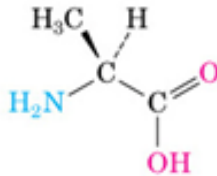
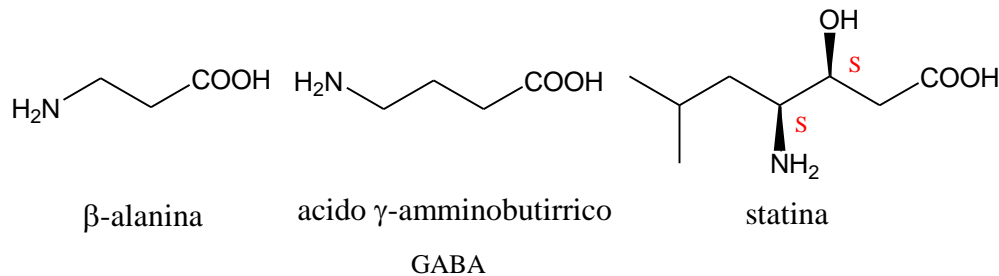


# Amminoacidi

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:  $\alpha$ ,  $\beta$ ,  $\gamma$ , etc. Hanno ruoli biologici molto diversi.



**alanina:**  $\alpha$ -amminoacido proteinogenico

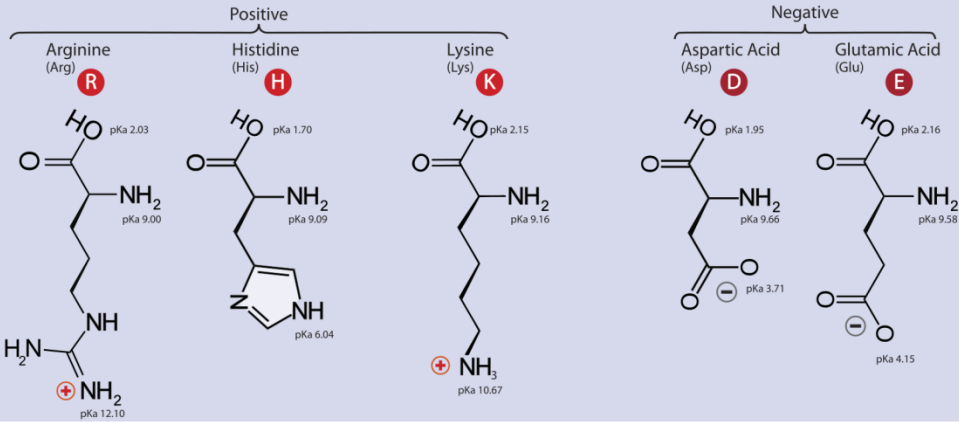


**$\beta$ -alanina:** unità strutturale presente nel CoA.

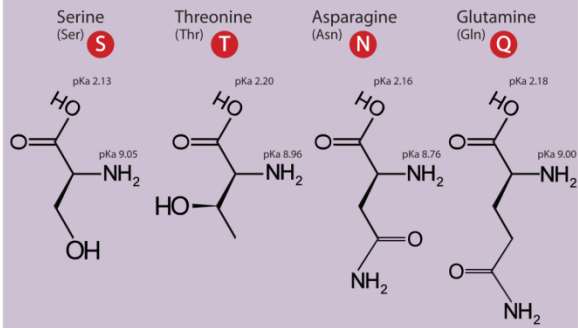
**GABA:** neurotrasmettitore ad azione inibitrice; ha azione ipertensiva

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

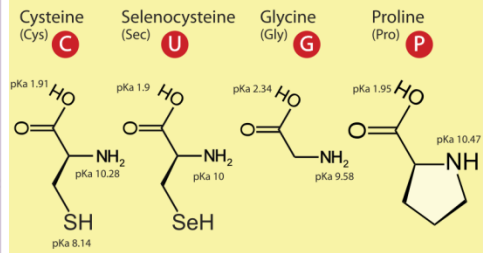
A. Amino Acids with Electrically Charged Side Chains



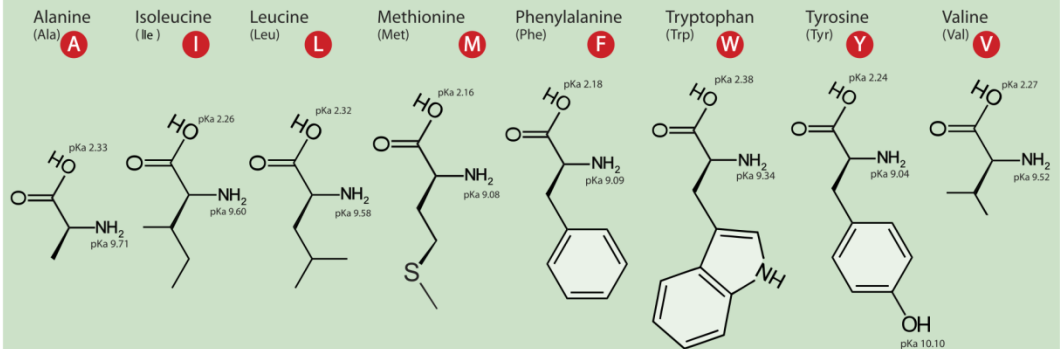
B. Amino Acids with Polar Uncharged Side Chains



