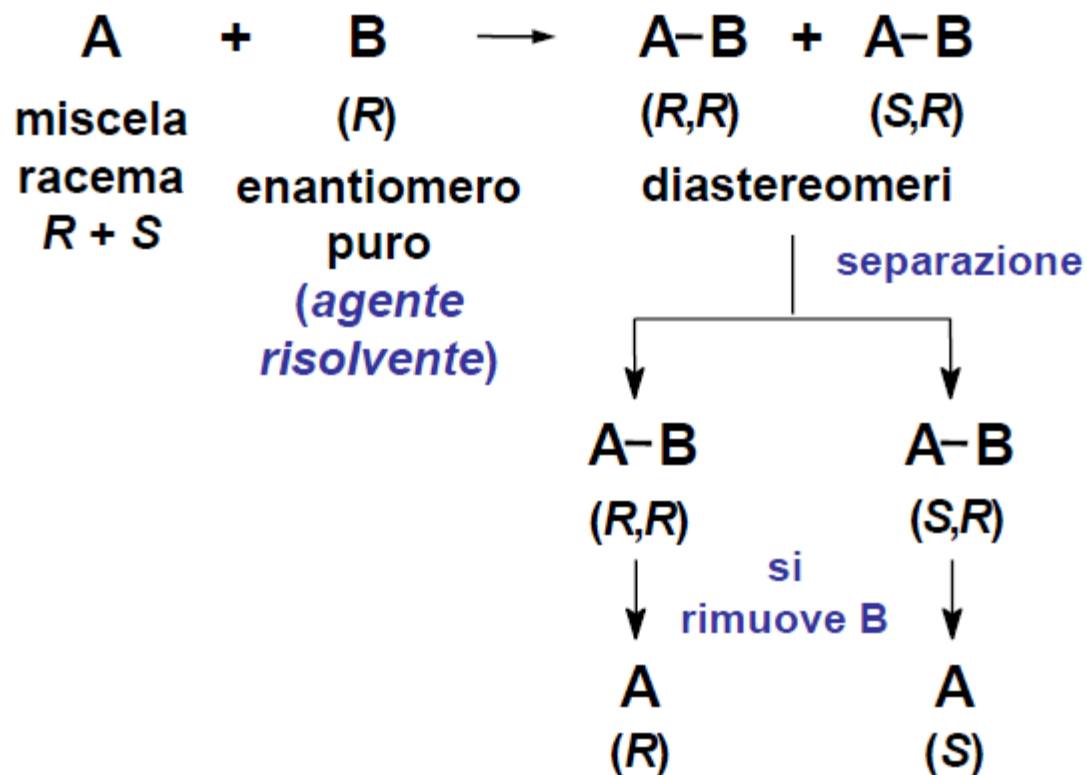


Amminoacidi: sintesi

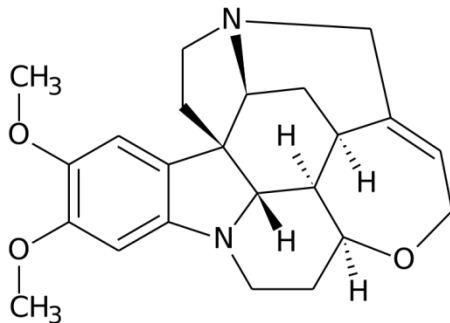
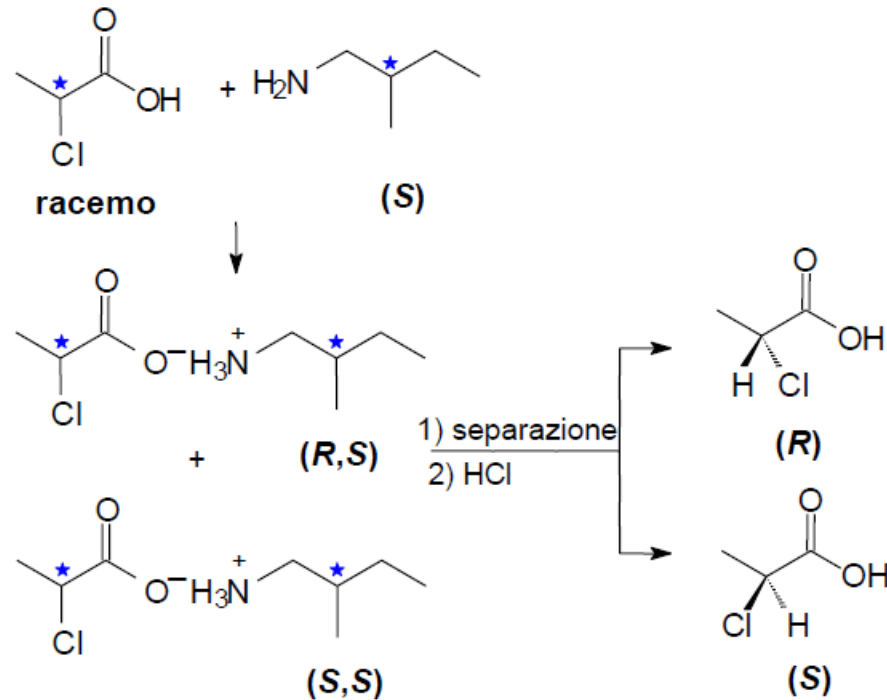
Sintesi di Gabriel



