

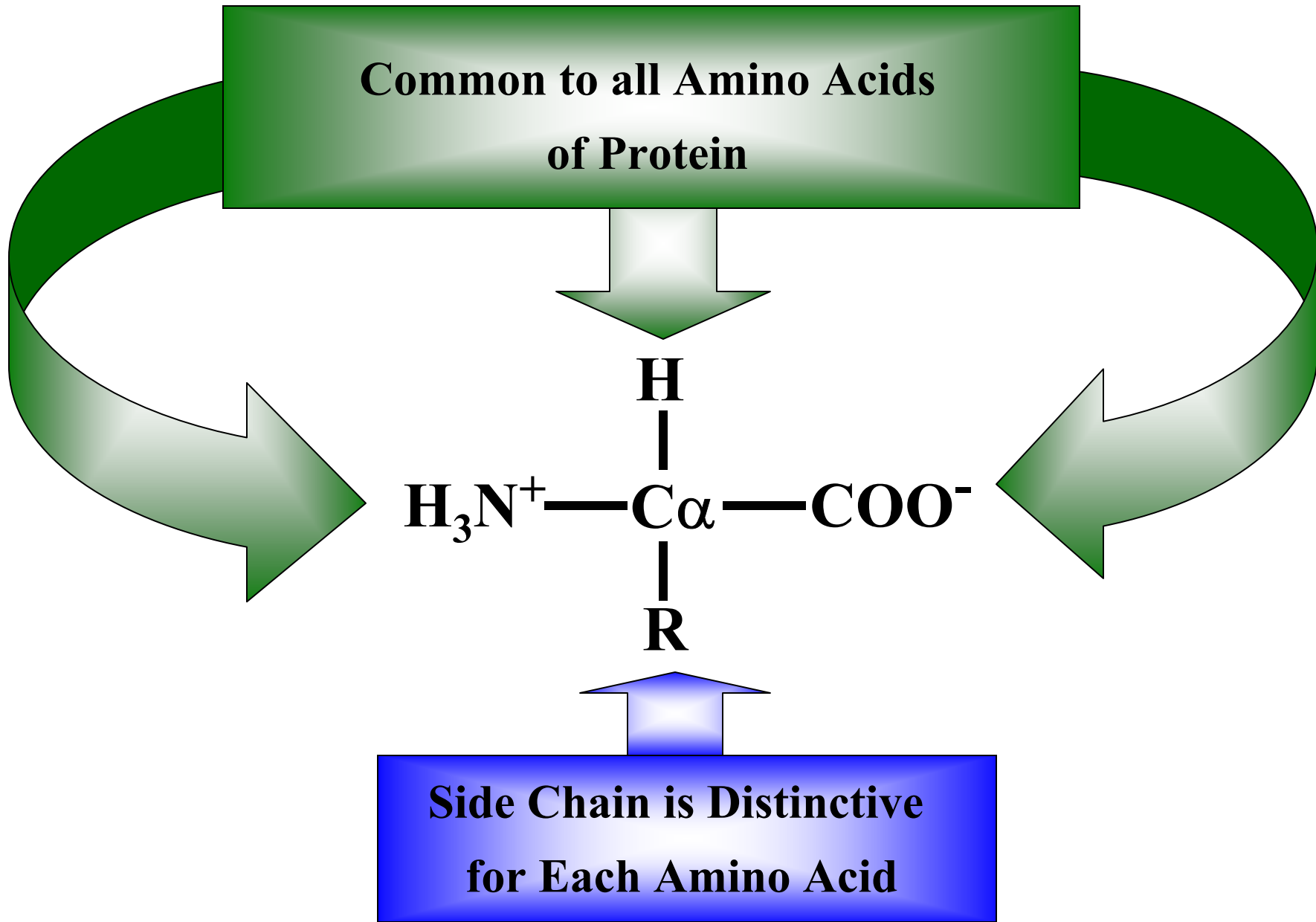
Amino Acids

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COMSATS Institute of Information
Technology
Islamabad

Amino Acids

- Classification of Amino Acids
- Stereochemistry
- Essential Amino Acids
- Titration of Amino Acids
 - pKa's and pI
- Amino Acid Hydrophobicity and Protein Structure

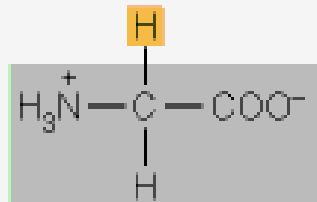
Amino Acid Structure



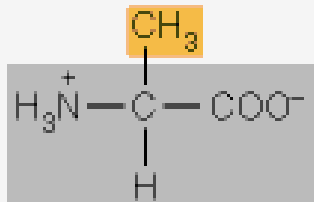
Classification of Amino Acids

- with non-polar aliphatic side chain
- with aromatic side chain
- with polar side chain
 - Hydroxyl containing
 - Sulfur containing
- charged acidic and their uncharged amides
- charged basic

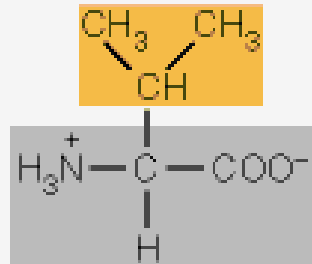
Amino Acids with Non-polar Aliphatic R-Groups



