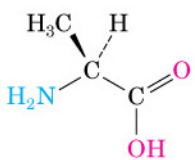
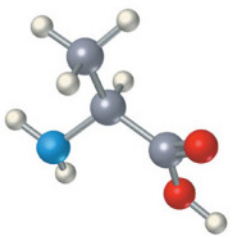
Il codice genetico

	T	C	A	G	
T	TTT *Phe (F)*	TCT *Ser (S)*	TAT *Tyr (Y)*	TGT *Cys (C)*	T
	TTC "	TCC "	TAC "	TGC "	C
	TTA *Leu (L)*	TCA "	TAA ***stop***	TGA ***stop***	A
	TTG "	TCG "	TAG ***stop***	TGG *Trp (W)*	G
C	CTT *Leu (L)*	CCT *Pro (P)*	CAT *His (H)*	CGT *Arg (R)*	T
	CTC "	CCC "	CAC "	CGC "	C
	CTA "	CCA "	CAA *Gln (Q)*	CGA "	A
	CTG "	CCG "	CAG "	CGG "	G
A	ATT *Ile (I)*	ACT *Thr (T)*	AAT *Asn (N)*	AGT *Ser (S)*	T
	ATC "	ACC "	AAC "	AGC "	C
	ATA "	ACA "	AAA *Lys (K)*	AGA *Arg (R)*	A
	ATG *Met (M)*	ACG "	AAG "	AGG "	G
G	GTT *Val (V)*	GTC *Ala (A)*	GAT *Asp (D)*	GGT *Gly (G)*	T
	GTC "	GCC "	GAC "	GGC "	C
	GTA "	GCA "	GAA *Glu (E)*	GGA "	A
	GTG "	GCG "	GAG "	GGG "	G

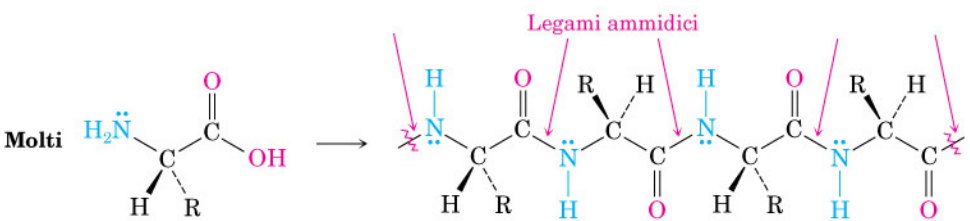
Amminoacidi: composti bifunzionali





Alanina (un amminoacido)

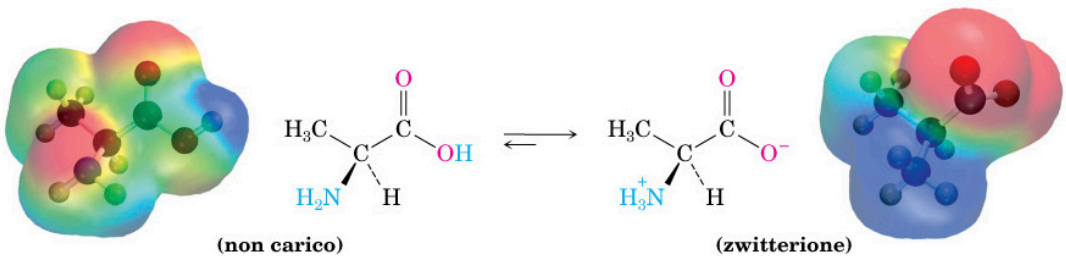
Contengono un gruppo acido ed uno basico



Unità strutturali delle proteine (o peptidi se <50 a.a.)

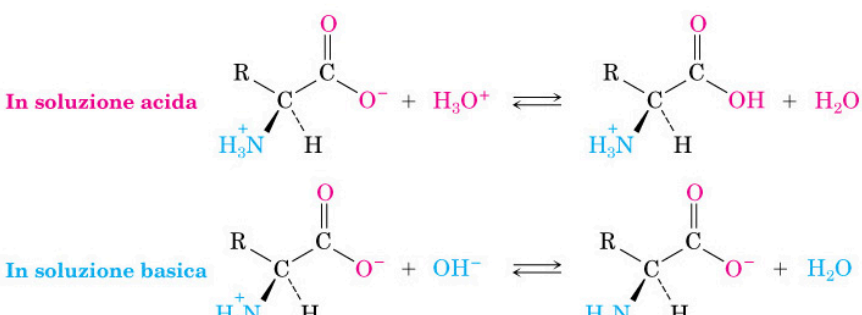
Sono soggetti a reazione acido-base intramolecolare

esistono principalmente in forma di ione dipolare o zwitterione



Alanina

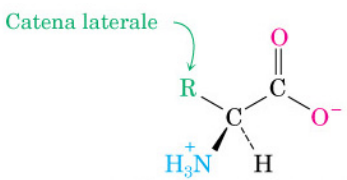
Sono anfoteri (possono reagire sia come basi che come acidi)