C. Special Cases



D. Amino Acids with Hydrophobic Side Chain

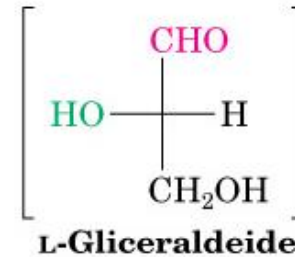
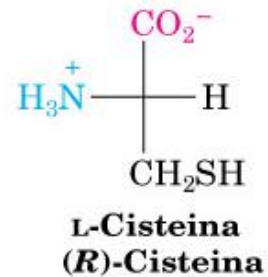
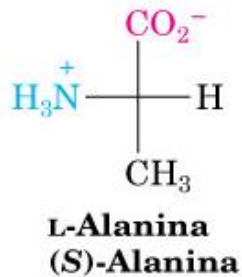


# Aminoacidi

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

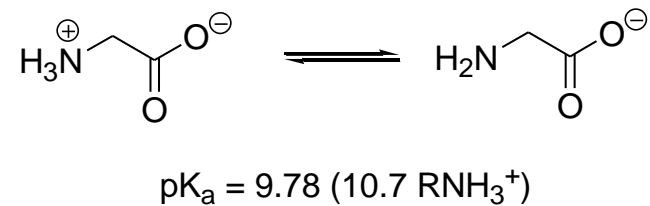
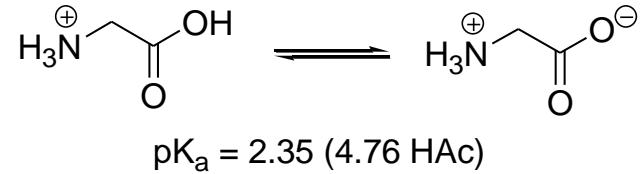
Negli organismi inferiori (batteri) si trovano anche amminoacidi della serie D e amminoacidi non chirali come l'AiB (acido  $\alpha$ -amminoisobutirrico)



# Aminoacidi

TABELLA 27.2 VALORI DEI  $pK_a$  PER I GRUPPI IONIZZABILI DEGLI AMMINOACIDI

Amminoacido	$pK_a$ $\alpha$ -CO <sub>2</sub> H	$pK_a$ $\alpha$ -NH <sub>3</sub> <sup>+</sup>	$pK_a$ 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



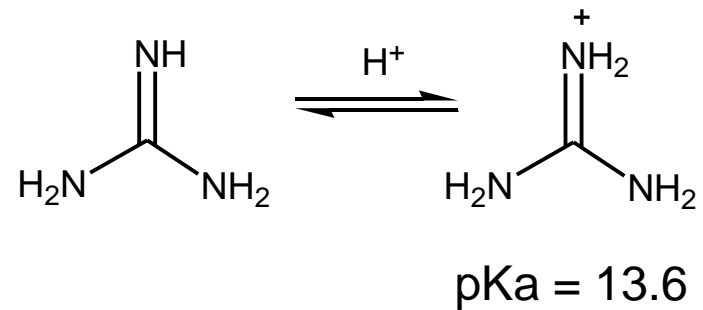
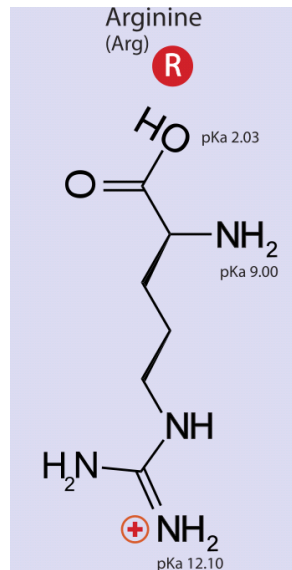
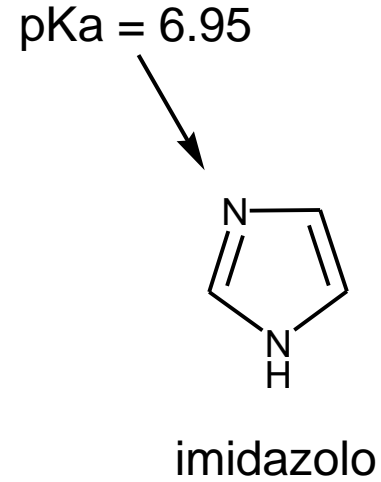
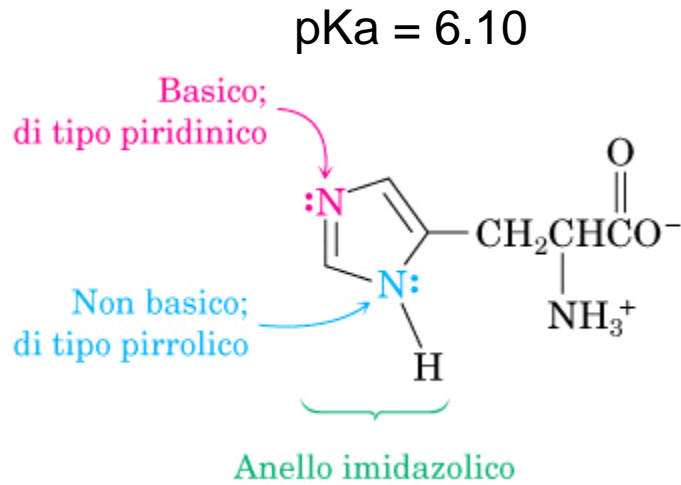
## Punto Isoelettrico (pI)

