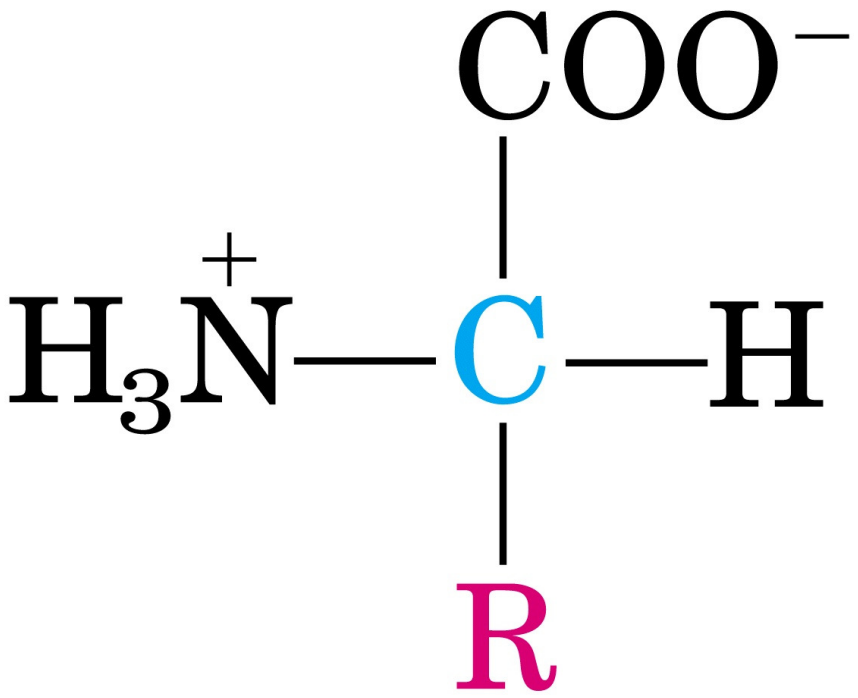
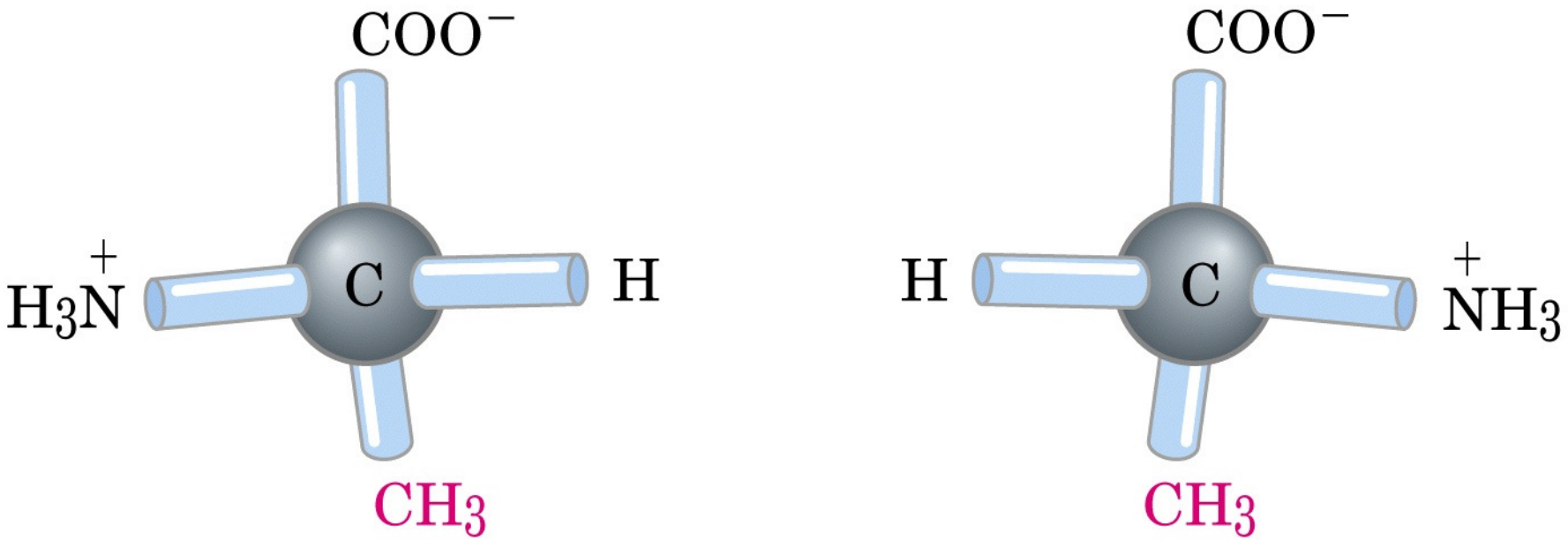
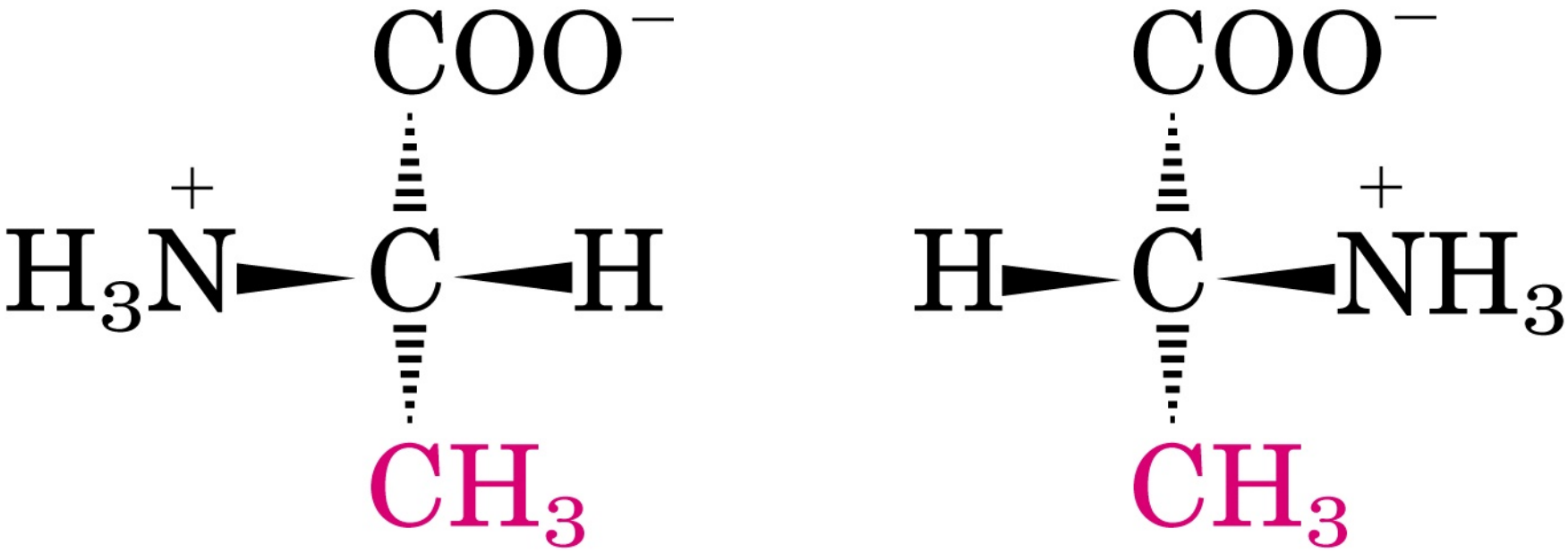
AMMINOACIDI