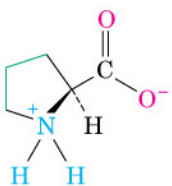
Gli a.a. comuni presenti nelle proteine sono 20

si tratta di **α-amminoacidi**

19 di 20 sono ammine primarie e differiscono solo per la natura del sostituente in α: la catena laterale
la prolina è secondaria (anello pirrolidinico)

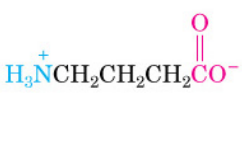


α-Amminoacido primario



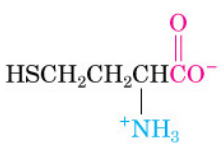
Prolina
(α-amminoacido secondario)

Altri amminoacidi non proteici importanti:



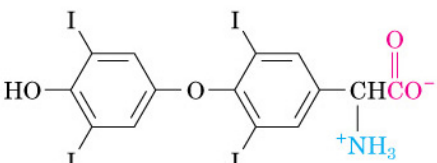
Acido γ-ammino-butirrico

Neurotrasmettitore nel cervello



Omocisteina

Presente nel sangue,
legata a disturbi delle coronarie

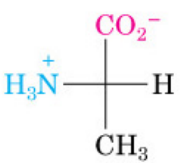


Tiroxina

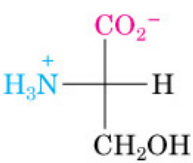
Ormone tiroideo

degli amminoacidi proteici solo la glicina non è chirale

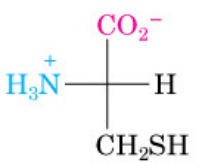
Proiezioni di Fischer



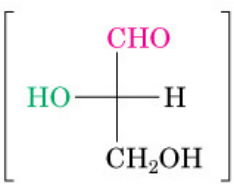
L-Alanina
(*S*)-Alanina



L-Serina
(*S*)-Serina



L-Cisteina
(*R*)-Cisteina

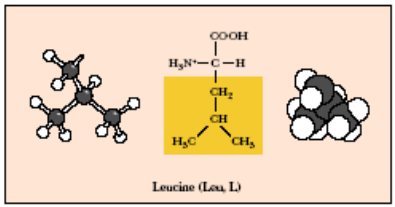


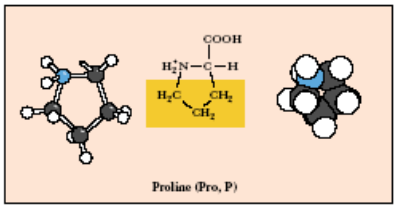
L-Gliceraldeide

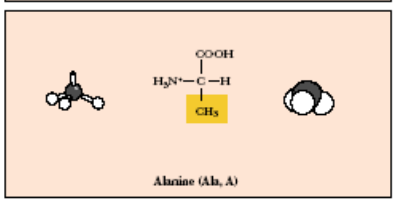
L-amminoacidi

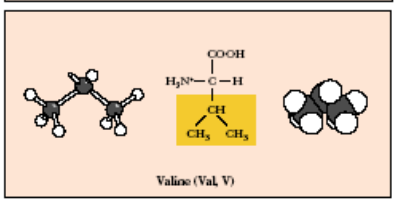
L-carboidrati

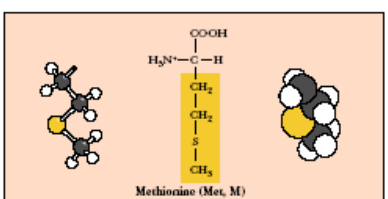
I 20 a.a. comuni sono distinti in neutri, acidi e basici in base alla natura della catena laterale