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

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

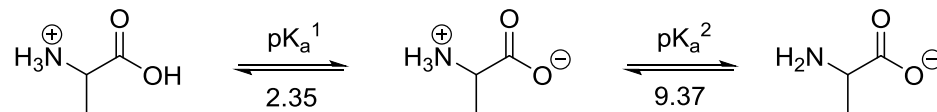
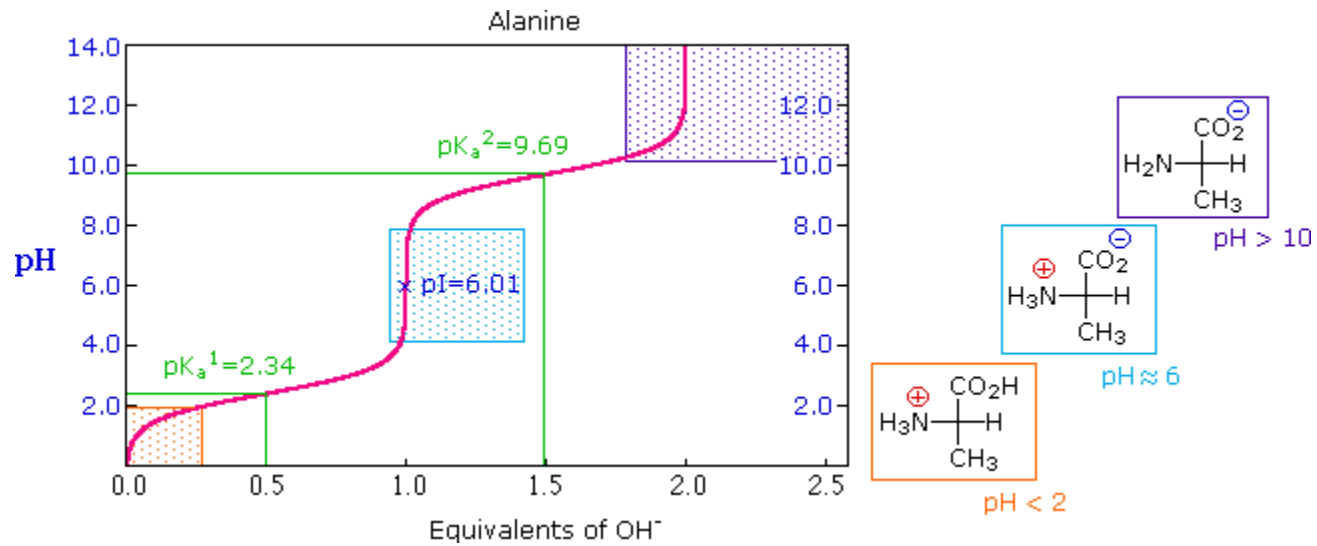
$$(9.78+2.35)/2 = 6.06$$

# Aminoacidi: istidina e arginina



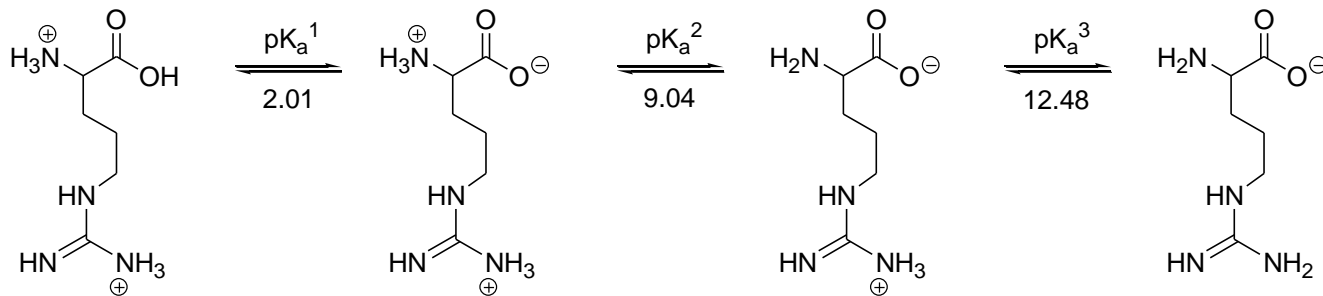
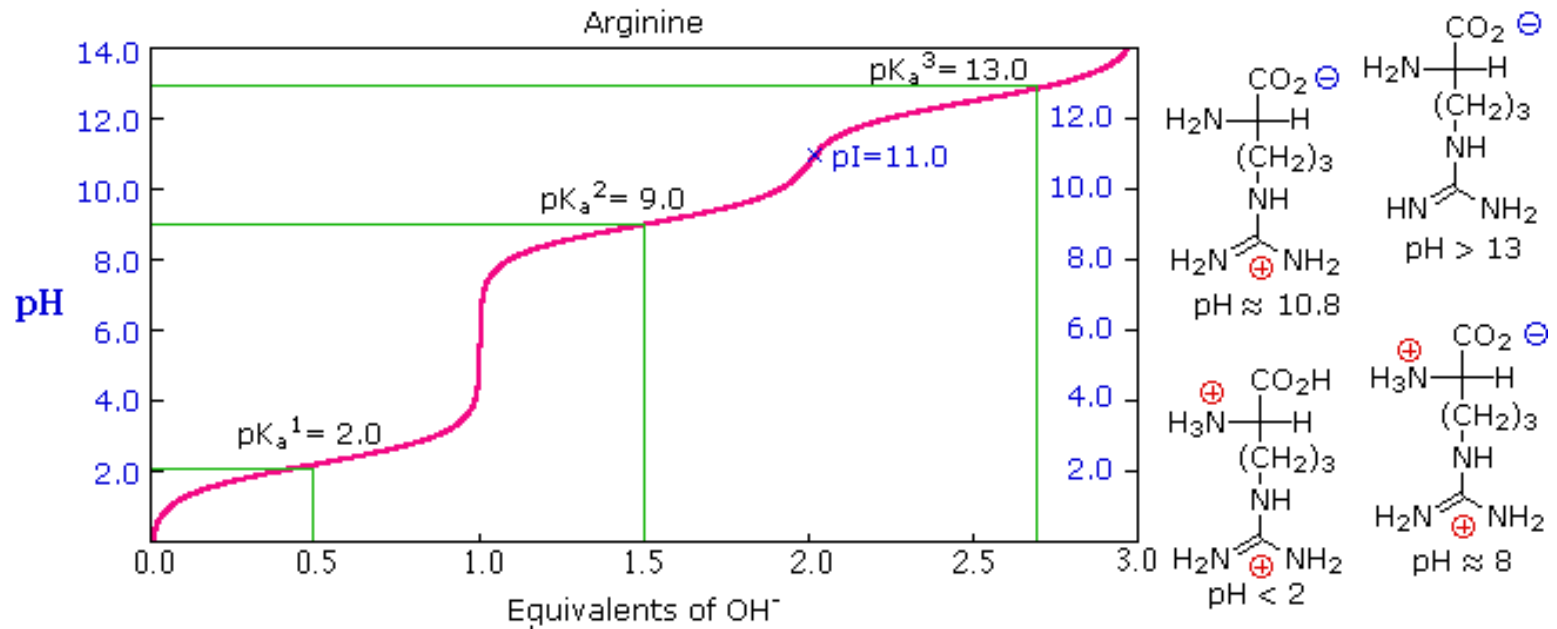
TEA (triethyl ammina) pKa = 10.75