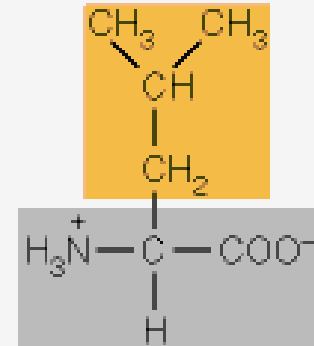
Glycine (Gly) G



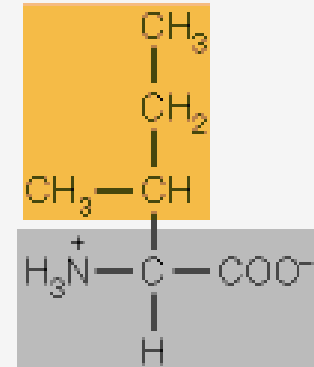
Alanine (Ala) A



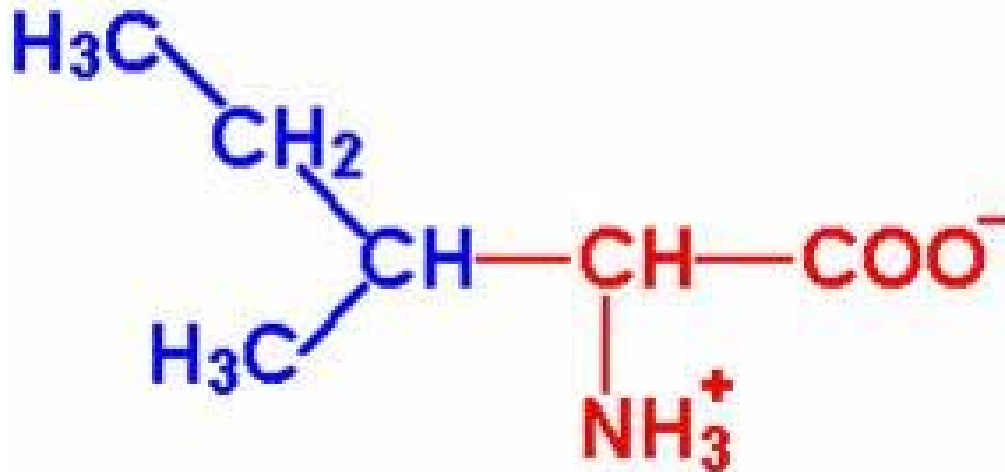
Valine (Val) V



Leucine (Leu) L

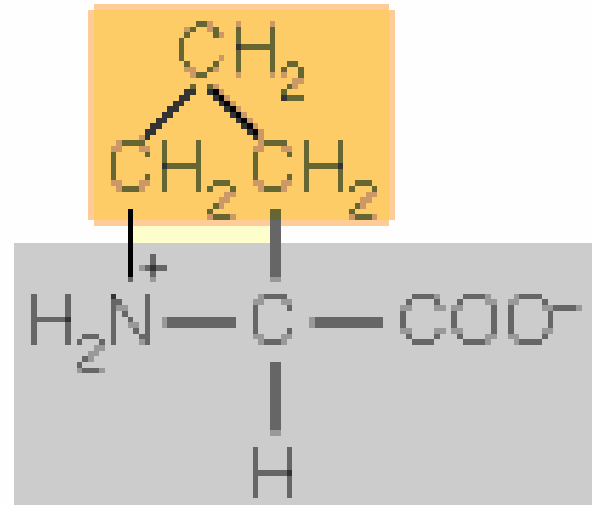


Isoleucine (Ile) I

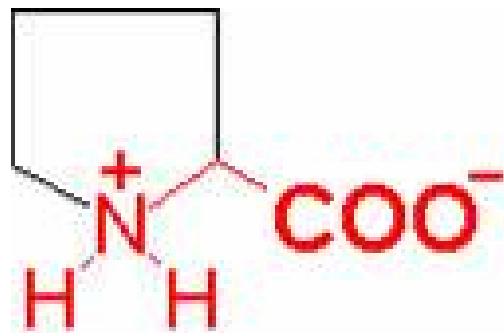


~~Val~~

Imino Acid

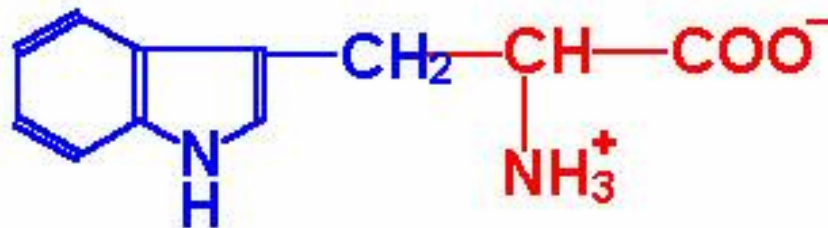
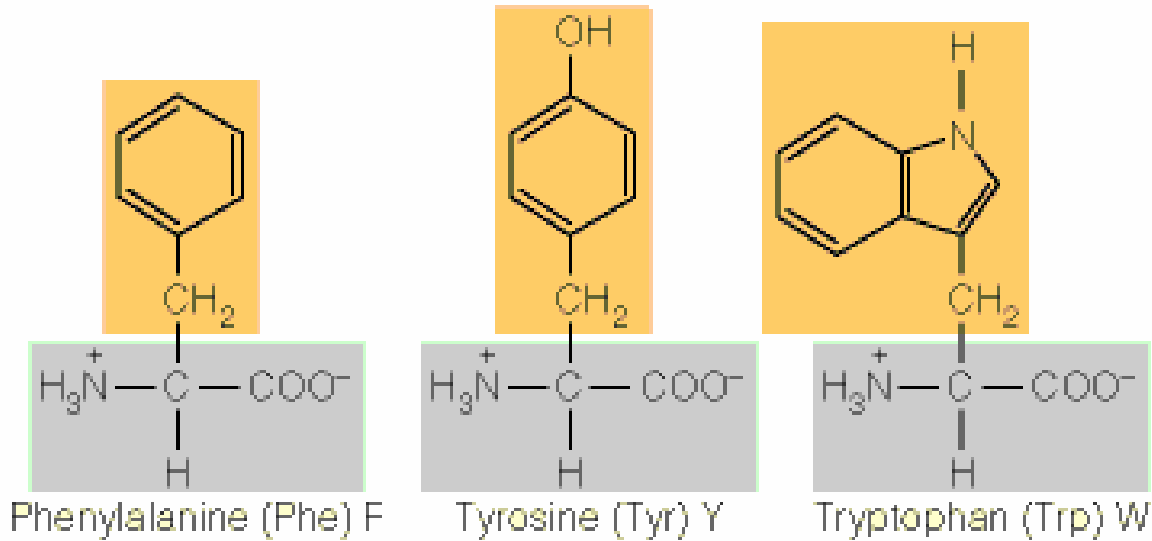


Proline (Pro) P



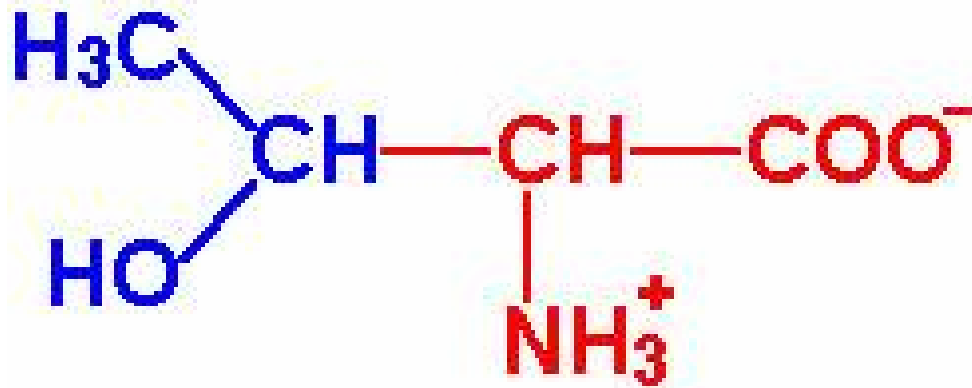
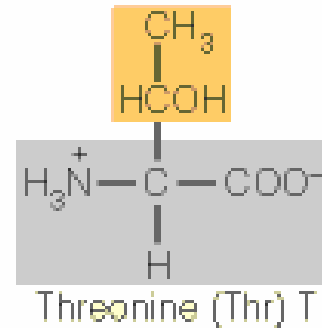
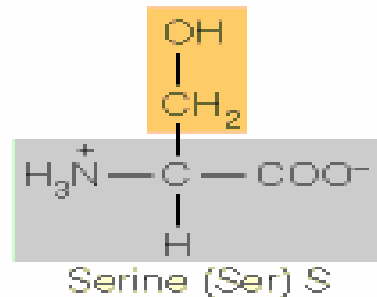
Pro

