

## Amino Acids List

AA Name	Abbrev.		Structure	AA Name	Abbrev.		Structure
Alanine	Ala	A	$\begin{array}{c} \text{CH}_3 \\   \\ \text{-NH-CH-CO-} \end{array}$	Leucine	Leu	L	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_2\text{-CH-CH}_2 \\   \\ \text{-NH-CH-CO-} \end{array}$
Arginine	Arg	R	$\begin{array}{c} \text{NH}_2 \\   \\ \text{CH}_2\text{CH}_2\text{CH}_2\text{-NH-C} \\    \\ \text{-NH-CH-CO-} \\   \\ \text{NH} \end{array}$	Lysine	Lys	K	$\begin{array}{c} \text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2 \\   \\ \text{-NH-CH-CO-} \end{array}$
Asparagine	Asn	N	$\begin{array}{c} \text{O} \\    \\ \text{CH}_2\text{-C-NH}_2 \\   \\ \text{-NH-CH-CO-} \end{array}$	Methionine	Met	M	$\begin{array}{c} \text{CH}_2\text{CH}_2\text{S-CH}_3 \\   \\ \text{-NH-CH-CO-} \end{array}$
Aspartic acid	Asp	D	$\begin{array}{c} \text{O} \\    \\ \text{CH}_2\text{-C-OH} \\   \\ \text{-NH-CH-CO-} \end{array}$	Phenylalanine	Phe	F	$\begin{array}{c} \text{CH}_2\text{-} \langle \text{benzene ring} \rangle \\   \\ \text{-NH-CH-CO-} \end{array}$
Cysteine	Cys	C	$\begin{array}{c} \text{H}_2\text{C-SH} \\   \\ \text{-NH-CH-CO-} \end{array}$	Proline	Pro	P	$\begin{array}{c} \text{CH}_2 \\ / \quad \backslash \\ \text{H}_2\text{C} \quad \text{CH}_2 \\   \\ \text{-N-CH-CO-} \end{array}$
Glutamine	Gln	Q	$\begin{array}{c} \text{O} \\    \\ \text{CH}_2\text{CH}_2\text{-C-NH}_2 \\   \\ \text{-NH-CH-CO-} \end{array}$	Serine	Ser	S	$\begin{array}{c} \text{CH}_2\text{-OH} \\   \\ \text{-NH-CH-CO-} \end{array}$
Glutamic acid	Glu	E	$\begin{array}{c} \text{O} \\    \\ \text{CH}_2\text{CH}_2\text{-C-OH} \\   \\ \text{-NH-CH-CO-} \end{array}$	Threonine	Thr	T	$\begin{array}{c} \text{OH} \quad \text{CH}_3 \\   \quad   \\ \text{CH} \\   \\ \text{-NH-CH-CO-} \end{array}$
Glycine	Gly	G	$\text{-NH-CH}_2\text{-CO-}$	Tryptophan	Trp	W	$\begin{array}{c} \text{H} \\   \\ \text{CH} \\   \\ \text{CH}_2\text{-} \langle \text{indole ring} \rangle \\   \\ \text{-NH-CH-CO-} \end{array}$
Histidine	His	H	$\begin{array}{c} \text{H} \\   \\ \text{N} \\ / \quad \backslash \\ \text{CH}_2 \quad \text{CH} \\   \\ \text{-NH-CH-CO-} \end{array}$	Tyrosine	Tyr	Y	$\begin{array}{c} \text{CH}_2\text{-} \langle \text{benzene ring} \rangle\text{-OH} \\   \\ \text{-NH-CH-CO-} \end{array}$
Isoleucine	Ile	I	$\begin{array}{c} \text{CH}_3 \\   \\ \text{HC-CH}_2\text{CH}_2 \\   \\ \text{-NH-CH-CO-} \end{array}$	Valine	Val	V	$\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \\   \quad   \\ \text{CH} \\   \\ \text{-NH-CH-CO-} \end{array}$

	A	A	A	A	C	G	G	G	H	I	L	L	M	P	P	S	T	T	T	V
	L	R	S	S	Y	L	L	L	I	L	E	S	E	H	R	E	H	R	Y	A
	A	G	N	P	S	U	N	Y	S	E	U	S	T	E	O	R	R	P	R	L
<b>Acidic</b> (negative)				D		E														
<b>Basic</b> (positive)		R							H			K								
<b>Charged</b>		R		D		E			H			K								
<b>Neutral</b>	A		N		C		Q	G	H	I	L		M	F	P	S	T	W	Y	V
<b>Hydrophobic</b> (nonpolar)	A							G		I	L		M	F	P			W	Y	V
<b>Hydrophilic</b> (polar)		R	N	D	C	E	Q		H			K				S	T			

\*Chemical properties as listed in RasMol Reference Manual (by Roger Sayle)

\*Amino acid structures from [www.ionsource.com](http://www.ionsource.com)

[www.mybiology.com](http://www.mybiology.com)

# The Genetic Code

		Second base					
		U	C	A	G		
First base (5' end)	U	UUU	UCU	UAU	UGU	U	
		UUC	UCC	UAC	UGC		C
		UUA	UCA	UAA Stop	UGA Stop		A
		UUG	UCG	UAG Stop	UGG Trp		G
	C	CUU	CCU	CAU	CGU	U	
		CUC	CCC	CAC	CGC		C
		CUA	CCA	CAA	CGA		A
		CUG	CCG	CAG	CGG		G
	A	AUU	ACU	AAU	AGU	U	
		AUC	ACC	AAC	AGC		C
		AUA	ACA	AAA	AGA		A
		AUG Met or start	ACG	AAG	AGG		G
	G	GUU	GCU	GAU	GGU	U	
		GUC	GCC	GAC	GGC		C
		GUA	GCA	GAA	GGA		A
		GUG	GCG	GAG	GGG		G

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