# Titolazioni di amminoacidi: ALANINA



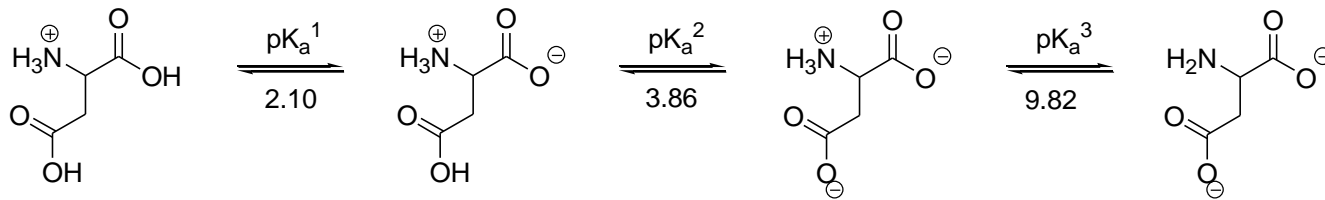
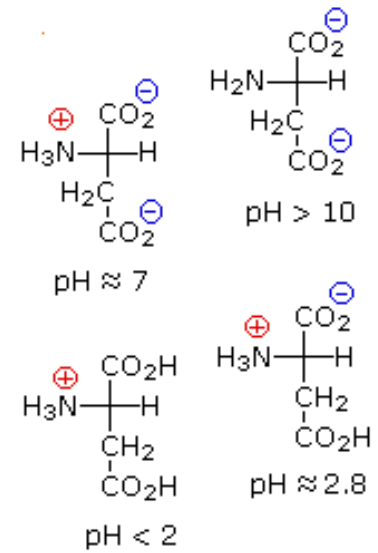
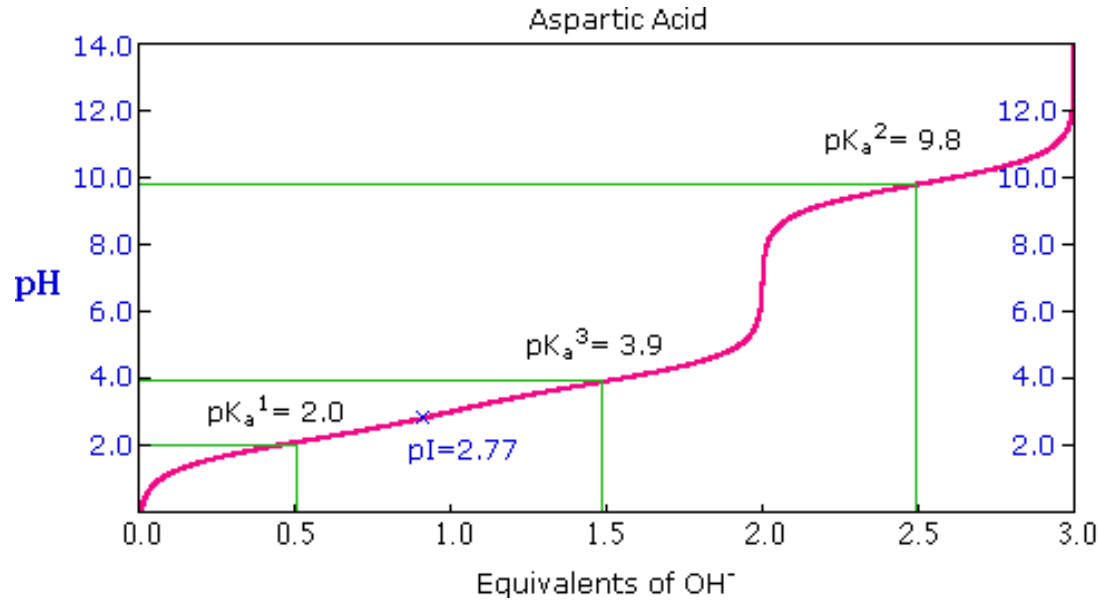
$\text{pI} = 6.11$