Amino Acids with Aromatic R-Groups



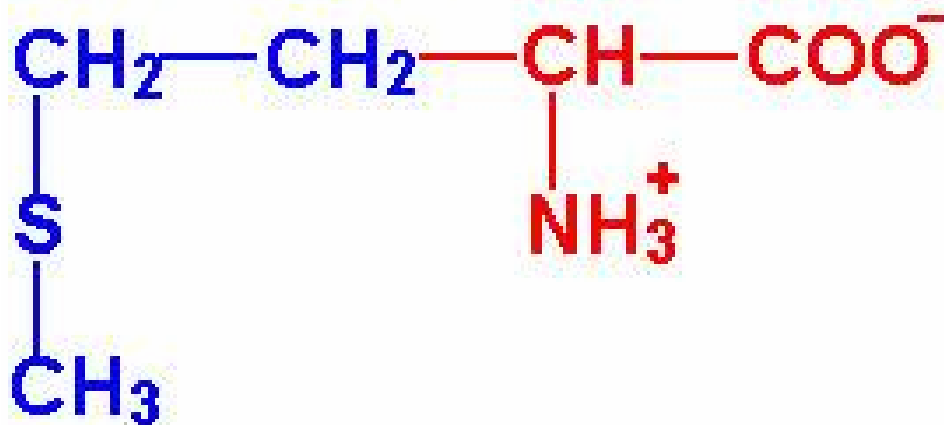
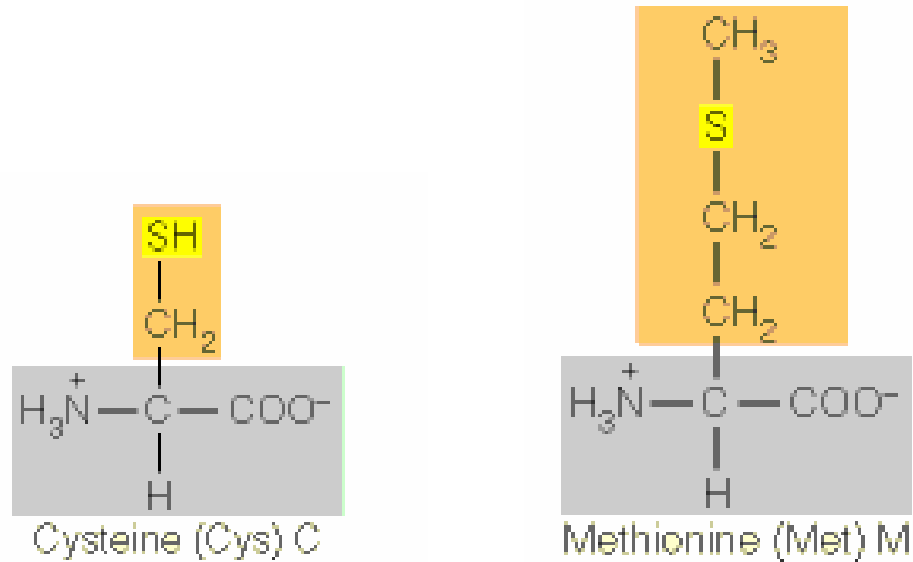
Trp

Polar Uncharged Amino Acids with Hydroxyl R-Groups



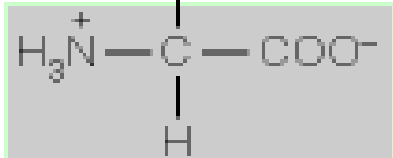
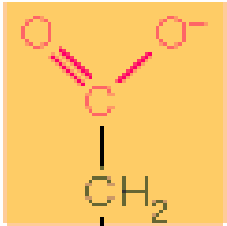
Ser

Polar Uncharged Amino Acids with Sulfur Containing R-Groups

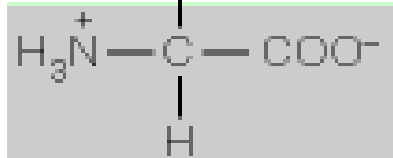
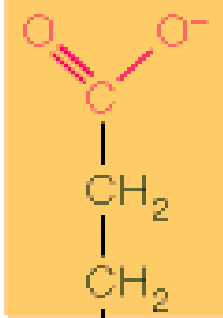


Met

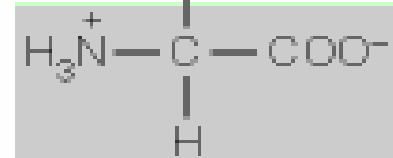
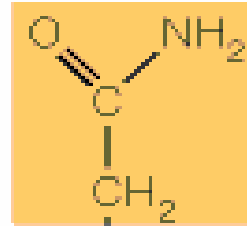
Charged Acidic Amino Acids and their Uncharged Amides



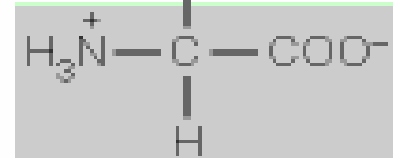
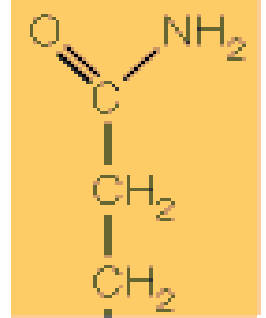
Aspartic acid (Asp) D



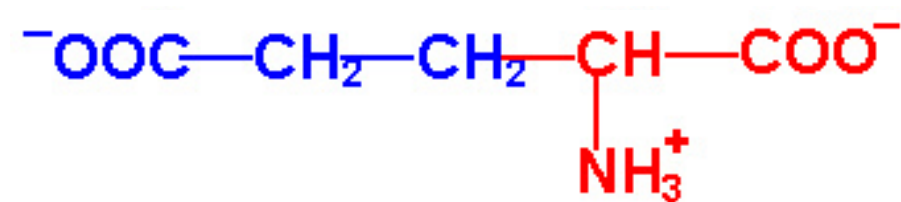
Glutamic acid (Glu) E



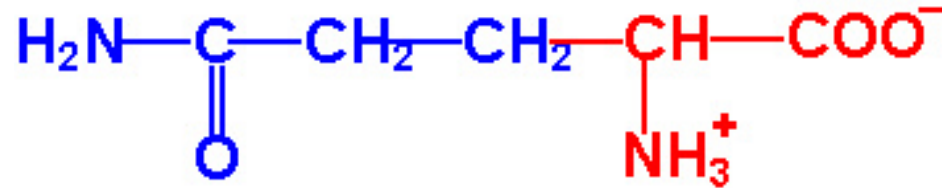
Asparagine (Asn) N



Glutamine (Gln) Q

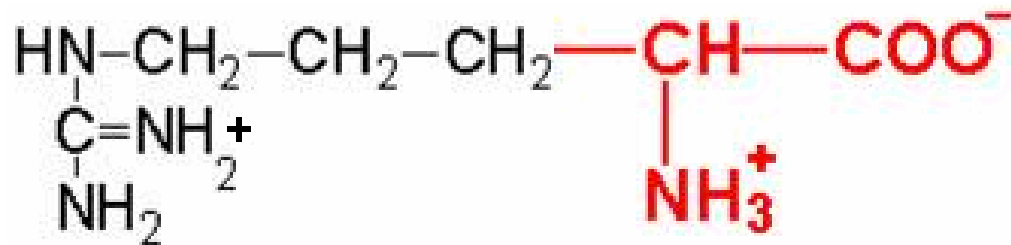
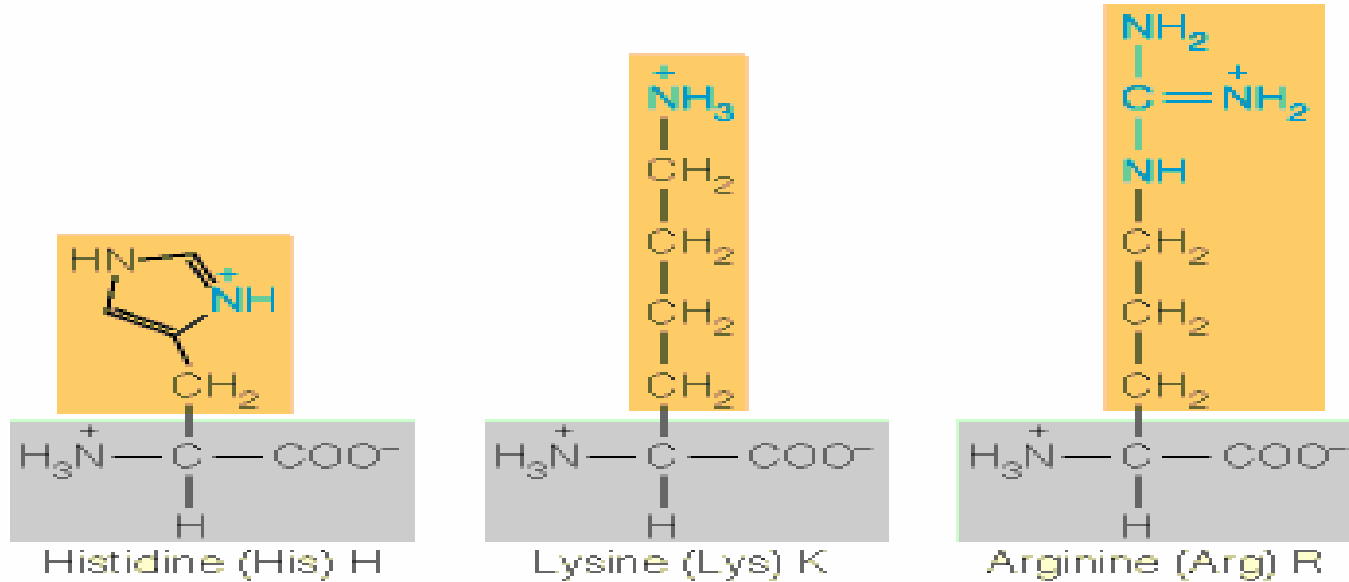