COO⁻
H₃N⁺
C
H
R

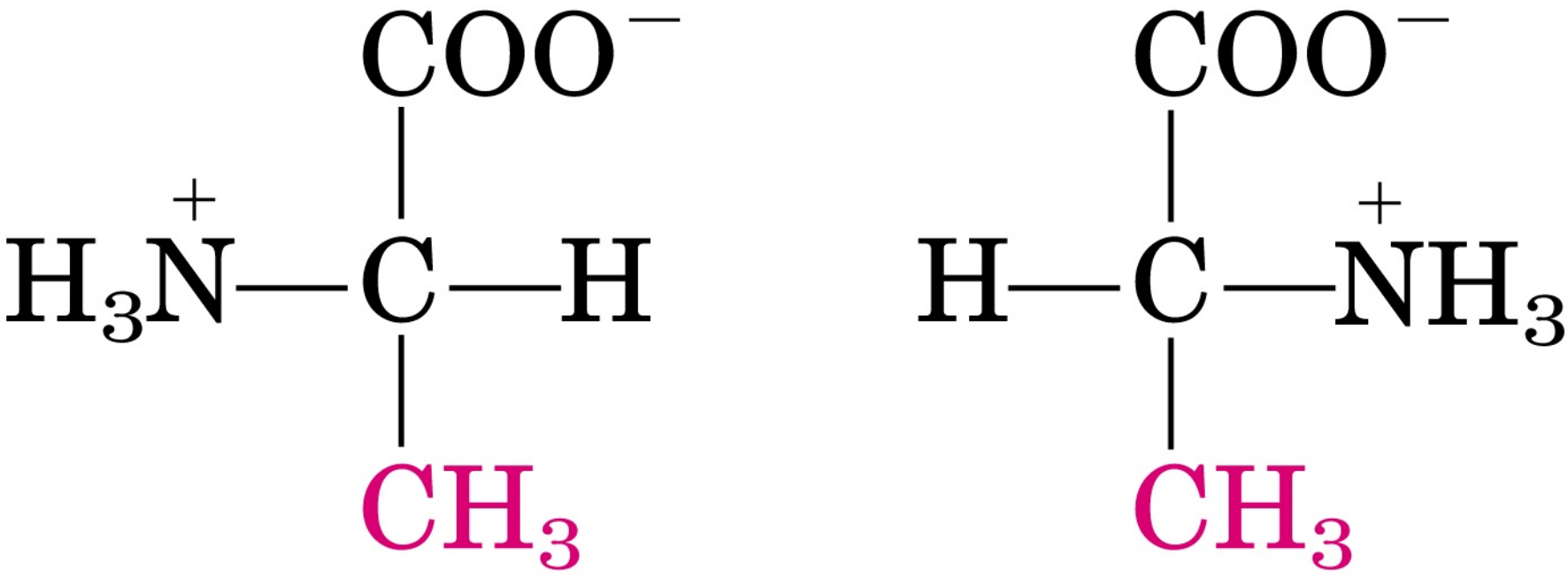


(a)



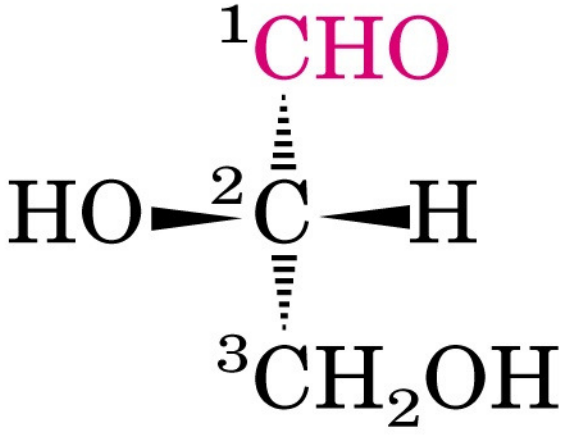
L-Alanine D-Alanine

(b)

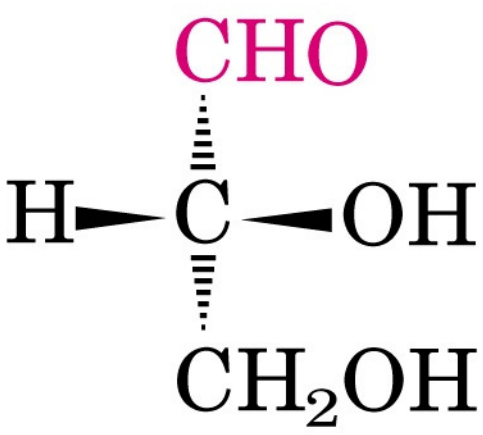


L-Alanine D-Alanine

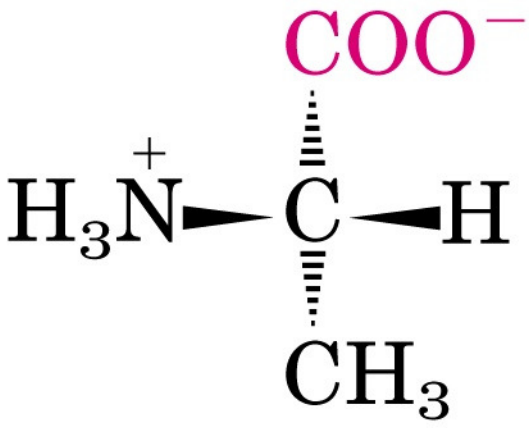
(c)



