

Table 1. Standard amino acid abbreviations. Both the three- and one-letter abbreviations are given along with the chemical properties of the amino acids.

Amino Acid	Three-letter Abbreviation	Single-letter Abbreviation	Chemical Properties
Alanine	Ala	A	non-polar; very small
Arginine	Arg	R	polar (positively charged), large
Asparagine	Asn	N	polar (uncharged); small
Aspartate	Asp	D	polar (negatively charged); small
Cysteine	Cys	C	polar (uncharged); small; sulphur containing
Glutamate	Glu	E	polar (negatively charged), medium sized
Glutamine	Gln	Q	polar (uncharged), medium sized
Glycine	Gly	G	non-polar; very small
Histidine	His	H	polar (positively charged); aromatic, medium sized
Isoleucine	Ile	I	non-polar large
Leucine	Leu	L	non-polar large
Lysine	Lys	K	polar (positively charged), large
Methionine	Met	M	non-polar; sulphur containing, large
Phenylalanine	Phe	F	non-polar; aromatic, very large
Proline	Pro	P	non-polar; small
Serine	Ser	S	polar (uncharged); very small
Threonine	Thr	T	polar (uncharged); small
Tryptophan	Trp	W	non-polar; aromatic, very large
Tyrosine	Tyr	Y	polar (uncharged); aromatic, very large
Valine	Val	V	non-polar; medium sized

Table 2. BLOSUM 62 substitution matrix. The twenty amino acids are given in both the left column and in the uppermost row of the table. The single letter amino acid abbreviations are used.

BLOSUM 62 Substitution Matrix																				
	C	S	T	P	A	G	N	D	E	Q	H	R	K	M	I	L	V	F	Y	W
C	9																			
S	-1	4																		
T	-1	1	5																	
P	-3	-1	-1	7																
A	0	1	0	-1	4															
G	-3	0	-2	-2	0	6														
N	-3	1	0	-2	-2	0	6													
D	-3	0	-1	-1	-2	-1	1	6												
E	-4	0	-1	-1	-1	-2	0	2	5											
Q	-3	0	-1	-1	-1	-2	0	0	2	5										
H	-3	-1	-2	-2	-2	-2	1	-1	0	0	8									
R	-3	-1	-1	-2	-1	-2	0	-2	0	1	0	5								
K	-3	0	-1	-1	-1	-2	0	-1	1	1	-1	2	5							
M	-1	-1	-1	-2	-1	-3	-2	-3	-2	0	-2	-1	-1	5						
I	-1	-2	-1	-3	-1	-4	-3	-3	-3	-3	-3	-3	-3	1	4					
L	-1	-2	-1	-3	-1	-4	-3	-4	-3	-2	-3	-2	-2	2	2	4				
V	-1	-2	0	-2	0	-3	-3	-3	-2	-2	-3	-3	-2	1	3	1	4			
F	-2	-2	-2	-4	-2	-3	-3	-3	-3	-3	-1	-3	-3	0	0	0	-1	6		
Y	-2	-2	-2	-3	-2	-3	-2	-3	-2	-1	2	-2	-2	-1	-1	-1	-1	3	7	
W	-2	-3	-2	-4	-3	-2	-4	-4	-3	-2	-2	-3	-3	-1	-3	-2	-3	1	2	11