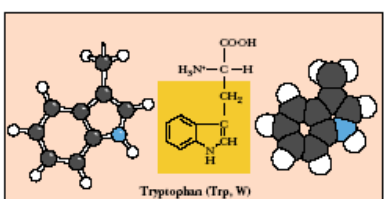


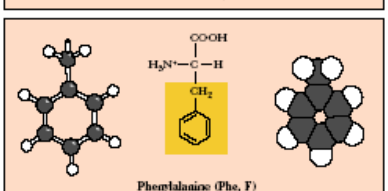


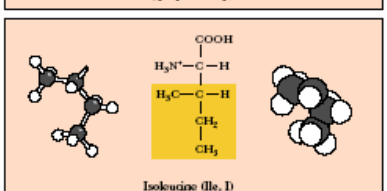




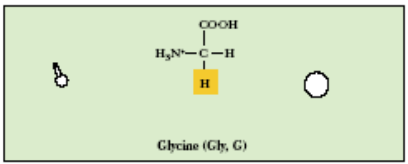


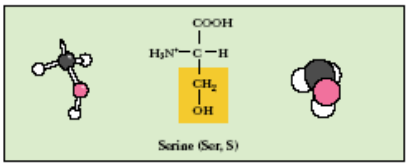


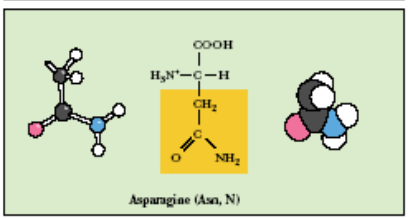


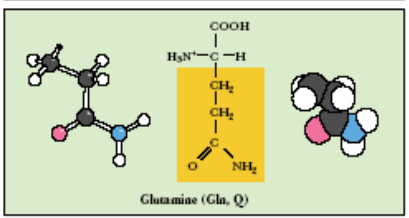


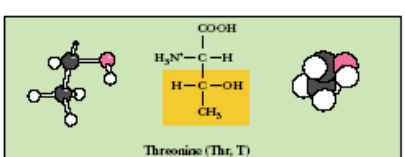
Amminoacidi: proprietà

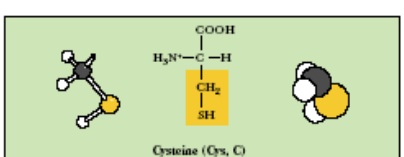


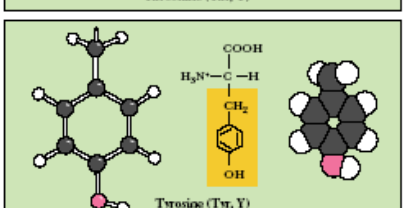


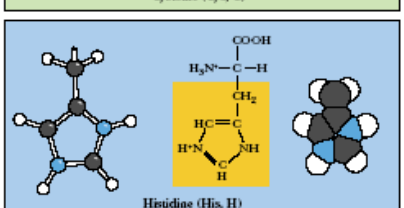




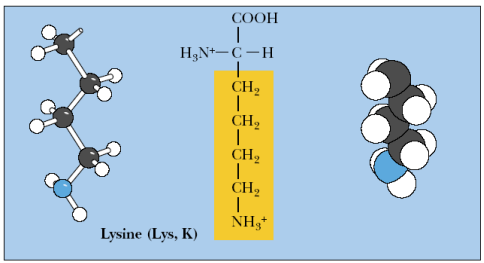


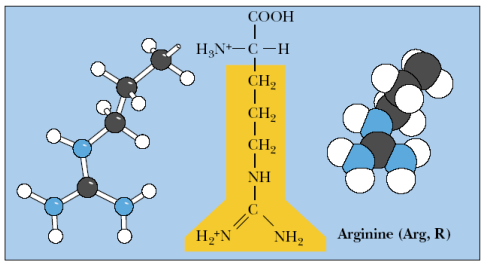


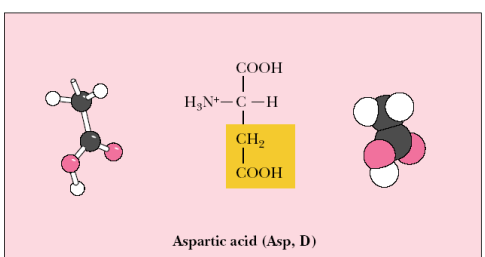


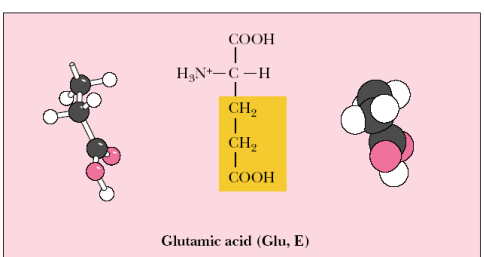


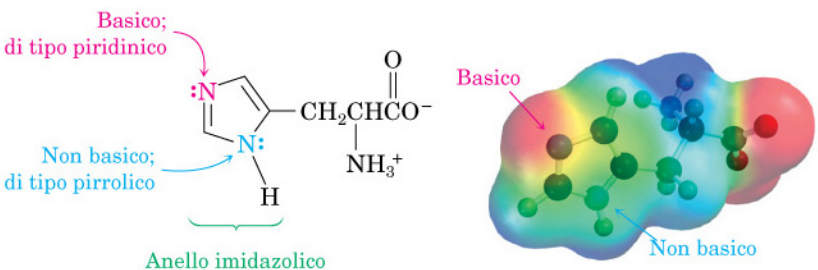
Amminoacidi: proprietà







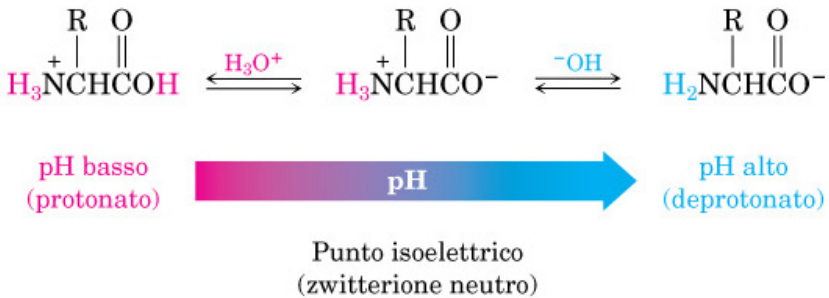




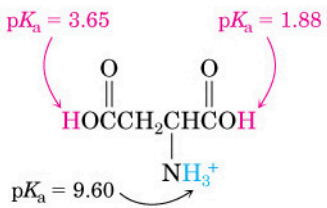
Istidina

La protonazione è influenzata dal pH – quello fisiologico è circa 7.3

Gli esseri umani sono in grado di sintetizzare solo 10 dei 20 a.a. proteici, gli altri (detti a.a. essenziali) devono essere assunti con l'alimentazione