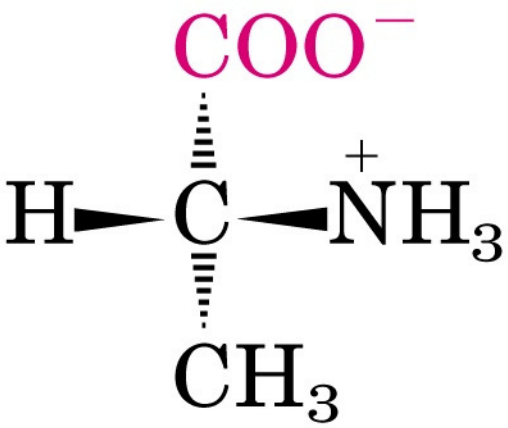
L-Glyceraldehyde



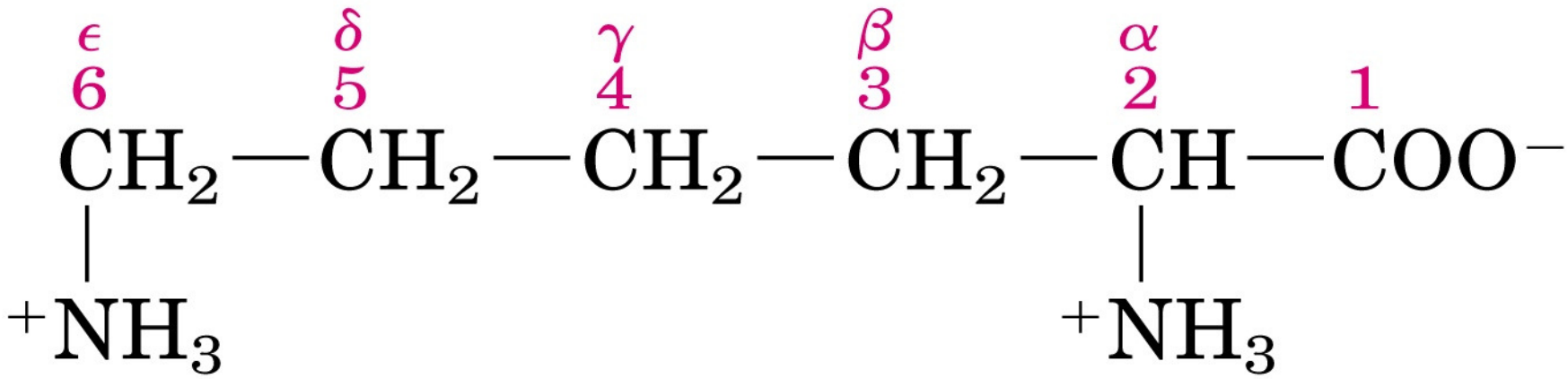
D-Glyceraldehyde



L-Alanine



D-Alanine



Lysine

table 5–1

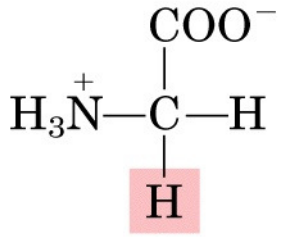
Properties and Conventions Associated with the Standard Amino Acids

Amino acid	Abbreviated names		M_r	pK_a values: pK_1 (—COOH)	pK_2 ($—NH_3^+$)	pK_R (R group)	pI	Hydropathy index*	Occurrence in proteins (%)
Nonpolar, aliphatic R groups									
Glycine	Gly	G	75	2.34	9.60		5.97	−0.4	7.2
Alanine	Ala	A	89	2.34	9.69		6.01	1.8	7.8
Valine	Val	V	117	2.32	9.62		5.97	4.2	6.6
Leucine	Leu	L	131	2.36	9.60		5.98	3.8	9.1
Isoleucine	Ile	I	131	2.36	9.68		6.02	4.5	5.3
Methionine	Met	M	149	2.28	9.21		5.74	1.9	2.3
Aromatic R groups									
Phenylalanine	Phe	F	165	1.83	9.13		5.48	2.8	3.9
Tyrosine	Tyr	Y	181	2.20	9.11	10.07	5.66	−1.3	3.2
Tryptophan	Trp	W	204	2.38	9.39		5.89	−0.9	1.4
Polar, uncharged R groups									
Serine	Ser	S	105	2.21	9.15		5.68	−0.8	6.8
Proline	Pro	P	115	1.99	10.96		6.48	1.6	5.2
Threonine	Thr	T	119	2.11	9.62		5.87	−0.7	5.9
Cysteine	Cys	C	121	1.96	10.28	8.18	5.07	2.5	1.9
Asparagine	Asn	N	132	2.02	8.80		5.41	−3.5	4.3
Glutamine	Gln	Q	146	2.17	9.13		5.65	−3.5	4.2
Positively charged R groups									
Lysine	Lys	K	146	2.18	8.95	10.53	9.74	−3.9	5.9
Histidine	His	H	155	1.82	9.17	6.00	7.59	−3.2	2.3
Arginine	Arg	R	174	2.17	9.04	12.48	10.76	−4.5	5.1
Negatively charged R groups									
Aspartate	Asp	D	133	1.88	9.60	3.65	2.77	−3.5	5.3
Glutamate	Glu	E	147	2.19	9.67	4.25	3.22	−3.5	6.3

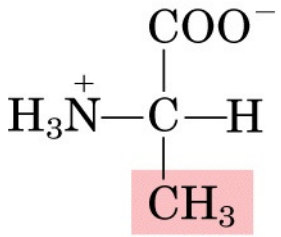
*A scale combining hydrophobicity and hydrophilicity of R groups; it can be used to measure the tendency of an amino acid to seek an aqueous environment (− values) or a hydrophobic environment (+ values). See Chapter 12. From Kyte, J. & Doolittle, R.F. (1982) *J. Mol. Biol.* **157,** 105 – 132.

†Average occurrence in over 1150 proteins. From Doolittle, R.F. (1989) Redundancies in protein sequences. In *Prediction of Protein Structure and the Principles of Protein Conformation* (Fasman, G.D., ed) Plenum Press, NY, pp. 599–623.