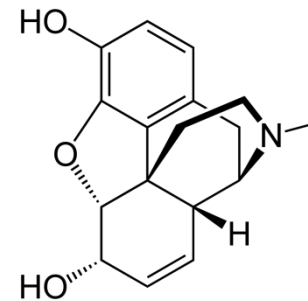
Risoluzione di Enantiomeri



Risoluzione di Enantiomeri

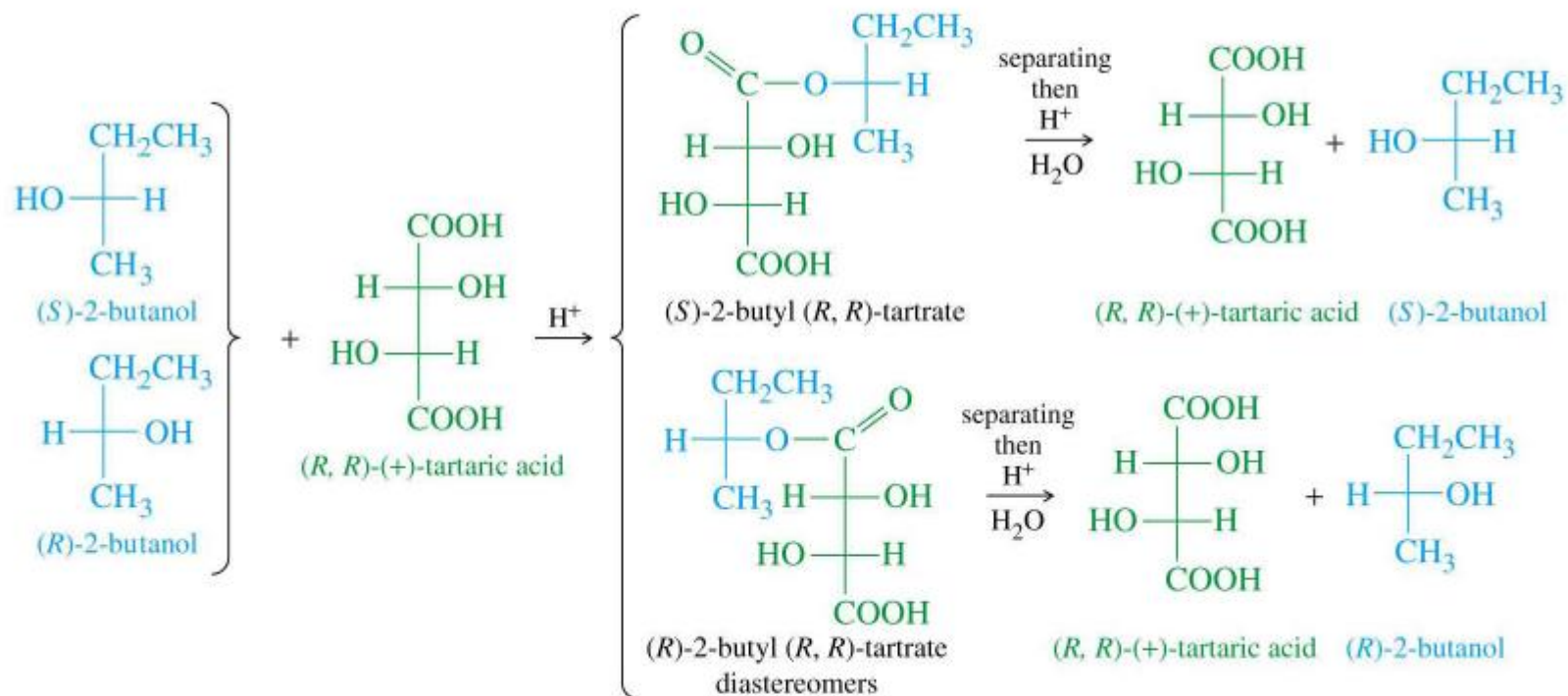