~~Asp~~



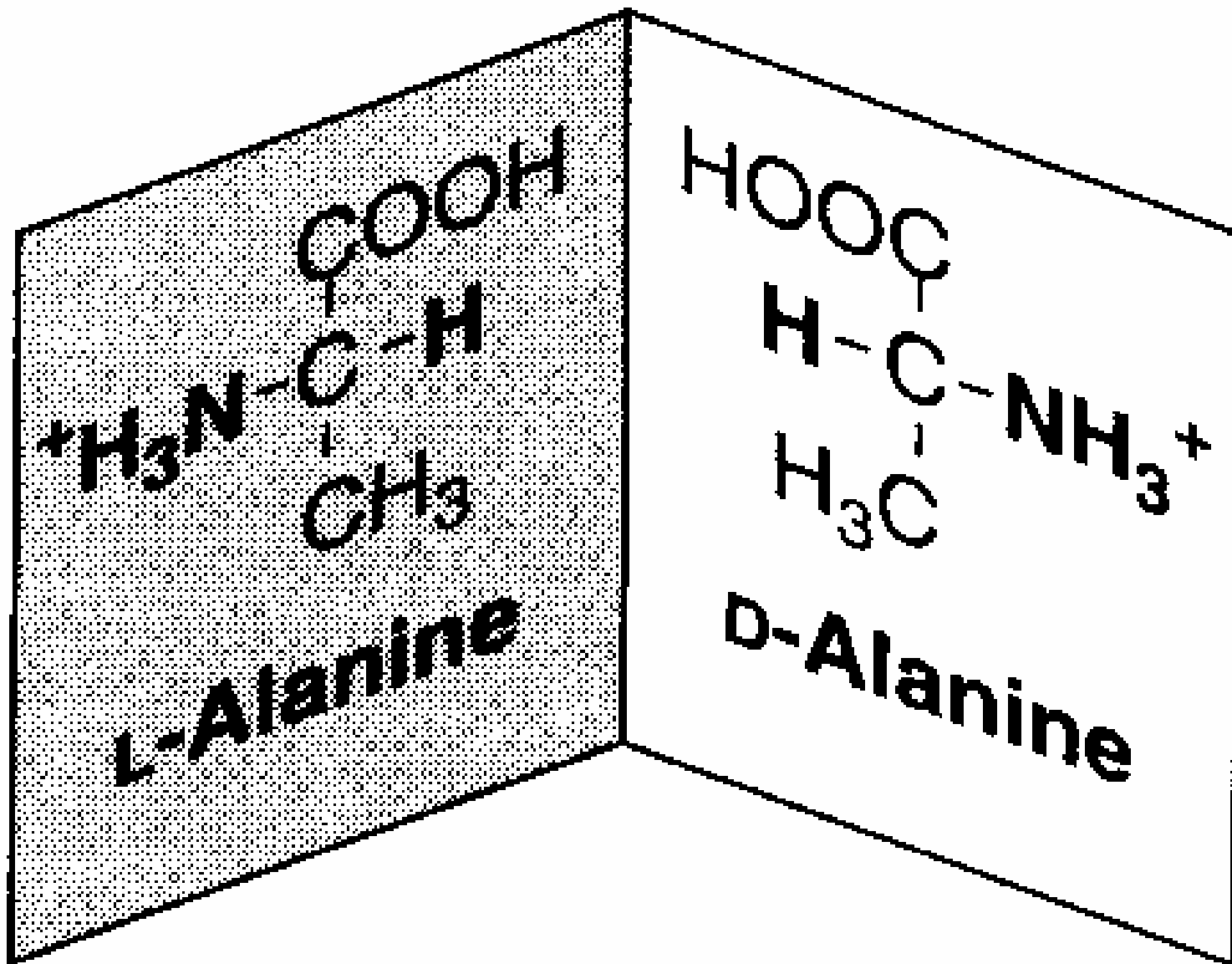
~~Gln~~

Charged Basic Amino Acids



Arg

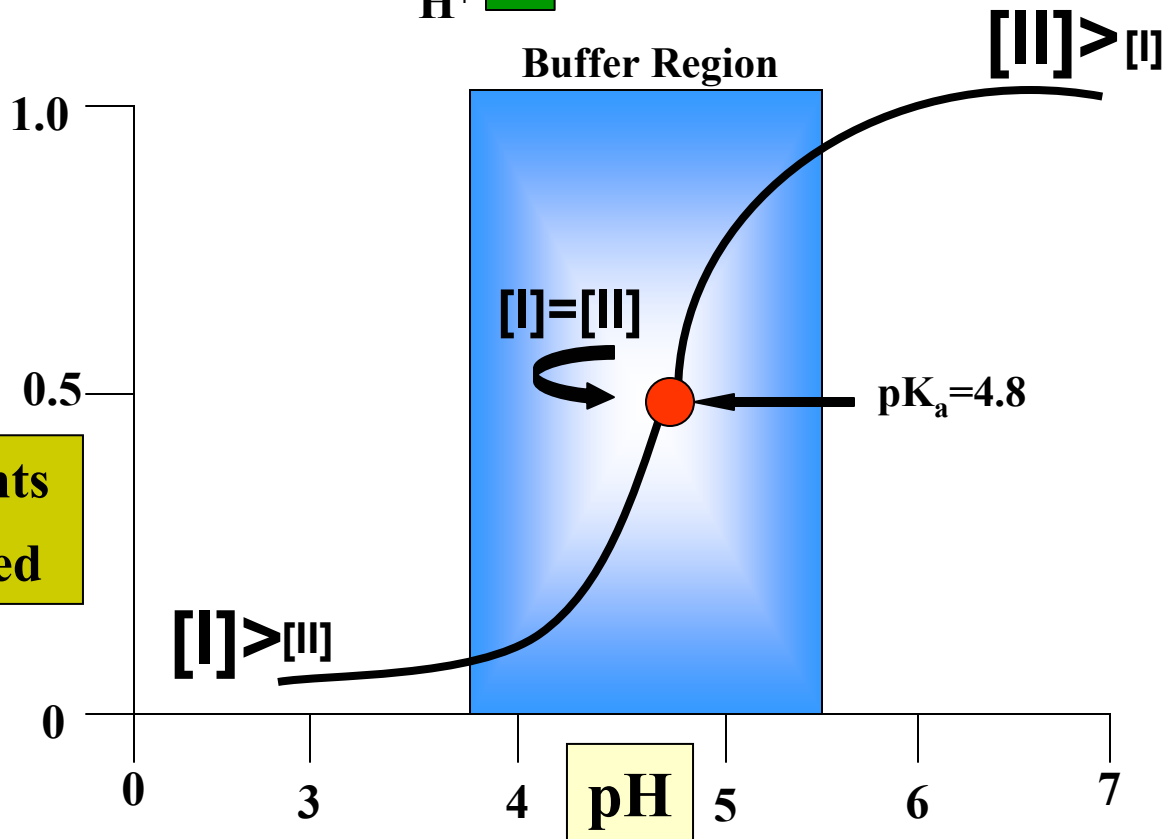
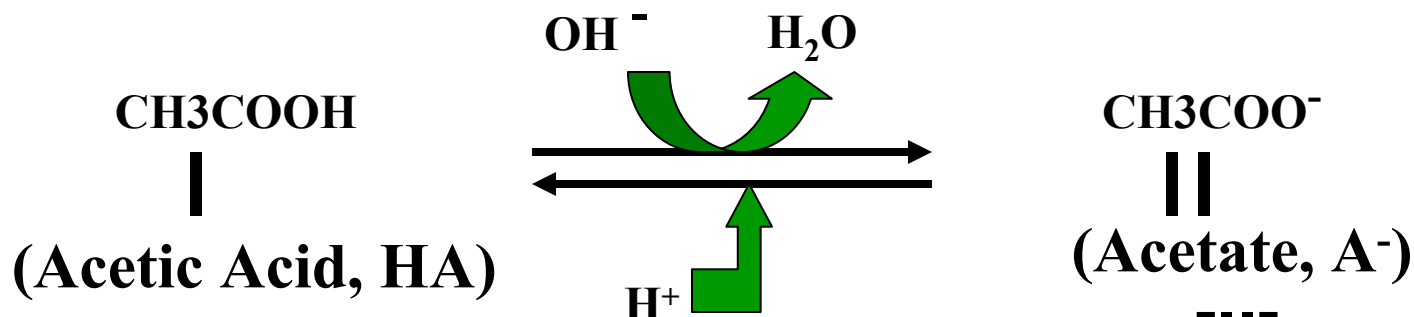
D and L Forms of Alanine



