

# Amino Acids Reference Guide

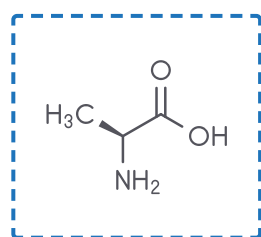
Amino acids are the building blocks of proteins. Approximately 500 of them exist, but only 20 appear in our genetic code. Those shown below are known as standard amino acids.

Use the following as a reference guide for amino acid names, abbreviations, and structures.

## Chart Key

■ Alkyl ■ Aromatic ■ Neutral ■ Acidic ■ Basic □ Essential □ Non-Essential

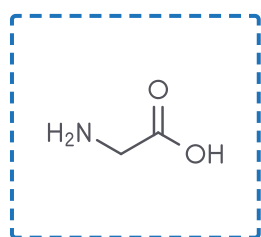
**Note:** The NH<sub>2</sub> and COOH values listed below are pK<sub>a</sub> values.



**Alanine**

*Ala A*

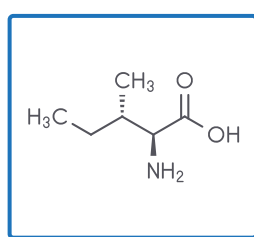
NH<sub>2</sub>: 9.87 COOH: 2.35



**Glycine**

*Gly G*

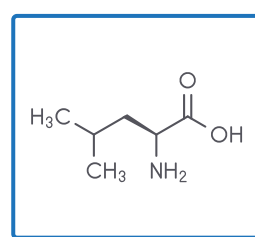
NH<sub>2</sub>: 9.60 COOH: 2.34



**Isoleucine**

*Ile I*

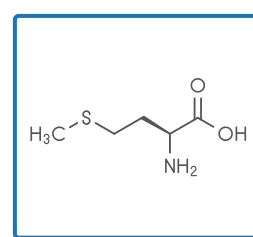
NH<sub>2</sub>: 9.76 COOH: 2.32



**Leucine**

*Leu L*

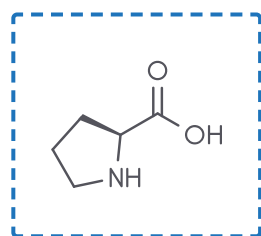
NH<sub>2</sub>: 9.60 COOH: 2.36



**Methionine**

*Met M*

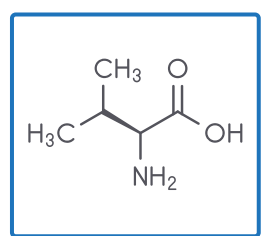
NH<sub>2</sub>: 9.21 COOH: 2.28



**Proline**

*Pro P*

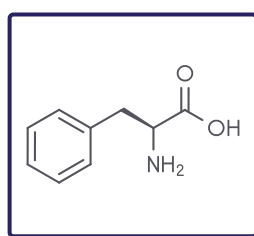
NH<sub>2</sub>: 10.60 COOH: 1.99



**Valine**

*Val V*

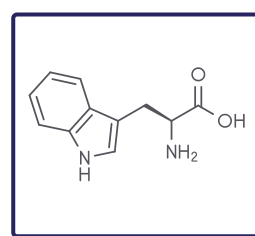
NH<sub>2</sub>: 9.72 COOH: 2.29



**Phenylalanine**

*Phe F*

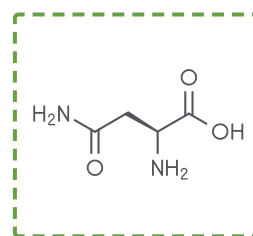
NH<sub>2</sub>: 9.24 COOH: 2.58



**Tryptophan**

*Trp W*

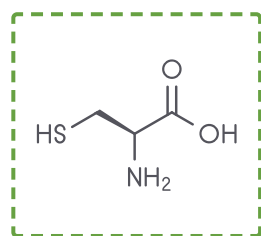
NH<sub>2</sub>: 9.39 COOH: 2.38



**Asparagine**

*Asn N*

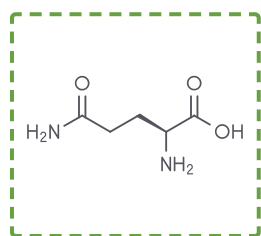
NH<sub>2</sub>: 8.80 COOH: 2.02



**Cysteine**

*Cys C*

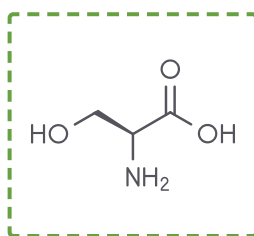
NH<sub>2</sub>: 10.78 COOH: 1.71



**Glutamine**

*Gln Q*

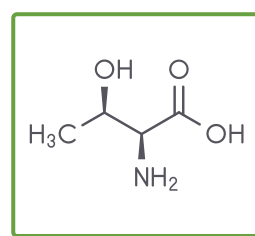
NH<sub>2</sub>: 9.13 COOH: 2.17



**Serine**

*Ser S*

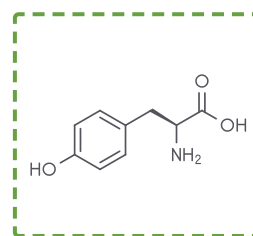
NH<sub>2</sub>: 9.15 COOH: 2.21



**Threonine**

*Thr T*

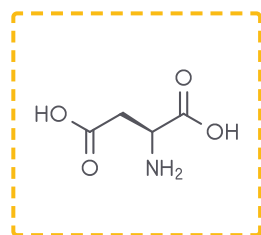
NH<sub>2</sub>: 9.12 COOH: 2.15



**Tyrosine**

*Tyr Y*

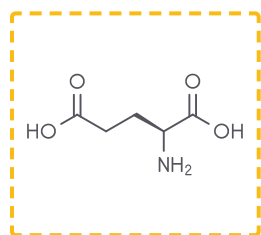
NH<sub>2</sub>: 9.11 COOH: 2.20



**Aspartic Acid**

*Asp D*

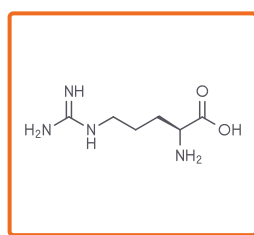
NH<sub>2</sub>: 9.60 COOH: 1.88



**Glutamic Acid**

*Glu E*

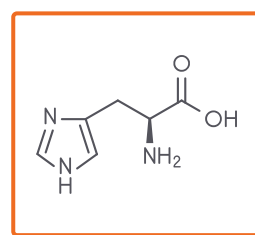
NH<sub>2</sub>: 9.67 COOH: 2.19



**Arginine**

*Arg R*

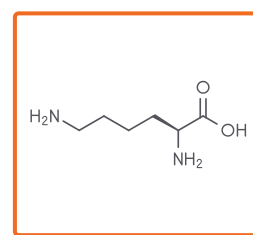
NH<sub>2</sub>: 9.09 COOH: 2.18



**Histidine**

*His H*

NH<sub>2</sub>: 8.97 COOH: 1.78



**Lysine**

*Lys K*

NH<sub>2</sub>: 10.28 COOH: 8.90