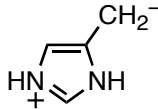
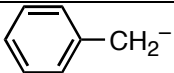
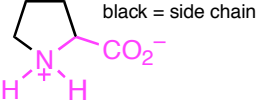
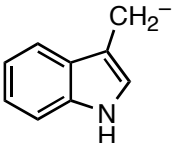
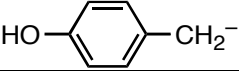


Amino Acid pKa Values and Side Chain Identities

Amino Acid	pKa Values			Side Chain (Z) – “fully” protonated
	α -CO ₂ H	α -NH ₃ ⁺	Side	
Alanine	2.34	9.69		-CH ₃
Arginine	2.17	9.04	12.48	$\begin{array}{c} +\text{NH}_2 \\ \\ \text{H}_2\text{NCNHCH}_2\text{CH}_2\text{CH}_2^- \end{array}$
Asparagine	2.02	8.84		$\begin{array}{c} \text{O} \\ \\ \text{H}_2\text{NCCH}_2^- \end{array}$
Aspartic Acid	2.09	9.82	3.86	-CH ₂ CO ₂ H
Cysteine	1.71	10.78	8.33	-CH ₂ SH
Glutamic Acid	2.19	9.67	4.25	-CH ₂ CH ₂ CO ₂ H
Glutamine	2.17	9.13		$\begin{array}{c} \text{O} \\ \\ \text{H}_2\text{NCCH}_2\text{CH}_2^- \end{array}$
Glycine	2.34	9.60		-H
Histidine	1.82	9.17	6.04	
Isoleucine	2.36	9.68		-CH(CH ₃)CH ₂ CH ₃
Leucine	2.36	9.60		-CH ₂ CH(CH ₃) ₂
Lysine	2.18	8.95	10.79	-CH ₂ CH ₂ CH ₂ CH ₂ NH ₃ ⁺
Methionine	2.28	9.21		-CH ₂ CH ₂ SCH ₃
Phenylalanine	1.83	9.13		
Proline	1.99	10.60		
Serine	2.21	9.15		-CH ₂ OH
Threonine	2.63	9.10		-CH(OH)CH ₃
Tryptophan	2.38	9.39		
Tyrosine	2.20	9.11	10.07	
Valine	2.32	9.62		-CH(CH ₃) ₂

General L-amino acid structure at physiological pH