# Titolazioni di amminoacidi: Arginina



$pI = 10.7$

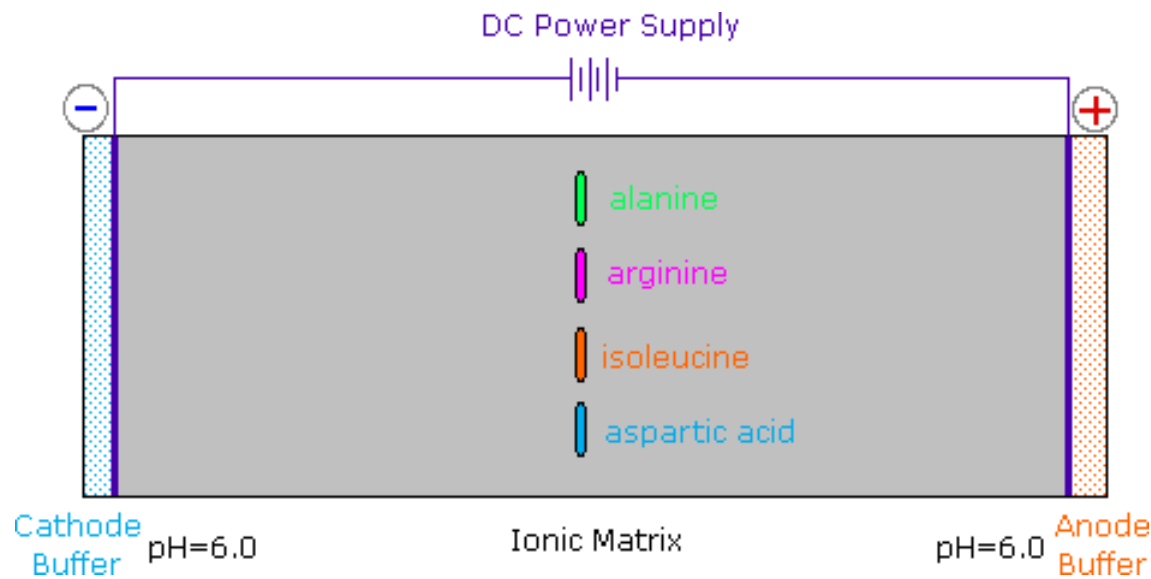
# Titolazioni di amminoacidi: Acido Aspartico



