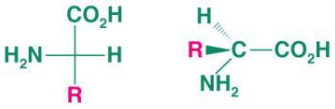
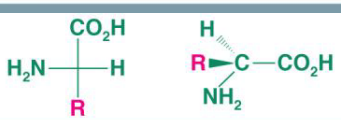
pK_a Values for Amino Acids

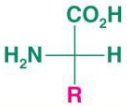


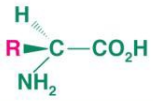
Structure of R	Name	Abbreviations[a]	pK_{a_1} α-CO_2H	pK_{a_2} α-NH_3^+	pK_{a_3} R group	pI
Neutral Amino Acids						
—H	Glycine	G or Gly	2.3	9.6		6.0
—CH_3	Alanine	A or Ala	2.3	9.7		6.0
—$CH(CH_3)_2$	Valine[b]	V or Val	2.3	9.6		6.0
—$CH_2CH(CH_3)_2$	Leucine[b]	L or Leu	2.4	9.6		6.0
—$CHCH_2CH_3$ CH_3	Isoleucine[b]	I or Ile	2.4	9.7		6.1
—CH_2–C$_6$H$_5$	Phenylalanine[b]	F or Phe	1.8	9.1		5.5
—CH_2CONH_2	Asparagine	N or Asn	2.0	8.8		5.4
—$CH_2CH_2CONH_2$	Glutamine	Q or Gln	2.2	9.1		5.7
—CH_2–C$_8$H$_6$N (indole)	Tryptophan[b]	W or Trp	2.4	9.4		5.9
HOC(=O)–CH(NH–CH_2–CH_2–CH_2)– (complete structure)	Proline	P or Pro	2.0	10.6		6.3



Structure of R	Name	Abbreviations[a]	pK_{a_1} α-CO_2H	pK_{a_2} α-NH_3^+	pK_{a_3} R group	pI
Neutral Amino Acids						
—CH_2OH	Serine	S or Ser	2.2	9.2		5.7
—$CHOH$ CH_3	Threonine[b]	T or Thr	2.6	10.4		6.5
—CH_2–C$_6$H$_4$–OH	Tyrosine	Y or Tyr	2.2	9.1	10.1	5.7
HOC(=O)–CH(NH–CH_2–CH(OH)–CH_2)– (complete structure)	Hydroxyproline	Hyp	1.9	9.7		6.3
—CH_2SH	Cysteine	C or Cys	1.7	10.8	8.3	5.0
—CH_2—S —CH_2—S	Cystine	Cys-Cys	1.6 2.3	7.9 9.9		5.1
—$CH_2CH_2SCH_3$	Methionine[b]	M or Met	2.3	9.2		5.8

pK_a Values for Amino Acids





Structure of R	Name	Abbreviations[a]	pK_{a_1} α-CO_2H	pK_{a_2} α-NH_3^+	pK_{a_3} R group	pI
R Contains an Acidic (Carboxyl) Group						
$-CH_2CO_2H$	Aspartic acid	D or Asp	2.1	9.8	3.9	3.0
$-CH_2CH_2CO_2H$	Glutamic acid	E or Glu	2.2	9.7	4.3	3.2
R Contains a Basic Group						
$-CH_2CH_2CH_2CH_2NH_2$	Lysine[b]	K or Lys	2.2	9.0	10.5[c]	9.8
$-CH_2CH_2CH_2NH-C(=NH)-NH_2$	Arginine	R or Arg	2.2	9.0	12.5[c]	10.8
$-CH_2$-(imidazole ring)	Histidine	H or His	1.8	9.2	6.0[c]	7.6

[a]Single-letter abbreviations are now the most commonly used form in current biochemical literature.
[b]An essential amino acid.
[c]pK_a is of protonated amine of R group.