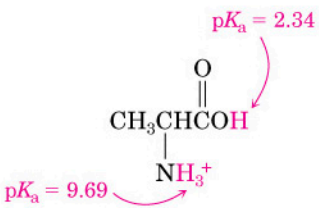


E' il valore di pH in cui l'a.a. è globalmente neutro



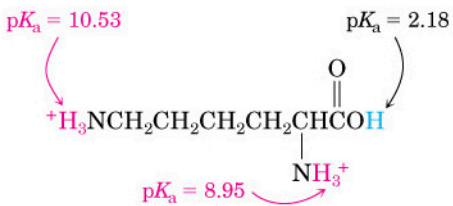
$$pI = \frac{1.88 + 3.65}{2} = 2.77$$

Amminoacido acido
Acido aspartico



$$pI = \frac{2.34 + 9.69}{2} = 6.01$$

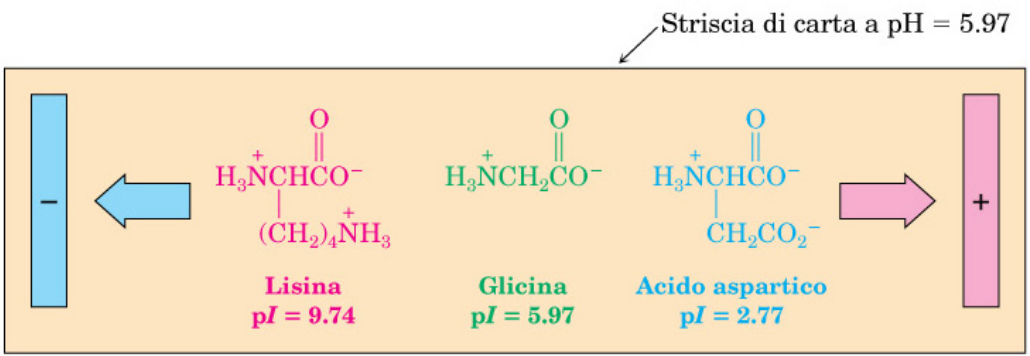
Amminoacido neutro
Alanina



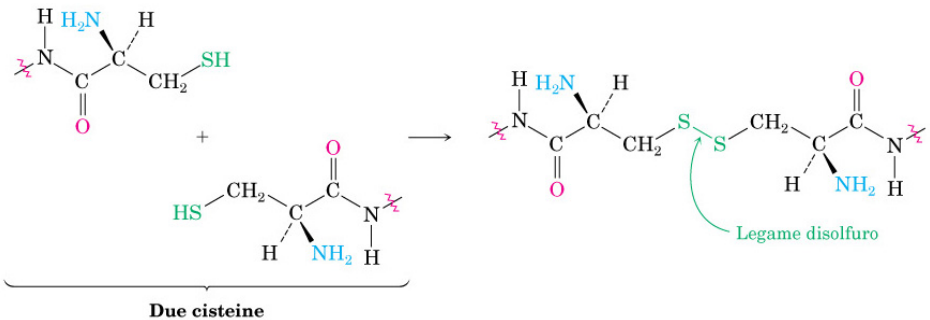
$$pI = \frac{8.95 + 10.53}{2} = 9.74$$

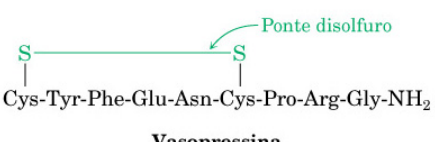
Amminoacido basico
Lisina

Separazione di una miscela di amminoacidi mediante elettroforesi. A pH = 5.97 le molecole di glicina sono per lo più neutre e non migrano, le molecole di lisina sono protonate e migrano verso l'elettrodo negativo e le molecole di acido aspartico sono deprotonate e migrano verso l'elettrodo positivo.