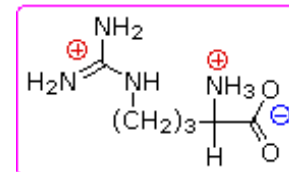
$pI = 2.98$



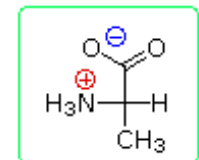
# Elettroforesi



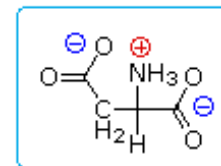
Predominant Species at pH=6.0



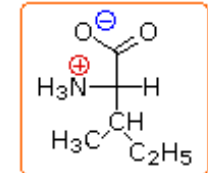
arginine  $pI=10.77$



alanine  $pI=6.01$



aspartic acid  $pI=2.80$

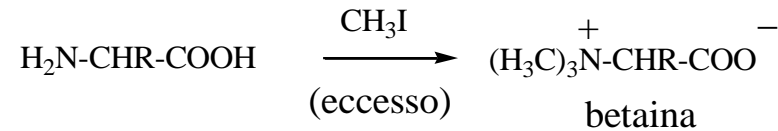


isoleucine  $pI=6.02$

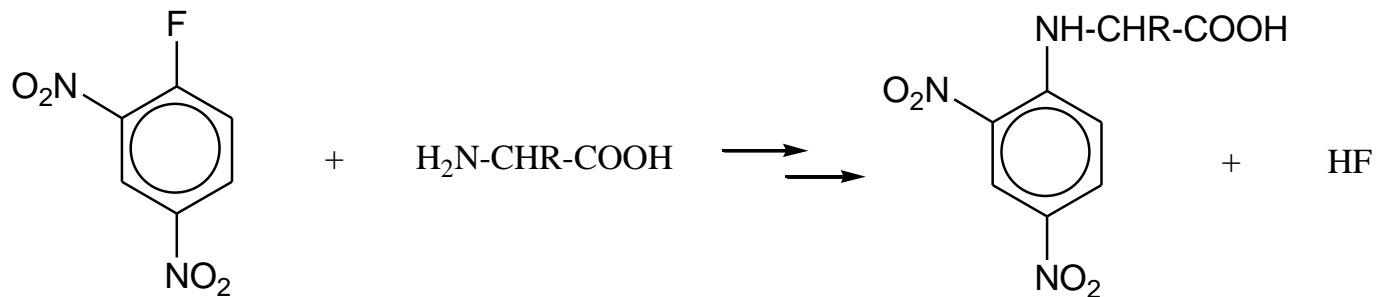
# Amminoacidi: reazioni

## Reazioni del gruppo amminico:

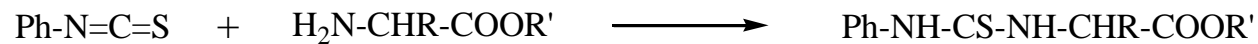
- acilazione
- alchilazione



## - reazione di Sanger



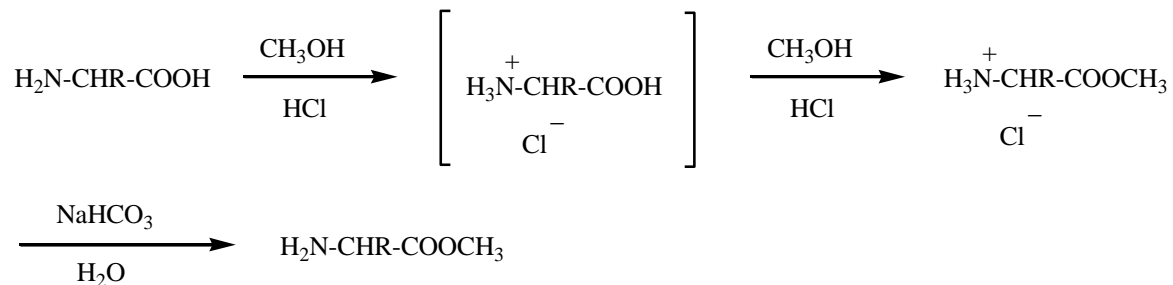
## - reazione di Edman



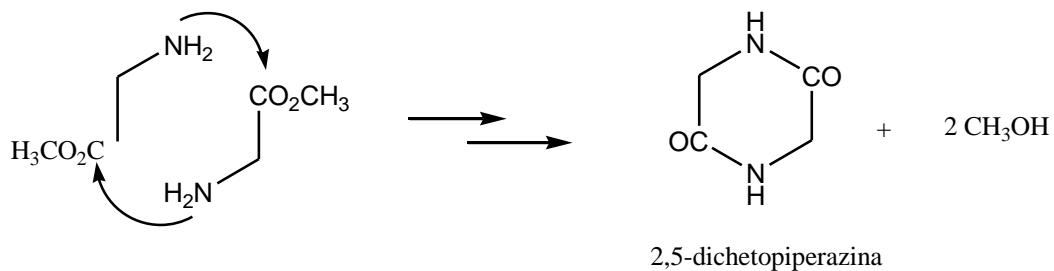
# Amminoacidi: reazioni

## Reazioni del gruppo carbossilico:

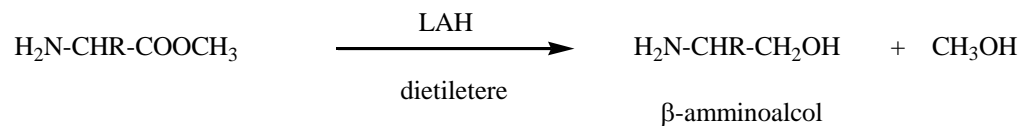
### Formazione di esteri:



NB: gli esteri degli  $\alpha$ -amminoacidi sono instabili. Più stabili i loro cloridrati.

