

TABLE 2.3 *pKa* values of amino acid side chains.

Residue	Deprotonation Process ^{*a}	$pK_{a_{\text{int}}}$ ^{*b}	$pK_{a_{\text{prot}}}$ ^{*c}
Serine	$\text{R-OH} \longleftrightarrow \text{R-O}^- + \text{H}^+$	~13	
Threonine	$\text{R-OH} \longleftrightarrow \text{R-O}^- + \text{H}^+$	~13	
Arginine	$\text{R}_1=\text{NH}_2^+ \longleftrightarrow \text{R}_1=\text{NH} + \text{H}^+$	12.3 ^{*d}	
Lysine	$\text{R-NH}_3^+ \longleftrightarrow \text{R-NH}_2 + \text{H}^+$	10.4	10.5 ± 1.1
Tyrosine	$\text{R-OH} \longleftrightarrow \text{R-O}^- + \text{H}^+$	9.8	10.3 ± 1.2
Cysteine	$\text{R-SH} \longleftrightarrow \text{R-S}^- + \text{H}^+$	8.6	6.8 ± 2.7
Histidine	$\text{R}_1=\text{NH}^+-\text{R}_2 \longleftrightarrow \text{R}_1=\text{N}-\text{R}_2 + \text{H}^+$	6.5	6.6 ± 1.0
Glutamate	$\text{R-COOH} \longleftrightarrow \text{R-COO}^- + \text{H}^+$	4.3	4.2 ± 0.9
Aspartate	$\text{R-COOH} \longleftrightarrow \text{R-COO}^- + \text{H}^+$	3.9	3.5 ± 1.2