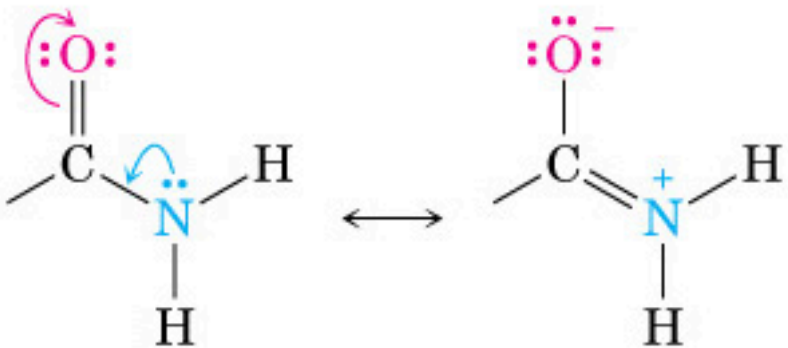


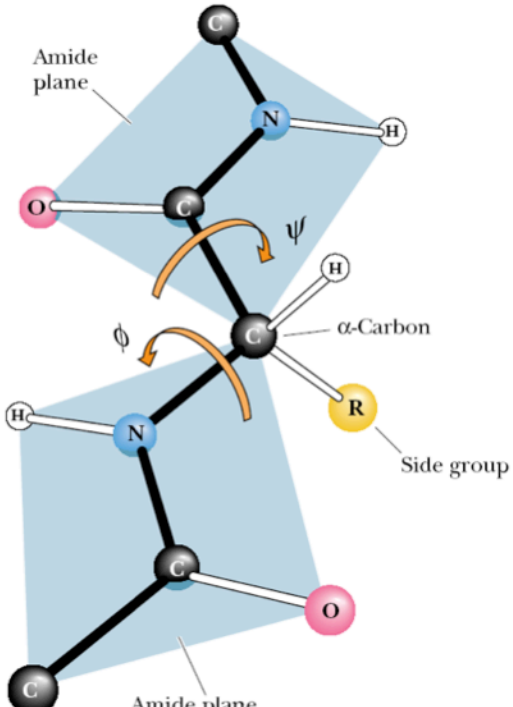
Il legame disolfuro





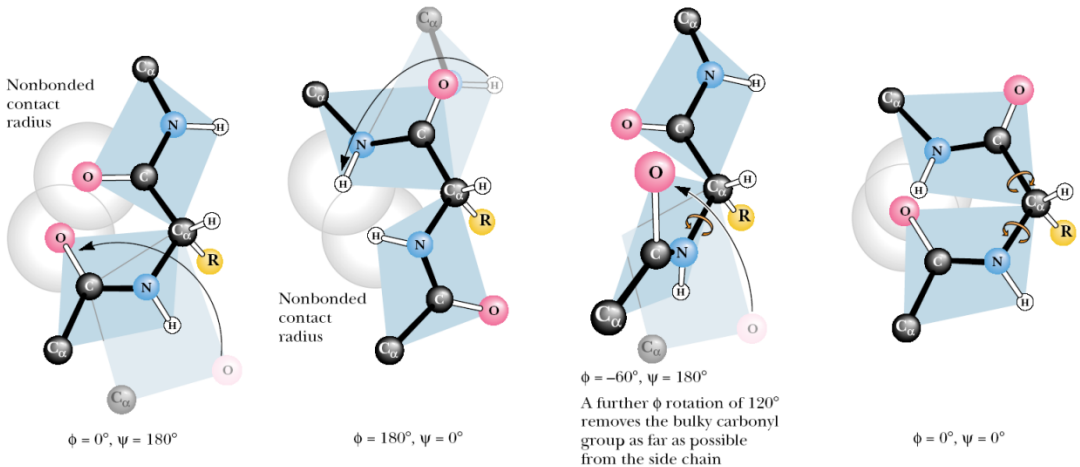
Può unire a.a. della stessa catena o di catene diverse


O
C
N
H
H
O
C
N
H
H

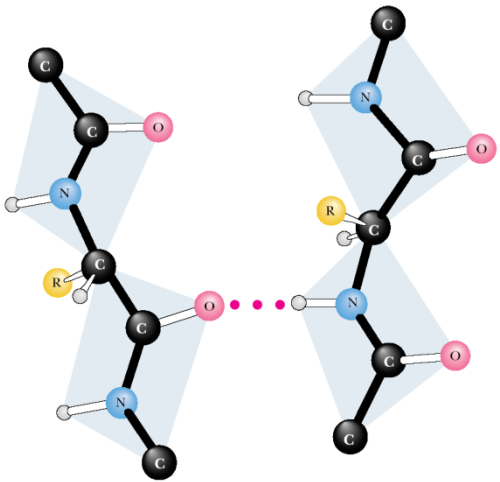


Sul legame ammidico c' è una barriera rotazionale di 88 $sen^2\theta$ $kJmol^{-1}$ a causa del parziale carattere di doppio legame