Brucina (2,3-dimetossistricnina)

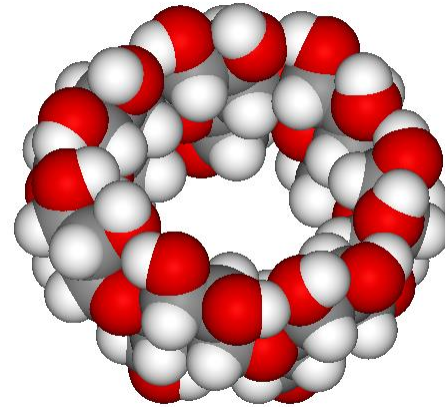
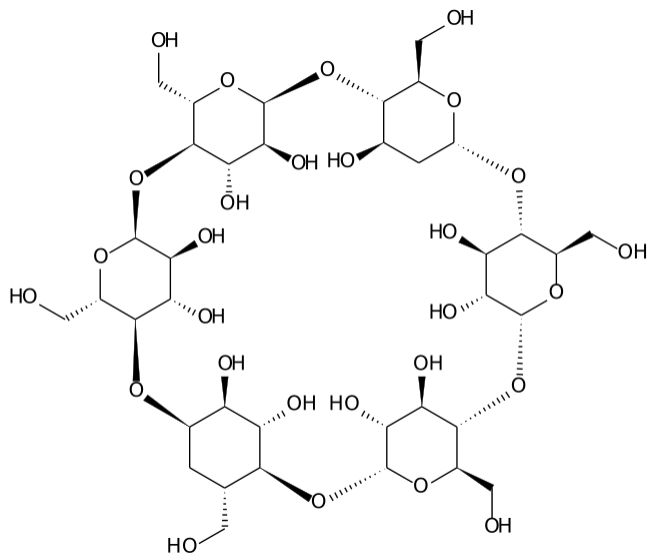