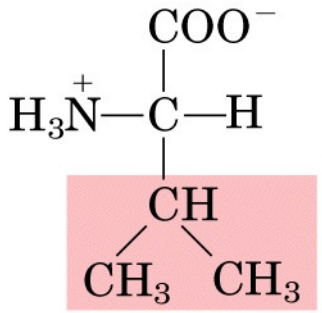
Nonpolar, aliphatic R groups



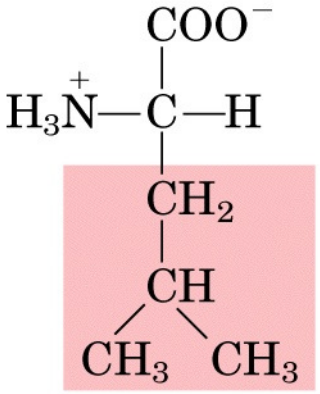
Glycine



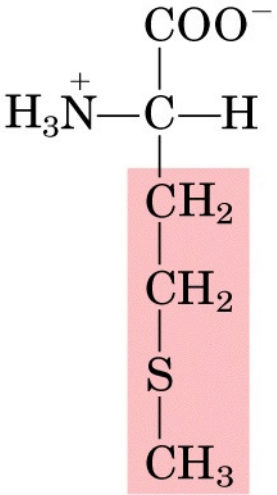
Alanine



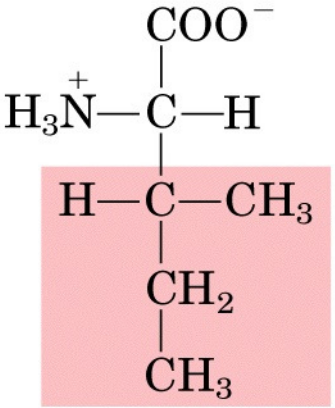
Valine



Leucine

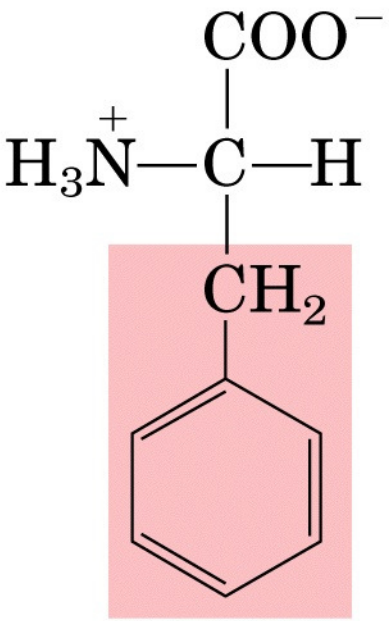


Methionine

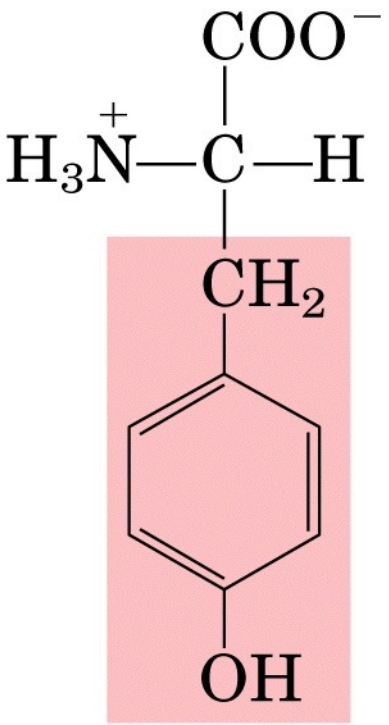


Isoleucine

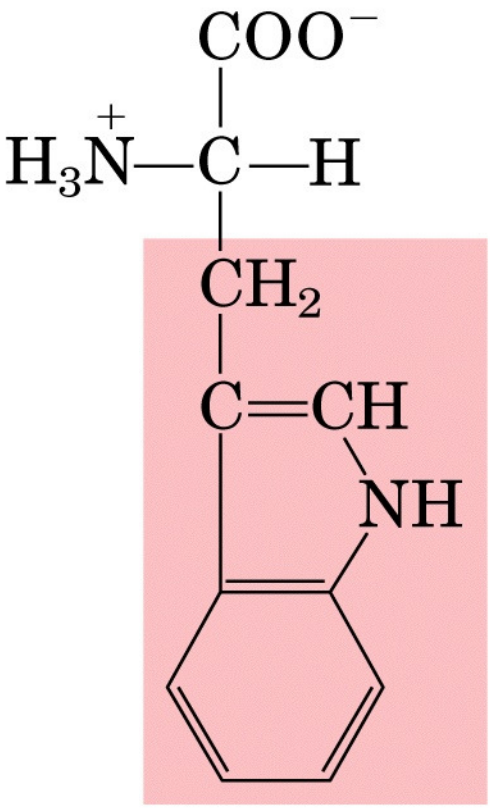
Aromatic R groups



Phenylalanine

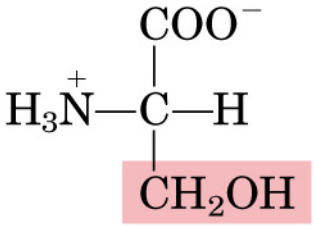


Tyrosine

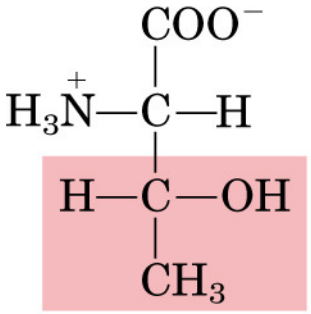


Tryptophan

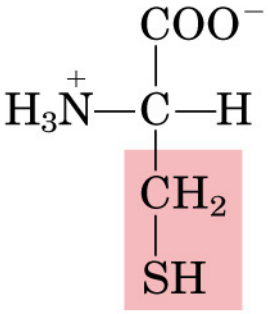
Polar, uncharged R groups



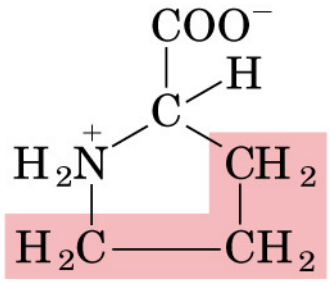
Serine



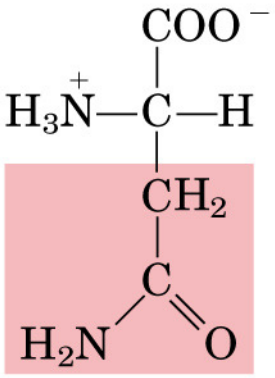
Threonine