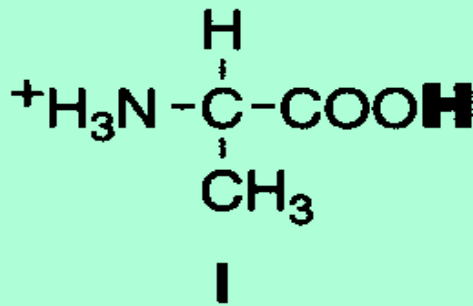
Essential Amino Acids

- P henylalanine
- V aline
- T ryptophan
- T hreonine
- I soleucine
- M ethionine
- H istidine*
- A rginine*
- L eucine
- L ysine

Titration Curve of Acetic Acid



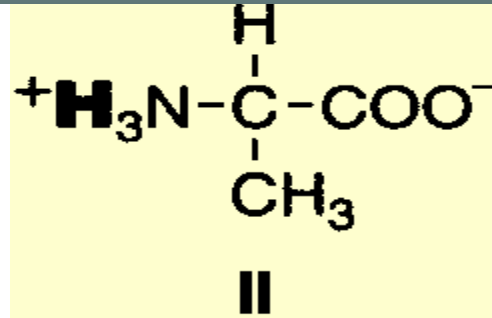
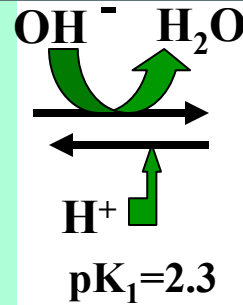
The Titration Curve of Alanine



Alanine in acid solution

(pH less than 2)

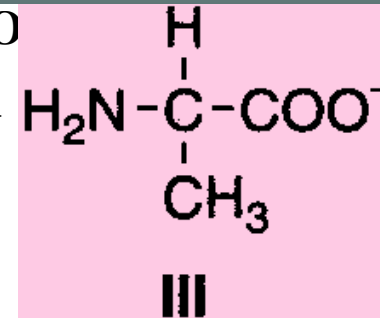
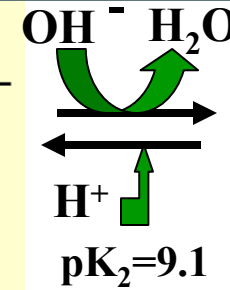
Net charge=+1



Alanine in neutral solution

(pH approximately 6)
Net charge=0

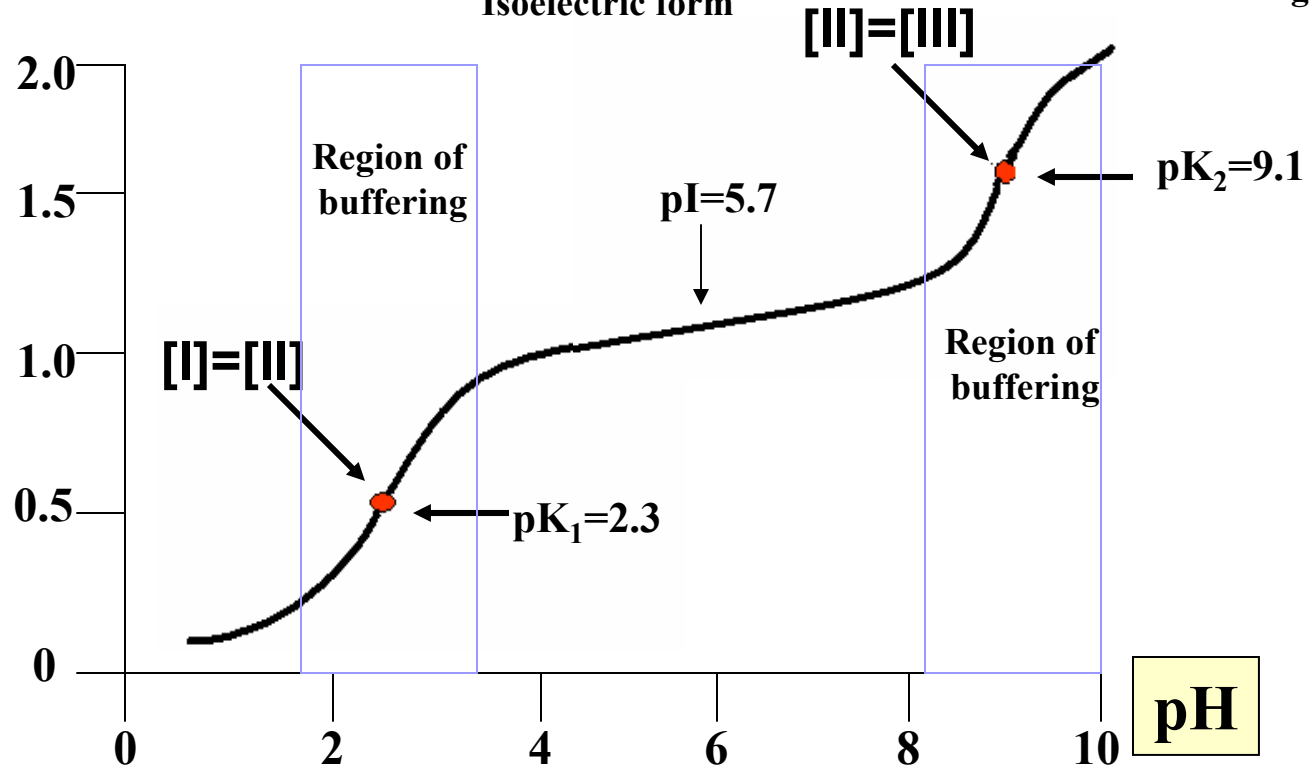
Isoelectric form



Alanine in basic solution

(pH greater than 10)