morfina

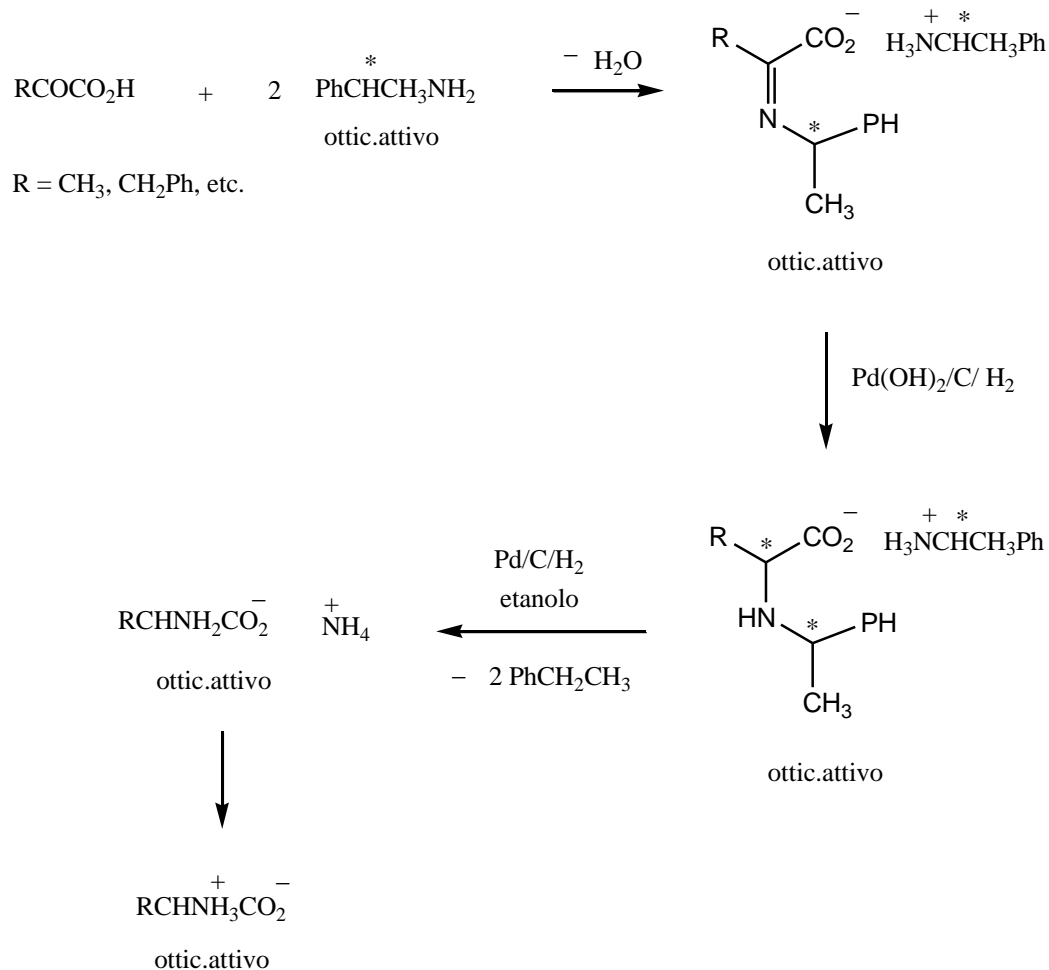
Risoluzione di Enantiomeri



Ciclodestrina

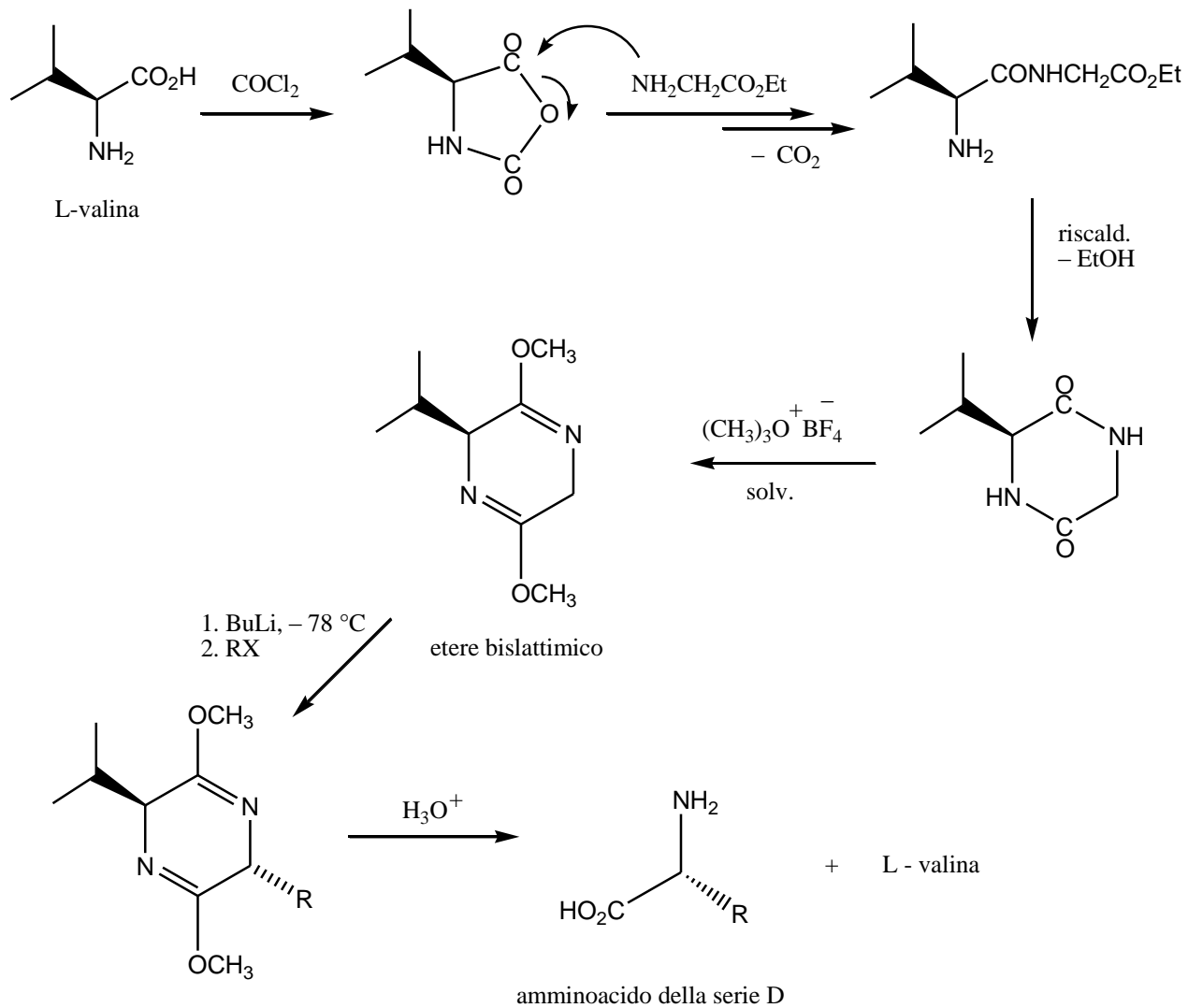


Amminoacidi: sintesi enantioselettiva



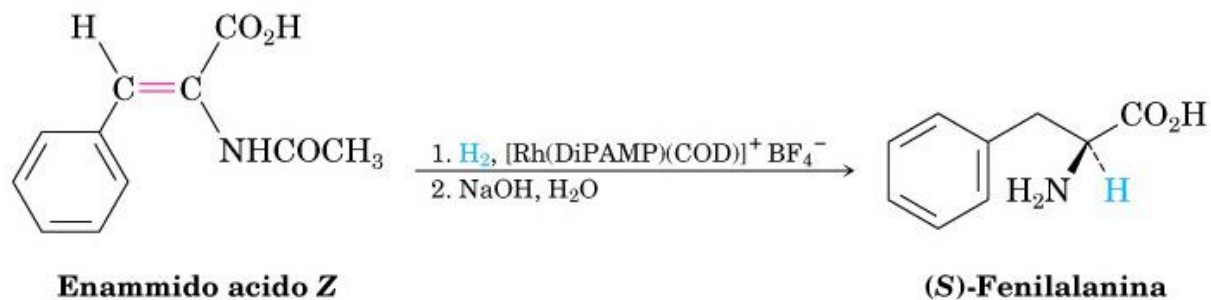
Ad es. utilizzando la (S)-(-)-1-fenetilammina, dopo la idrogenazione del doppio legame imminico, si ottengono due diastereomeri salini in proporzioni diverse che possono essere separati per cristallizzazione frazionata, sottoposti ad idrogenolisi per dare l'amminoacido che sarà otticamente attivo.