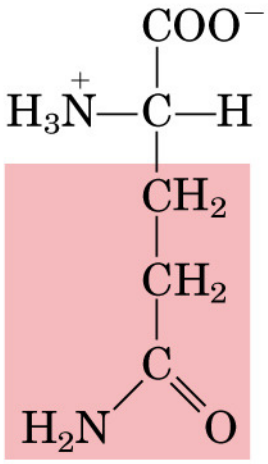
Cysteine



Proline

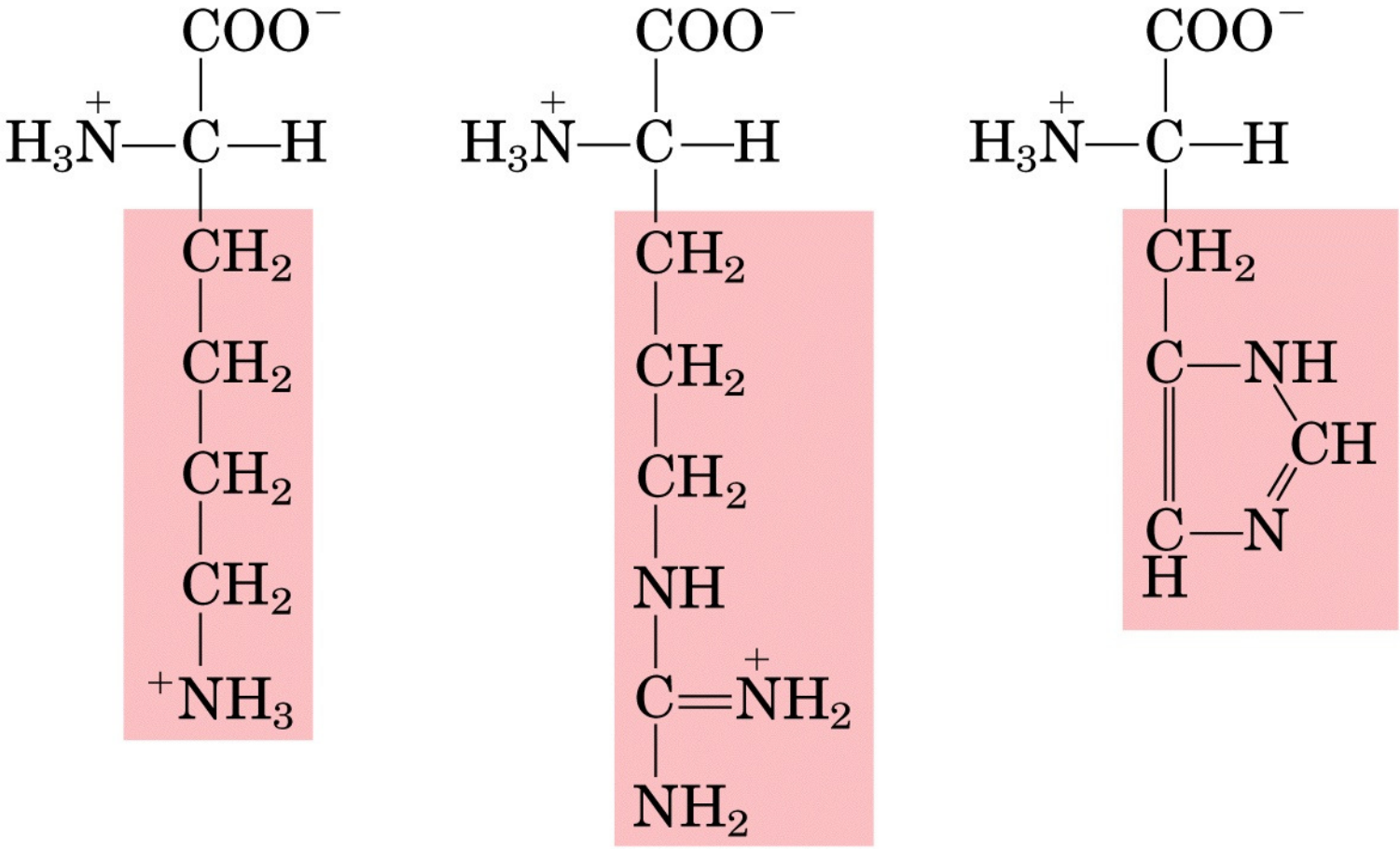


Asparagine



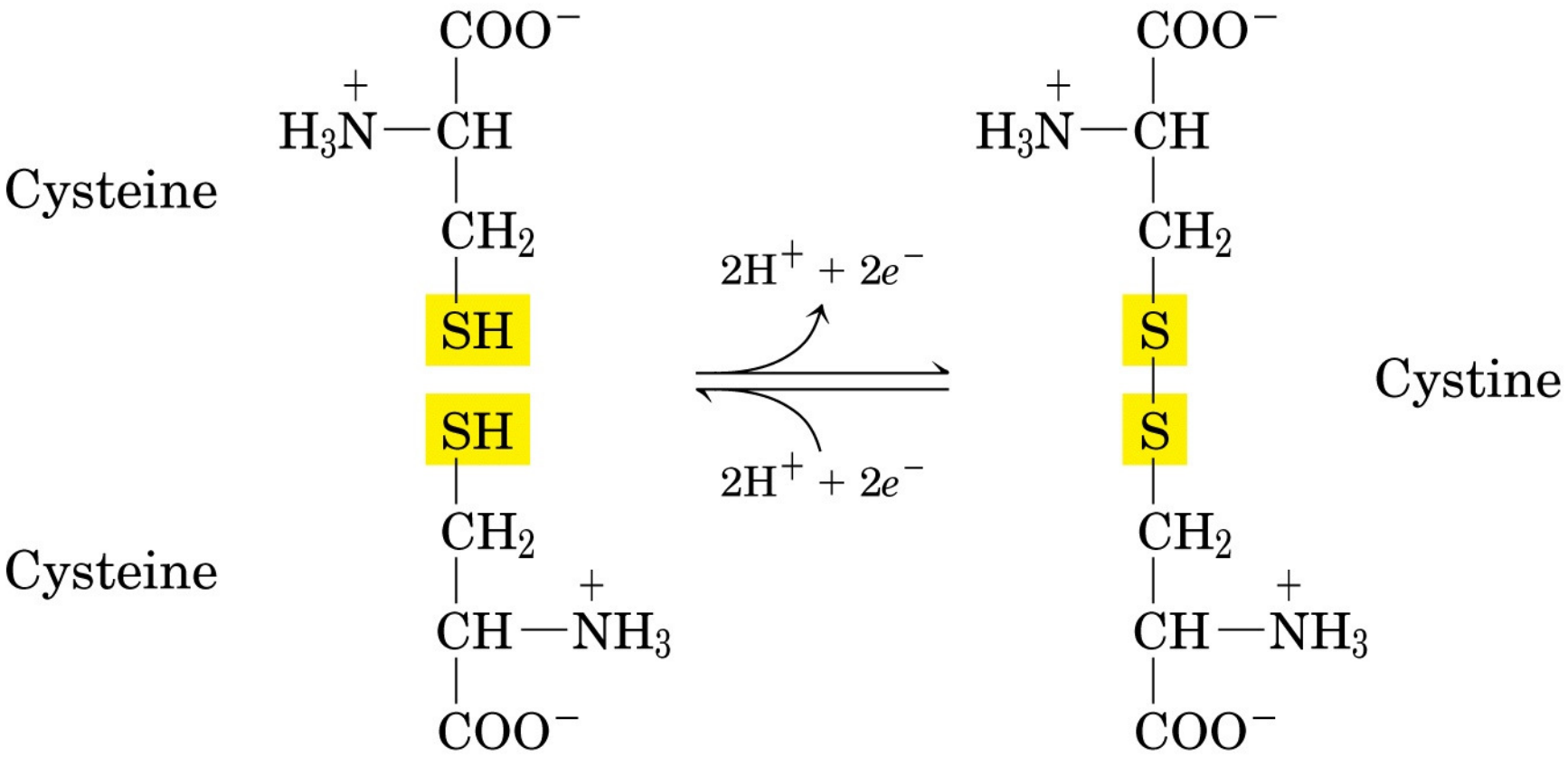
Glutamine

Positively charged R groups



Lysine Arginine Histidine

La cisteina si ossida facilmente e si trasforma in cistina (un dimero della cisteina in cui i due monomeri sono legati da un ponte disolfuro)



Proprietà di assorbimento della luce degli aa

Gli aa proteici non sono colorati e non assorbono nel VISIBILE, ma tutti luce ULTRAVIOLETTA, al di sotto dei 220 nm;

Solo gli aa aromatici(triptofano, tirosina e fenilalanina) assorbono in un campo spettrale compreso tra 320-240nm, e presentano un massimo di assorbimento a 280nm.