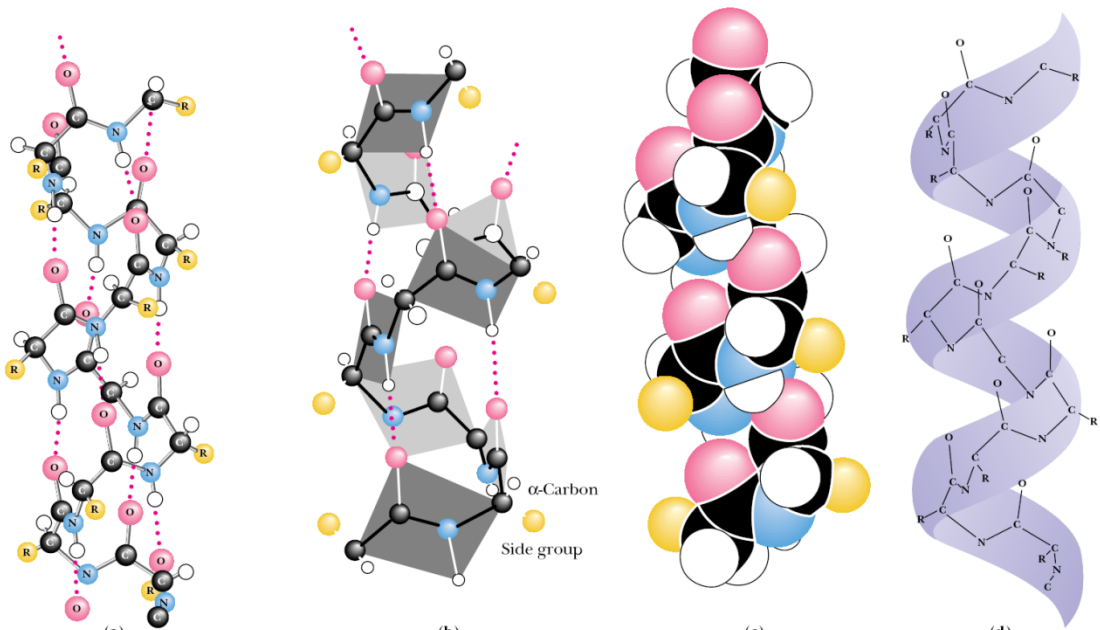
Per ogni amminoacido esistono due gradi di libertà rotazionali



In realtà non tutti gli angoli sono ugualmente possibili ed alcune conformazioni sono più probabili

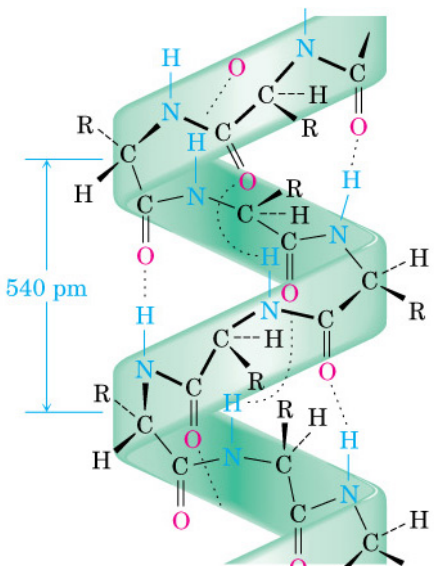


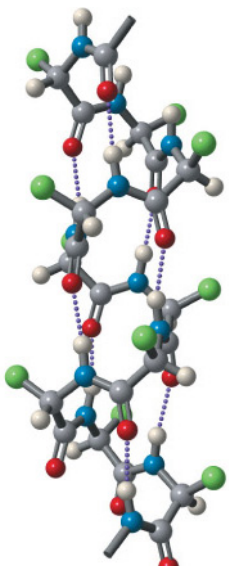
Ulteriori interazioni determinano le conformazioni delle proteine: legami a H



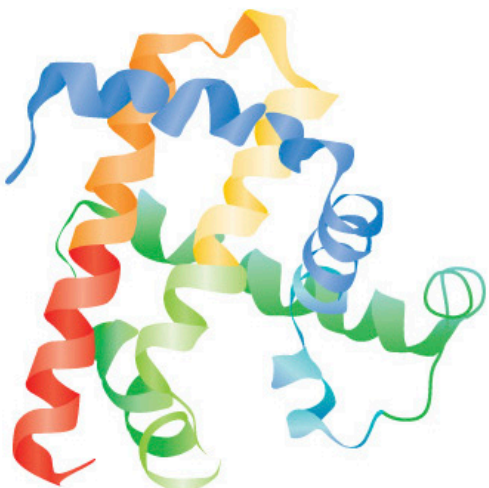
Strutture a elica

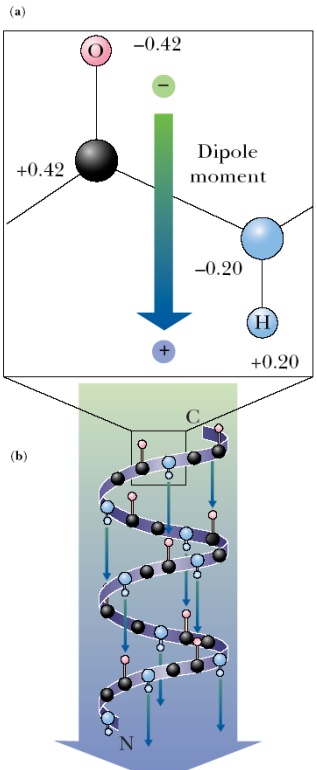
La struttura secondaria ad elica presente nell' α-cheratina.