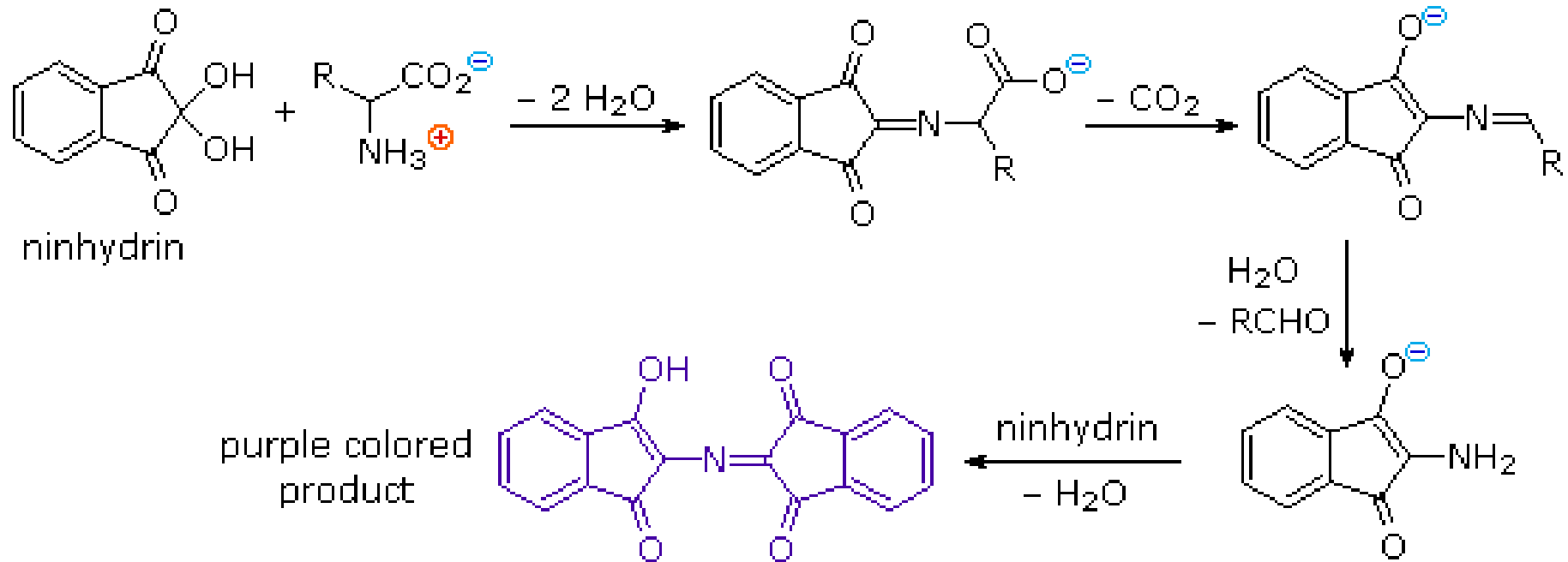


### Riduzione del gruppo estereo:



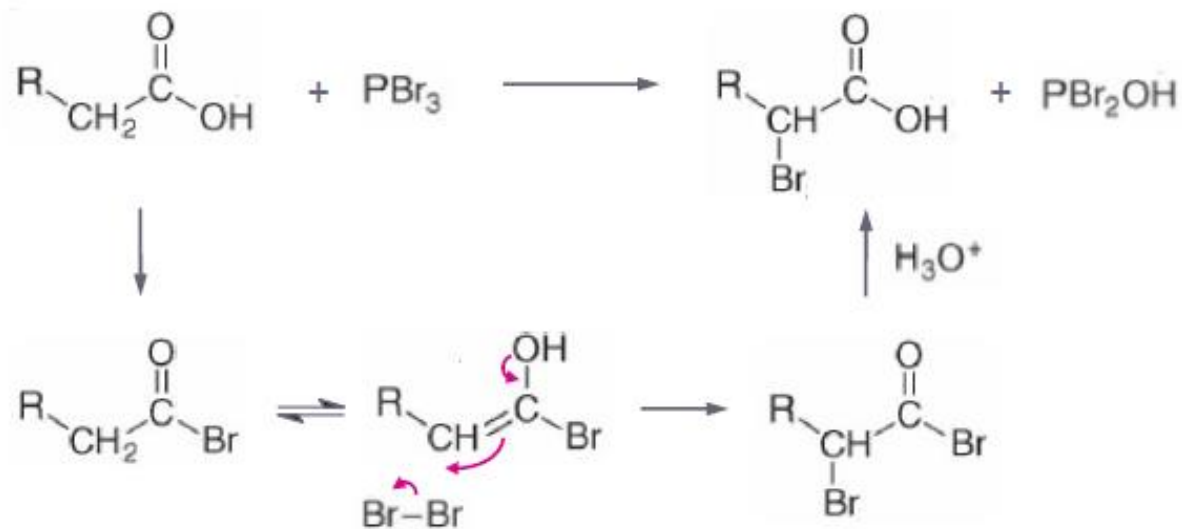
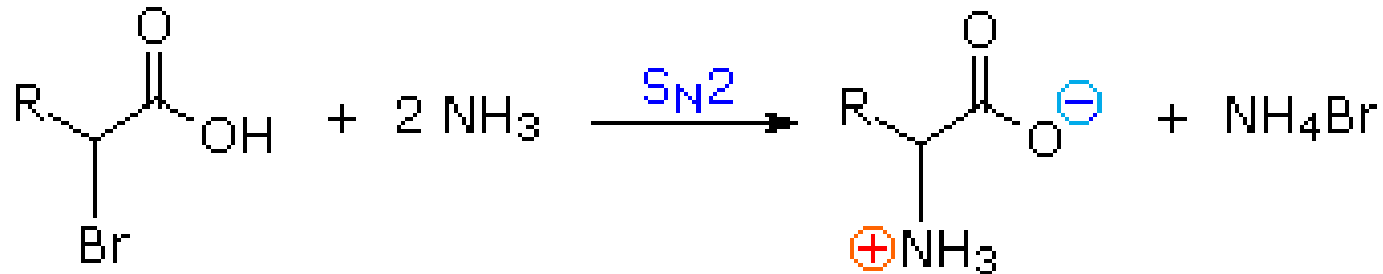
# Amminoacidi: reazioni

## Reazione con la ninidrina



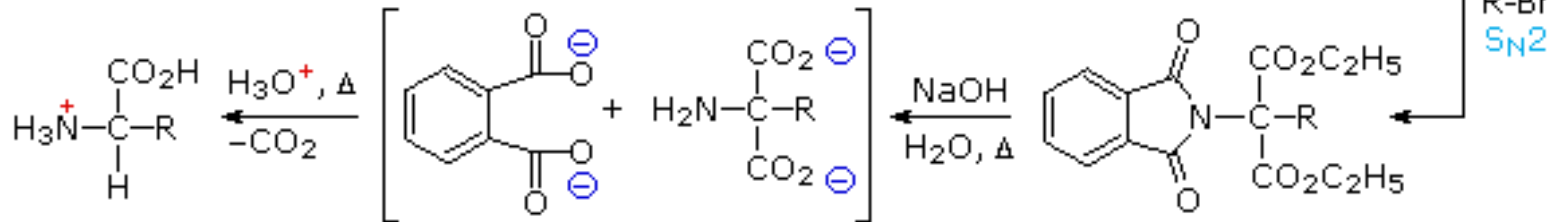
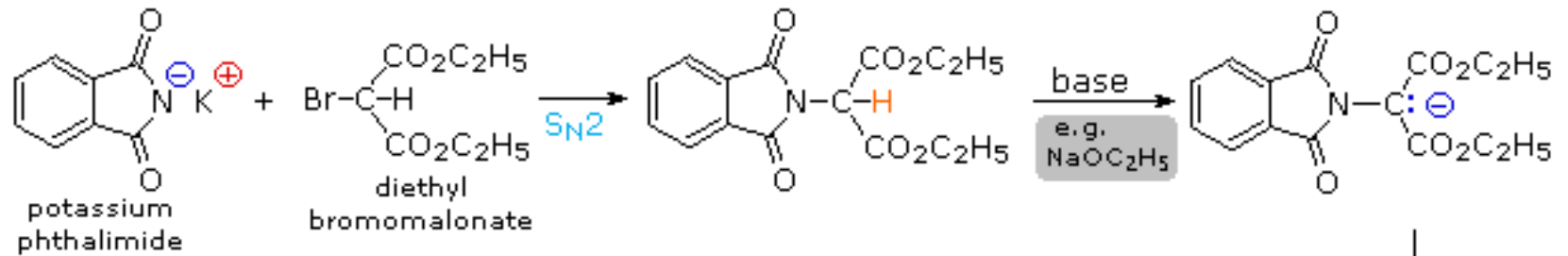
# Amminoacidi: sintesi