Legge di Lambert e Beer

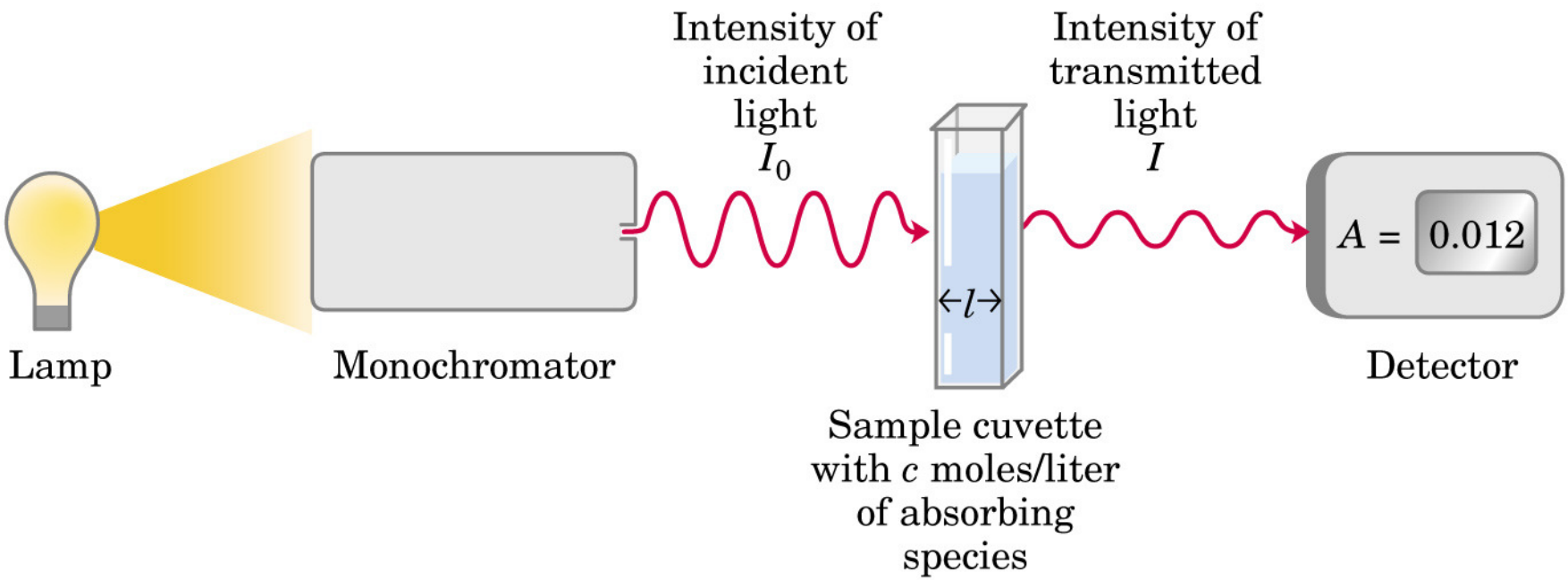
$A = \varepsilon c l$

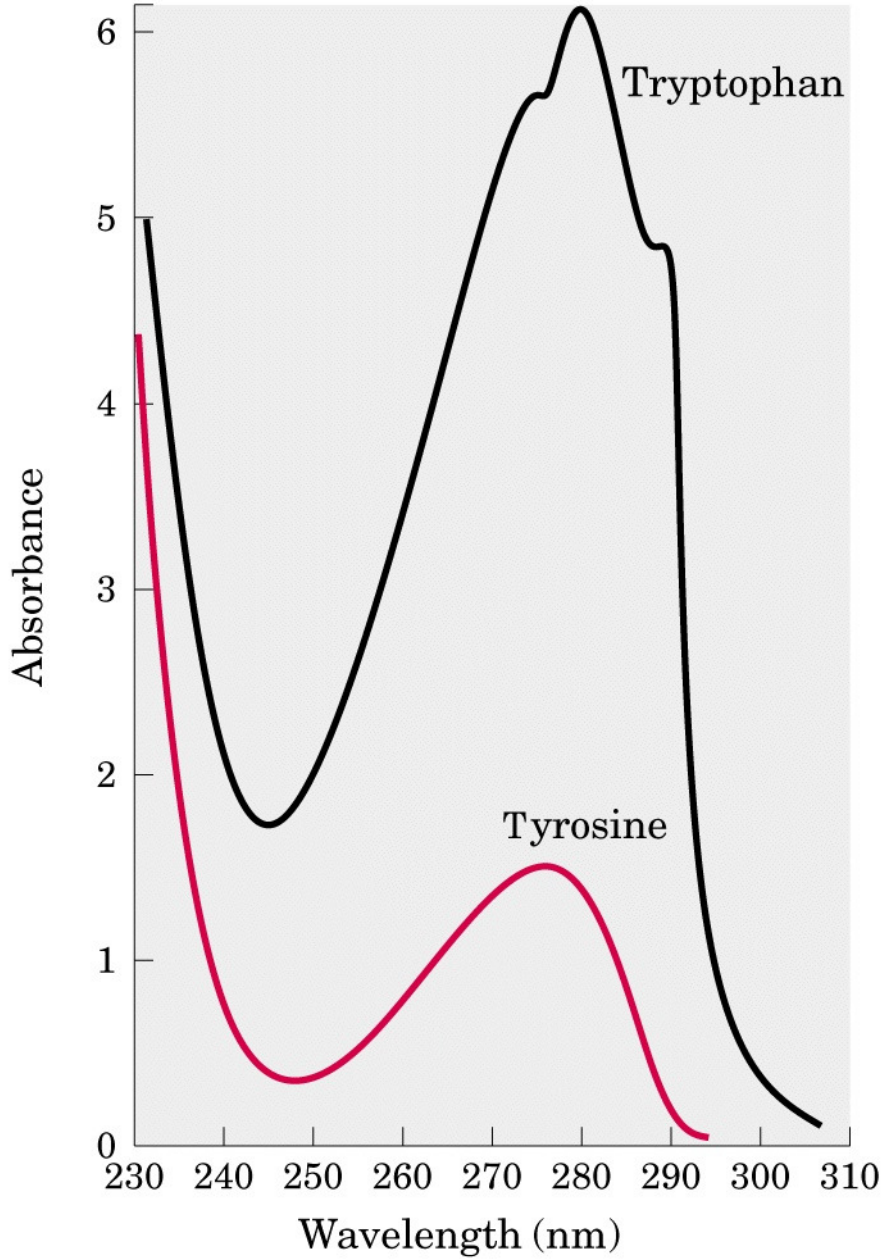
A = assorbimento ad una determinata lunghezza d'onda