Amminoacidi: sintesi enantioselettiva

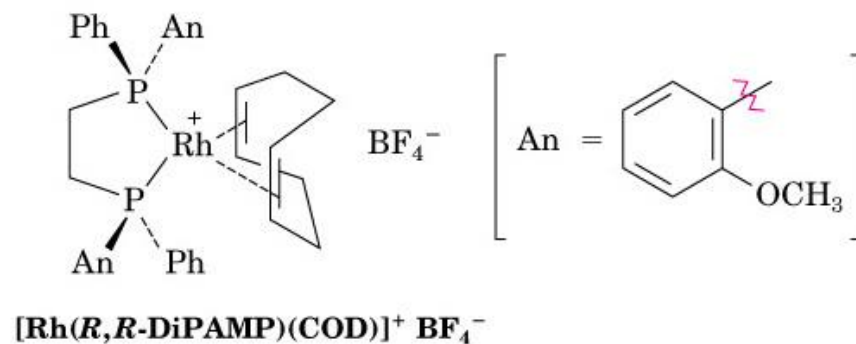


Amminoacidi: sintesi enantioselettiva

Sintesi di W. S. Knowles

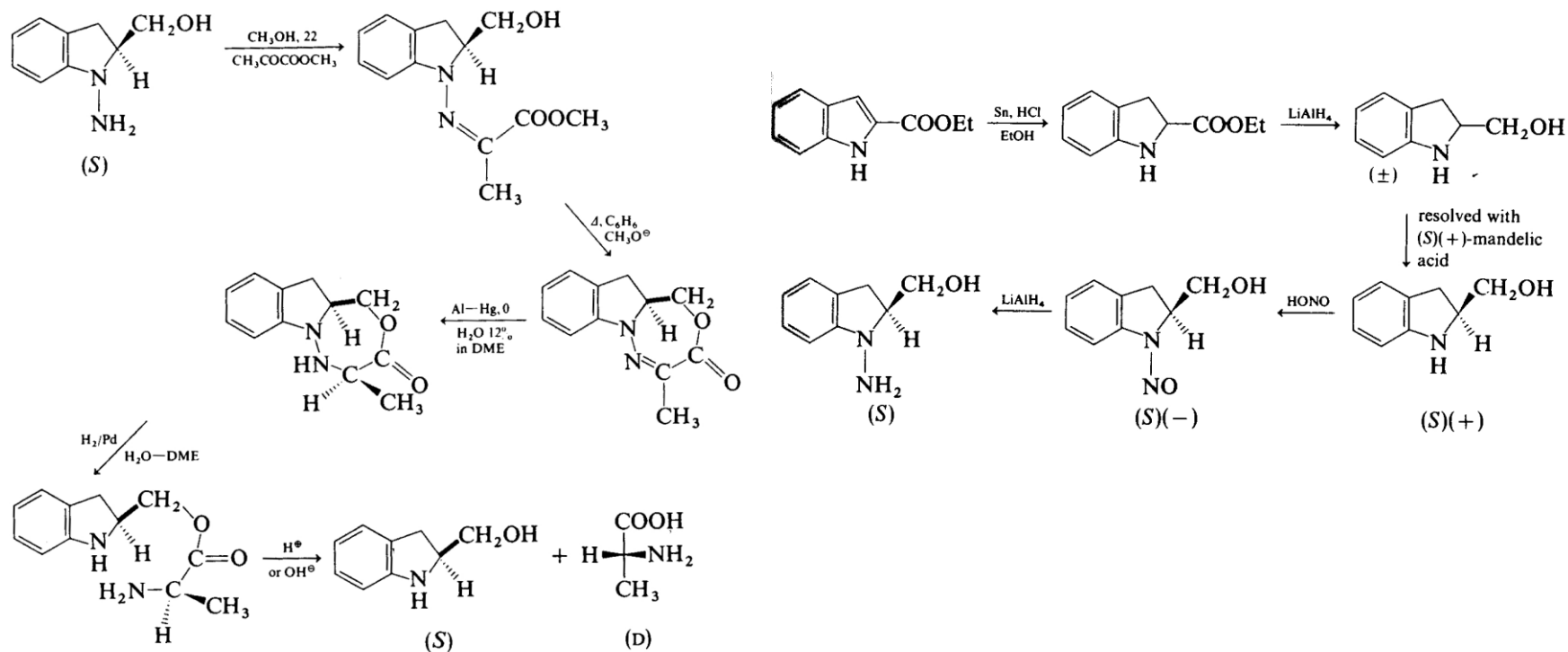


e.e. 99 %

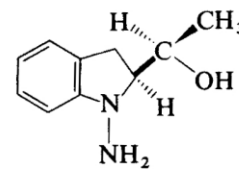


Amminoacidi: sintesi enantioselettiva

Sintesi di E.J. Corey



e.e. 80 %



e.e. 96 %