## Ammonolisi di acidi $\alpha$ -bromocarbossilici



# Amminoacidi: sintesi

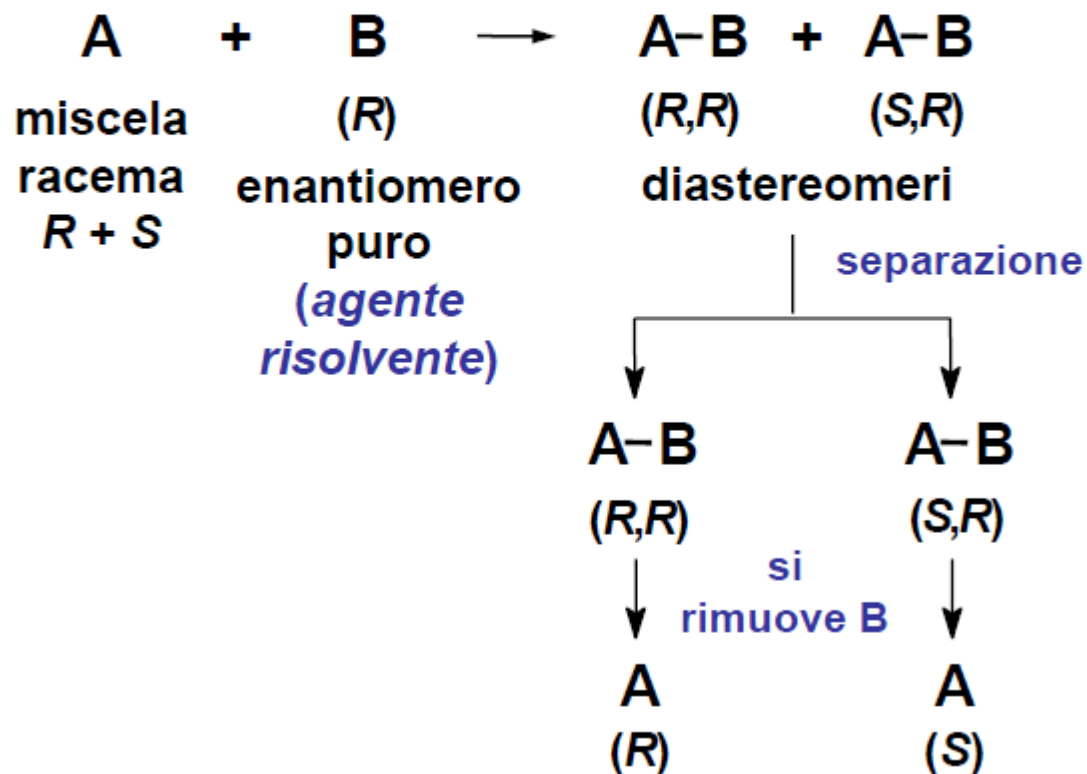
## Sintesi di Gabriel





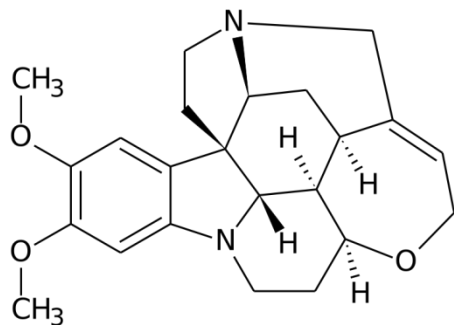
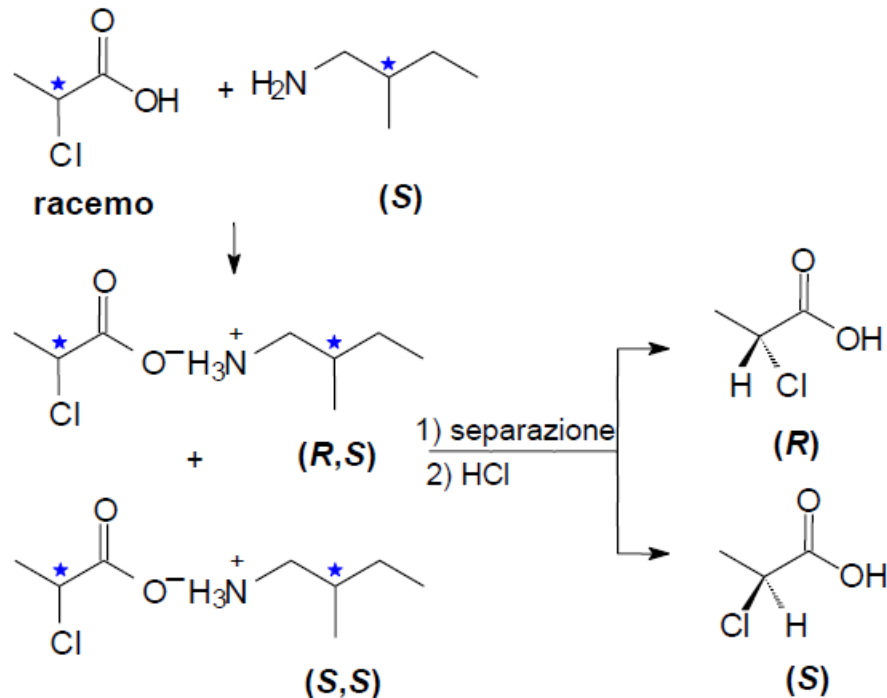
# Risoluzione di Enantiomeri

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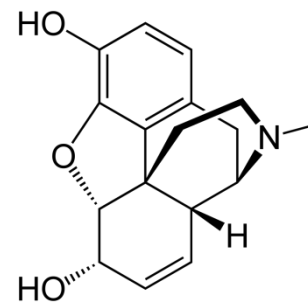




# Risoluzione di Enantiomeri



Brucina (2,3-dimetossistrichnina)



morfina

# Risoluzione di Enantiomeri