C = concentrazione della sostanza (moli/ litro)

ε = coefficiente di estinzione molare = assorbimento di una soluzione 1M del composto in esame , quando è attraversata da luce incidente per 1 cm.

l= cammino ottico=1cm


Intensity of incident light I_0
Intensity of transmitted light I
A = 0.012
$\leftarrow l \rightarrow$
Lamp
Monochromator
Sample cuvette with c moles/liter of absorbing species
Detector


Tryptophan
Tyrosine
Absorbance
0
1
2
3
4
5
6
230
240
250
260
270
280
290
300
310
Wavelength (nm)

Proprietà ottiche degli aa

$[\alpha]^t_\lambda$ = rotazione osservata (gradi X 100) / l c

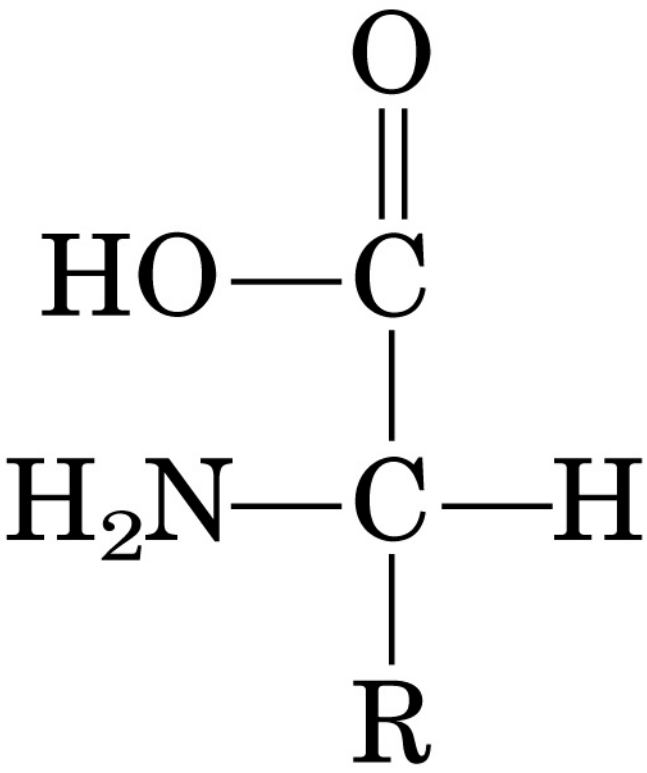
α = potere ottico rotatorio

t = temperatura a cui si effettua la misura

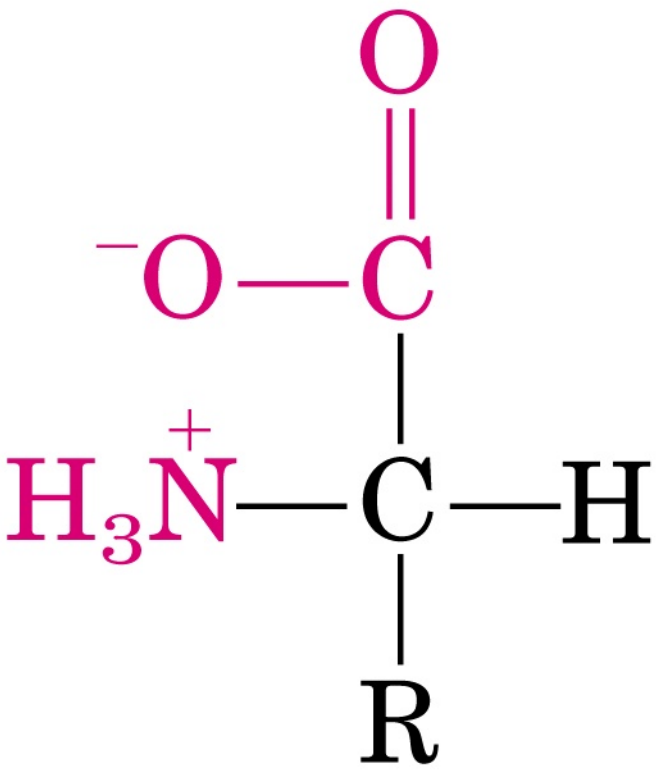
λ =lunghezza d'onda a cui si effettua la misura

c = concentrazione del campione (g / 100ml di soluzione).

l = lunghezza del cammino ottico (dm)