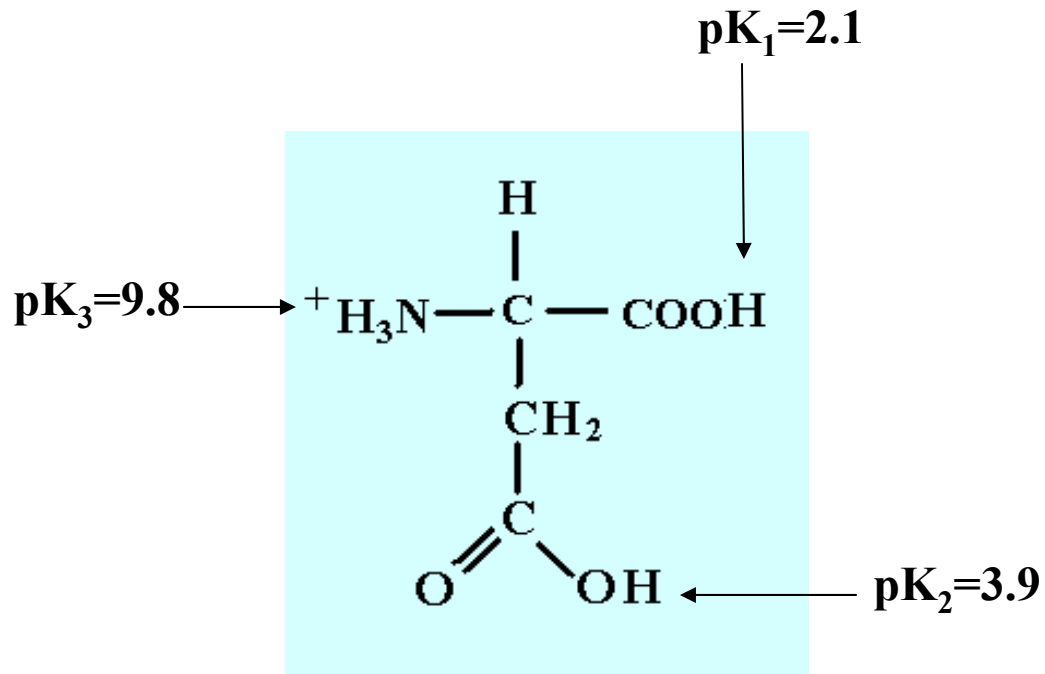
Net charge=-1



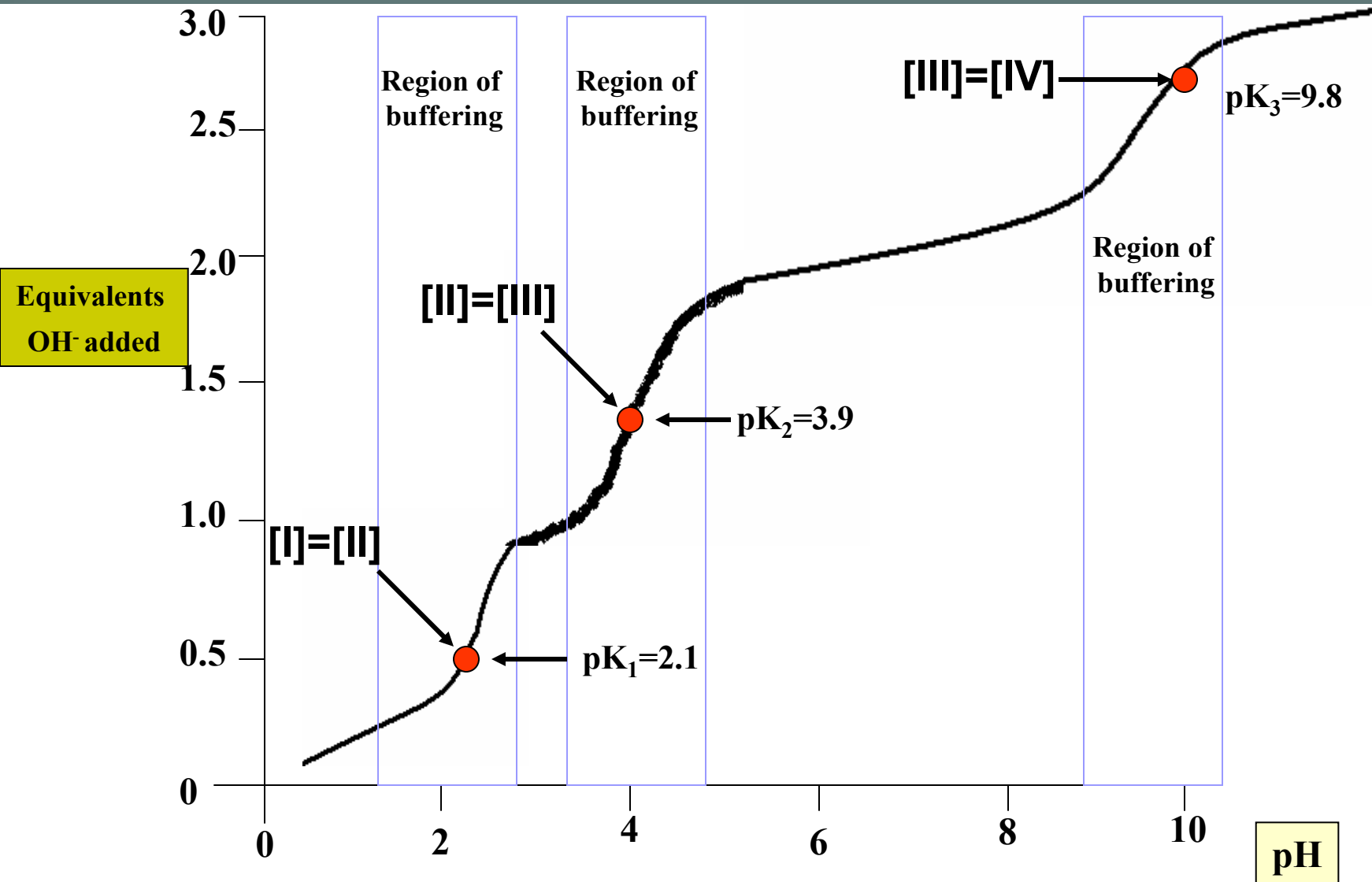
Equivalents
OH⁻ added

pH

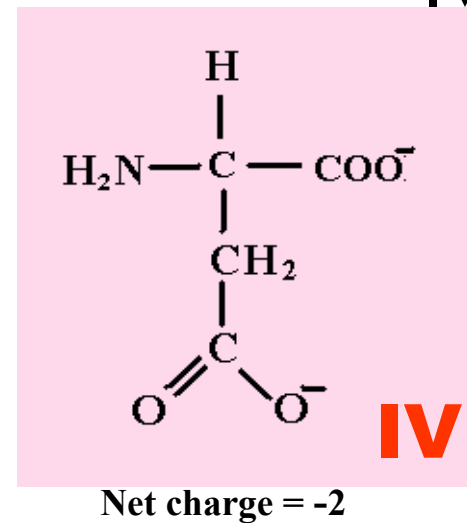
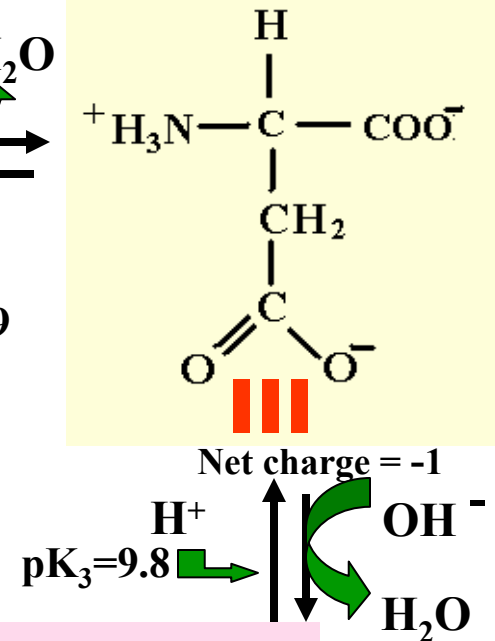
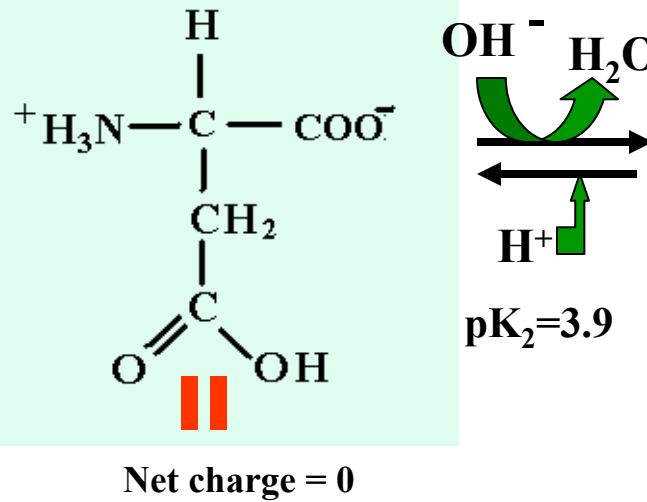
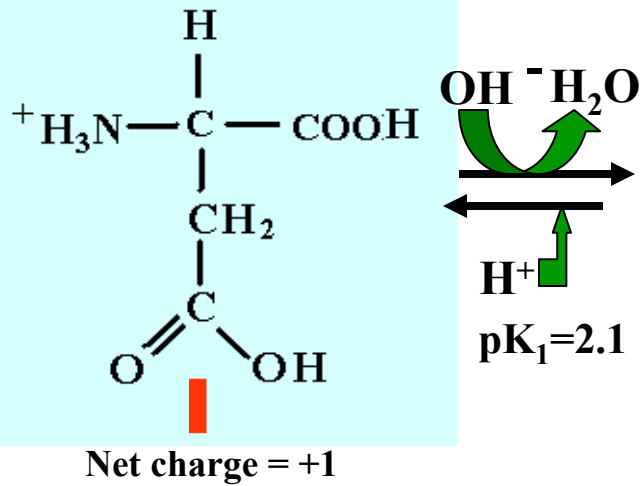
pKa's of Aspartic acid