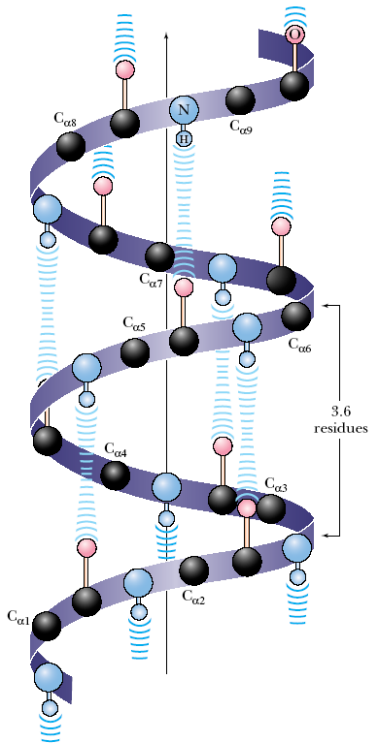
Struttura secondaria e terziaria della mioglobina, una proteina globulare con estese sezioni ad elica, qui mostrate come nastri.





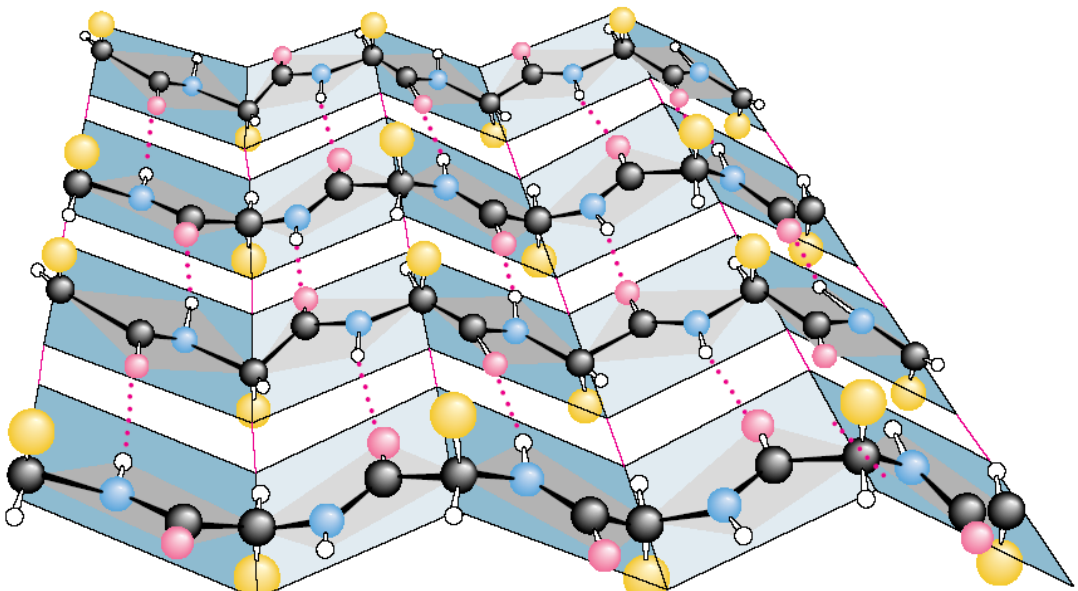
Momenti dipolari dei singoli legami peptidici si sommano in una struttura a elica

Leganti positivi tendono a legarsi in prossimità del C-terminale, negativi dell' N-terminale

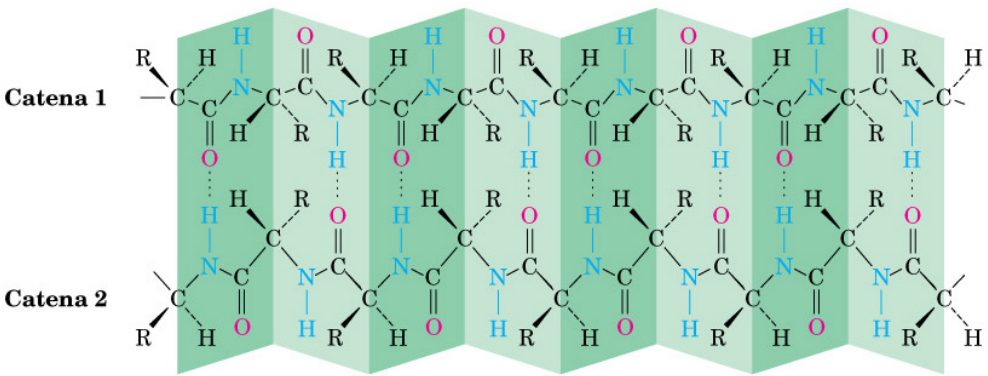


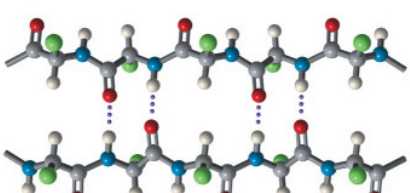
Agli estremi dell' elica vi sono accettori e donatori di legami a H liberi