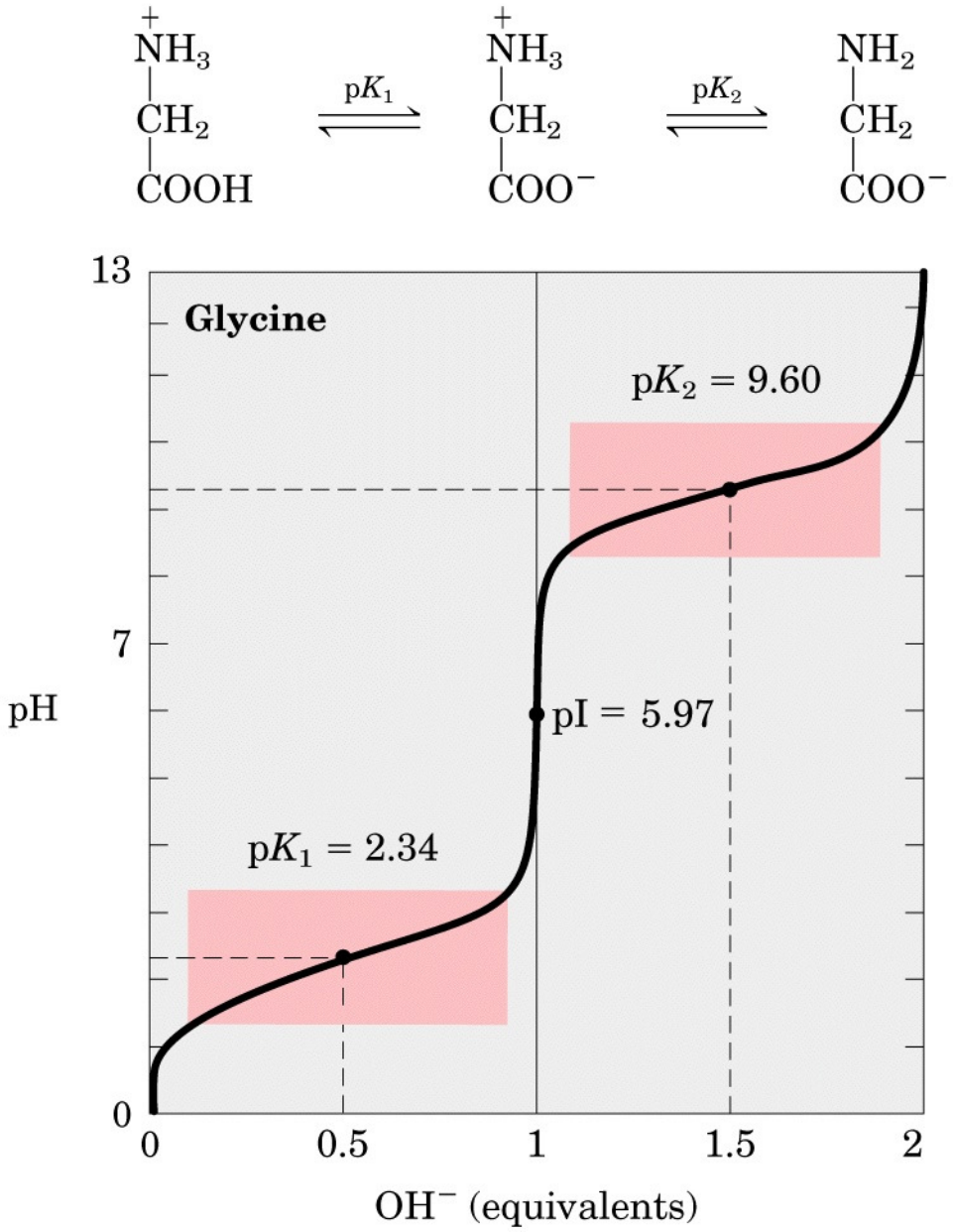


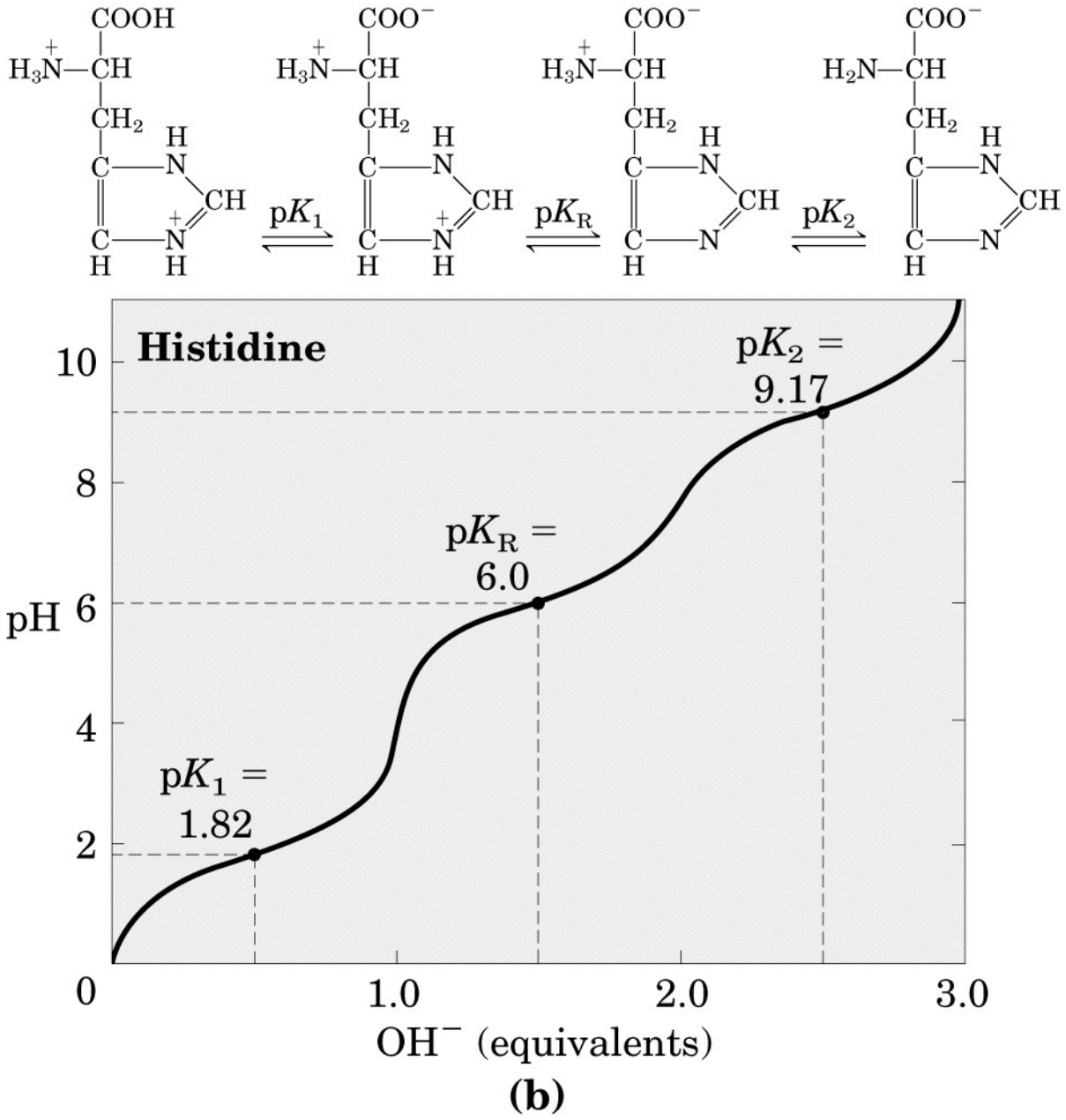
Nonionic form



Zwitterionic form

Gli amminoacidi sono sostanze anfotere


NH3+
CH2
COOH
pK1
NH3+
CH2
COO−
pK2
NH2
CH2
COO−
Glycine
pK2 = 9.60
pI = 5.97
pK1 = 2.34
pH
13
7
0
0
0.5
1
1.5
2
OH− (equivalents)


COOH
COO⁻
COO⁻
COO⁻
pK1
pKR
pK2
Histidine
pK2 = 9.17
pKR = 6.0
pK1 = 1.82
pH
10
8
6
4
2
0
1.0
2.0
3.0
OH⁻ (equivalents)

(b)

PI dell' istidina

- PI= (6+ 9,17)/2=7,58