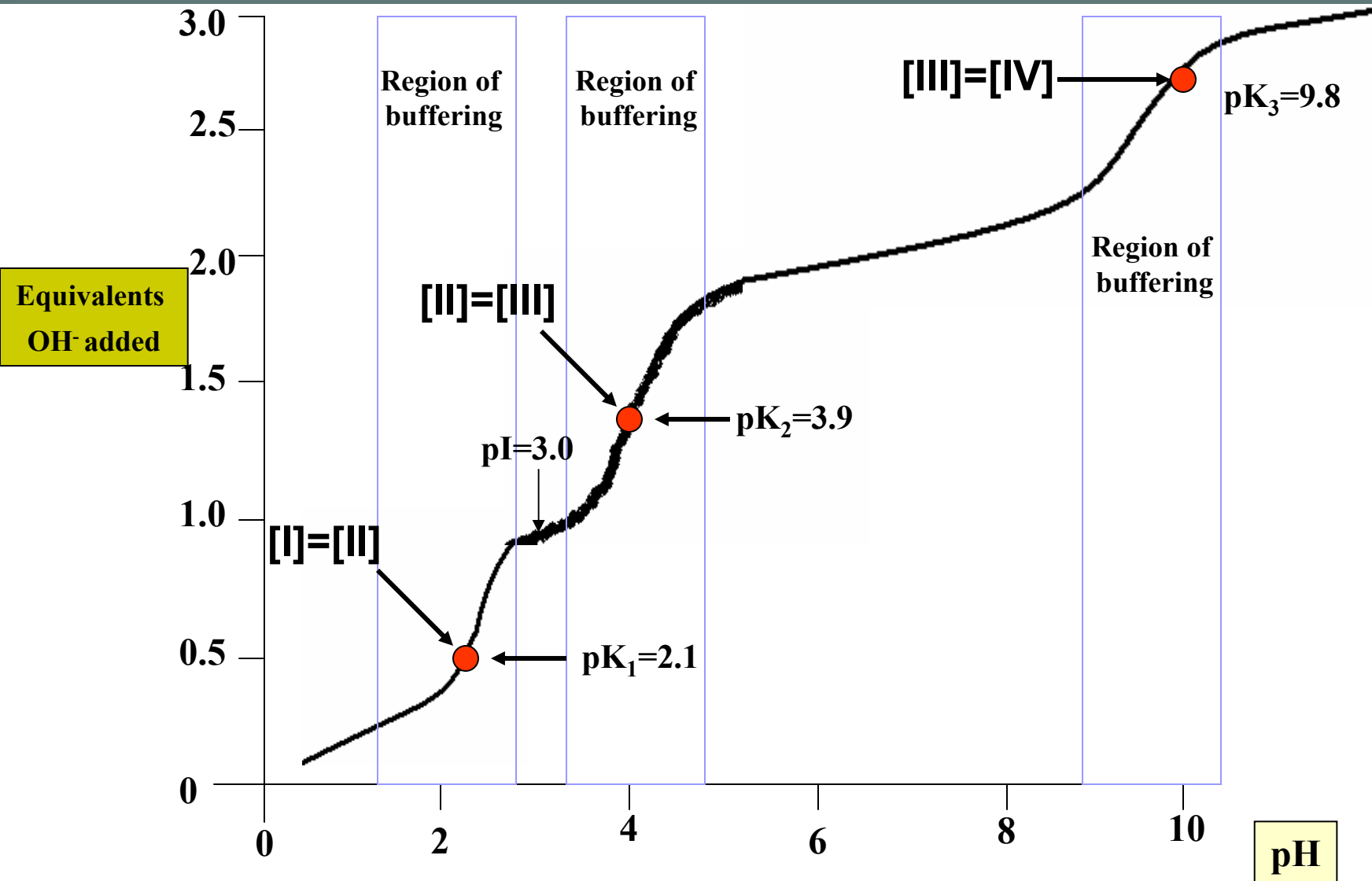
Titration Curve of Aspartic Acid



Aspartic Acid



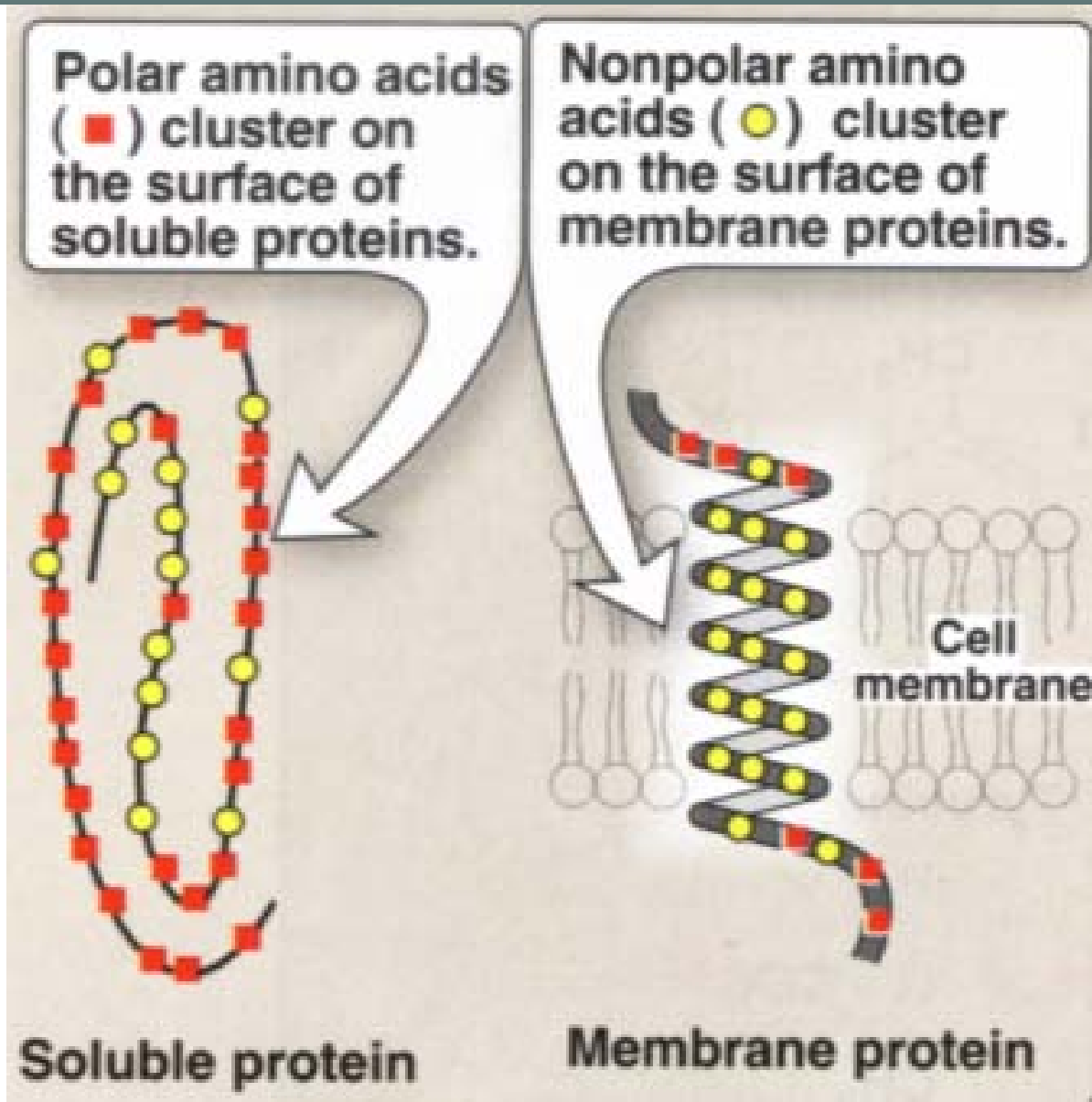
Titration Curve of Aspartic Acid



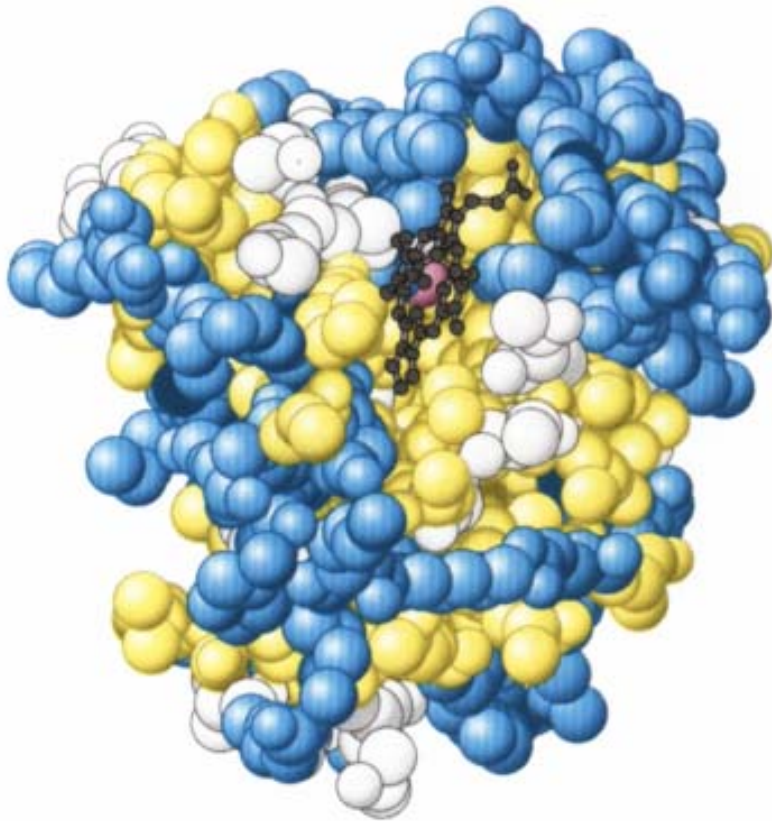
Relative Hydrophobic Character of the Amino Acid Side Chains

	Amino acid	Hydrophobic character*
Most hydrophobic	Isoleucine	1.83
	Leucine	1.80
	Phenylalanine	1.69
	Tryptophan	1.35
	Valine	1.32
	Methionine	1.10
	Proline	0.84
	Cysteine	0.76
	Tyrosine	0.39