Un altro motivo di struttura secondaria: il β-foglietto

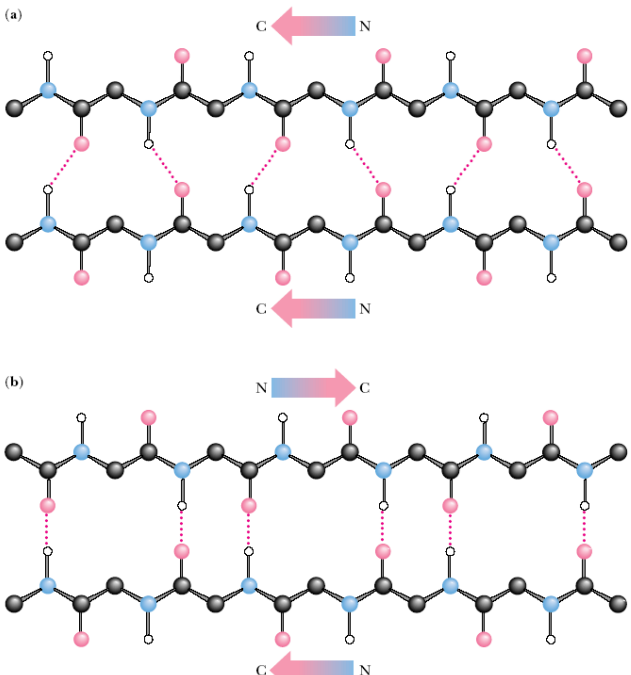


La struttura a foglietto β pieghettato nella fibroina della seta.

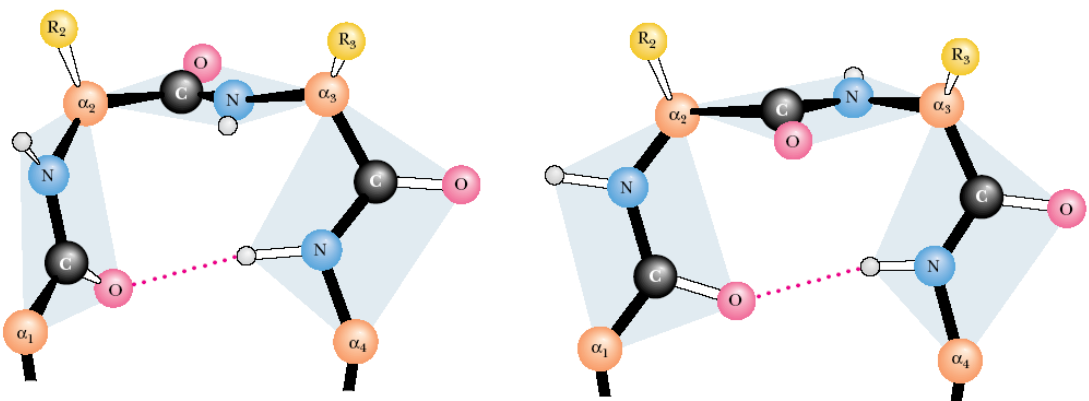




foglietto β parallelo e anti-parallelo

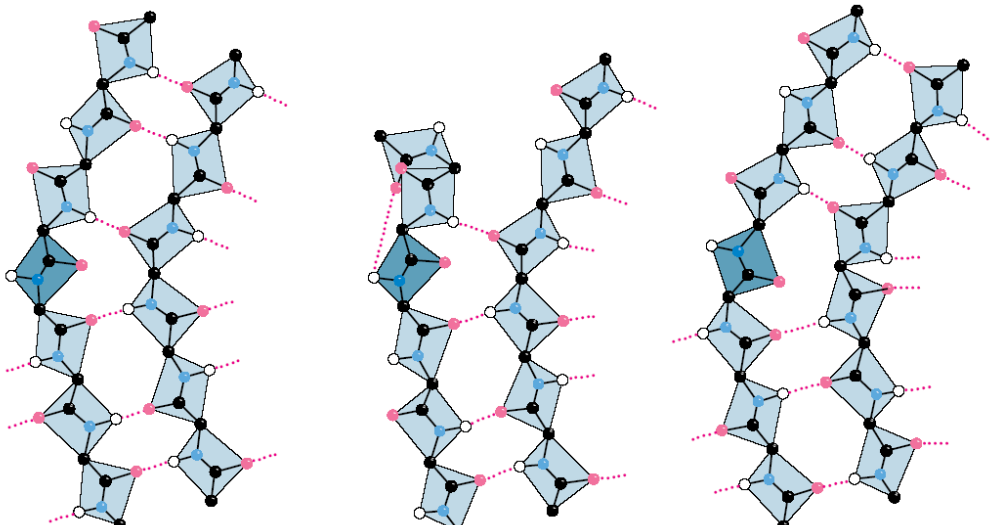


β turn



Sono presenti spesso glicine e proline

β buldge



Classic bulge

G-1 bulge

Wide bulge

www.pymol.org

Database di coordinate di strutture di proteine: www.rcsb.org