	Alanine	0.35
Standard	Glycine	0
	Threonine	-0.27
	Serine	-0.63
	Histidine	-0.65
	Glutamine	-0.93
	Asparagine	-0.99
	Arginine	-1.50
Least hydrophobic	Lysine	-1.54
	Glutamic acid	-1.95
	Aspartic acid	-2.15

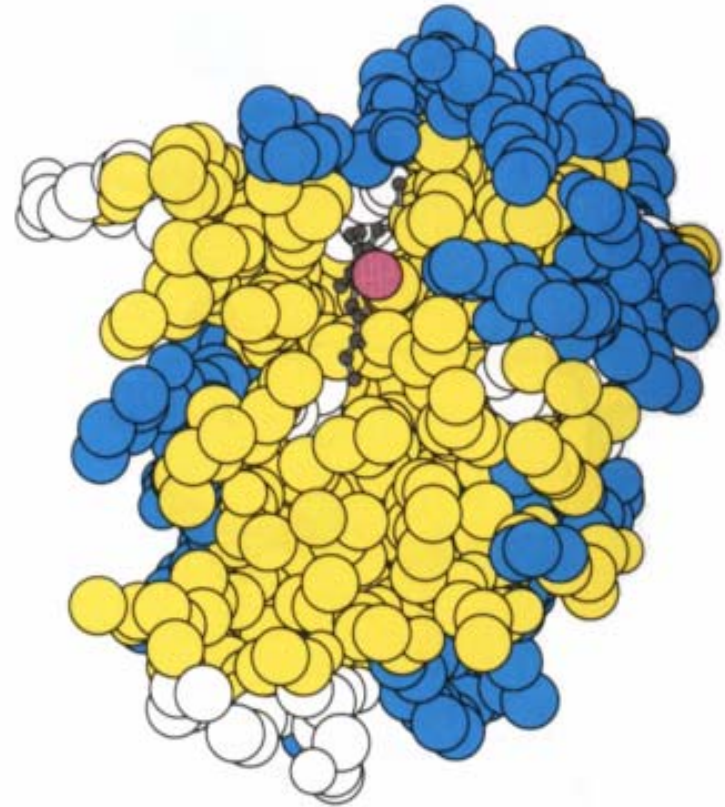
Location of non polar amino acids in soluble & membrane proteins



Distribution of amino acids in myoglobin



Space-Filled model of Myoglobin



Cross Sectional view of Myoglobin

Distribution of amino acids in porin

