PROPERTIES OF AMINO ACIDS

This table gives selected properties of some important amino acids and closely related compounds. The first part of the table lists the 20 "standard" amino acids that are the basic constituents of proteins (structures of these amino acids may be found in the following table). The second part includes other amino acids and related compounds of biochemical importance. Within each part of the table the compounds are listed by name in alphabetical order.

Symbol — Three-letter symbol for the standard amino acids
M_r — Molecular weight
t_m — Melting point
pK_a , pK_b , pK_c , pK_d — Negative of the logarithm of the acid dissociation constants for the COOH and NH_2 groups (and, in some cases, other groups) in the molecule (at 25°C)
pI — pH at the isoelectric point
S — Solubility in water at 25°C in units of grams of compound per kilogram of water; when quantitative data are not available, the notations sl.s. (for slightly soluble) and v.s. (for very soluble) are used.

Data on the enthalpy of formation of many of these compounds are included in the table "Standard Thermodynamic Properties of Chemical Substances" in Section 5 of this Handbook. Absorption spectra and optical rotation data can be found in Reference 3. Partial molar volume and other thermodynamic properties, including solubility as a function of temperature, are given in References 3 and 5. Most of the p*K* values come from Reference 7.

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The standard amino acids:

Symbol	Name	Mol. form.	M_r	t_m/°C	pK_a	pK_b	pK_c	pI	S/g kg^{-1}
Ala	Alanine	$C_3H_7NO_2$	89.09	297	2.33	9.71		6.00	165.0
Arg	Arginine	$C_6H_{14}N_4O_2$	174.20	244	2.03	9.00	12.10	10.76	182.6
Asn	Asparagine	$C_4H_8N_2O_3$	132.12	235	2.16	8.73		5.41	25.1
Asp	Aspartic acid	$C_4H_7NO_4$	133.10	270	1.95	9.66	3.71	2.77	4.95
Cys	Cysteine	$C_3H_7NO_2S$	121.16	240	1.91	10.28	8.14	5.07	v.s.
Glu	Glutamic acid	$C_5H_9NO_4$	147.13	160	2.16	9.58	4.15	3.22	8.61
Gln	Glutamine	$C_5H_{10}N_2O_3$	146.15	185	2.18	9.00		5.65	42
Gly	Glycine	$C_2H_5NO_2$	75.07	290	2.34	9.58		5.97	250.9
His	Histidine	$C_6H_9N_3O_2$	155.16	287	1.70	9.09	6.04	7.59	43.5
Ile	Isoleucine	$C_6H_{13}NO_2$	131.17	284	2.26	9.60		6.02	34.2
Leu	Leucine	$C_6H_{13}NO_2$	131.17	293	2.32	9.58		5.98	22.0
Lys	Lysine	$C_6H_{14}N_2O_2$	146.19	224	2.15	9.16	10.67	9.74	5.8
Met	Methionine	$C_5H_{11}NO_2S$	149.21	281	2.16	9.08		5.74	56
Phe	Phenylalanine	$C_9H_{11}NO_2$	165.19	283	2.18	9.09		5.48	27.9
Pro	Proline	$C_5H_9NO_2$	115.13	221	1.95	10.47		6.30	1623
Ser	Serine	$C_3H_7NO_3$	105.09	228	2.13	9.05		5.68	421.7
Thr	Threonine	$C_4H_9NO_3$	119.12	256	2.20	8.96		5.60	98.1
Trp	Tryptophan	$C_{11}H_{12}N_2O_2$	204.23	289	2.38	9.34		5.89	13.2
Tyr	Tyrosine	$C_9H_{11}NO_3$	181.19	343	2.24	9.04	10.10	5.66	0.46
Val	Valine	$C_5H_{11}NO_2$	117.15	315	2.27	9.52		5.96	88.5

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Other amino acids and related compounds:

Name	Mol. form.	M_r	t_m/°C	pK_a	pK_b	pK_c	pK_d	S/g kg^{-1}
N-Acetylglutamic acid	$C_7H_{11}NO_5$	189.17	199					
*N*6-Acetyl-*L*-lysine	$C_8H_{16}N_2O_3$	188.23	265	2.12	9.51			
β-Alanine	$C_3H_7NO_2$	89.09	200	3.51	10.08			891
DL-2-Aminobutanoic acid	$C_4H_9NO_2$	103.12	304	2.30	9.63			210
DL-3-Aminobutanoic acid	$C_4H_9NO_2$	103.12	194	3.43	10.05			1250
4-Aminobutanoic acid	$C_4H_9NO_2$	103.12	203	4.02	10.35			v.s.
5-Aminolevulinic acid	$C_5H_9NO_3$	131.13	118	4.05	8.90			
L-3-Amino-2-methylpropanoic acid	$C_4H_9NO_2$	103.12	183					
Azaserine	$C_5H_7N_3O_4$	173.13	150		8.55			v.s.
L-γ-Carboxyglutamic acid	$C_6H_9NO_6$	191.14	167	1.70	9.90	4.75	3.20	
Carnosine	$C_9H_{14}N_4O_3$	226.24	260	2.51	9.35	6.76		322
Citrulline	$C_6H_{13}N_3O_3$	175.19	222	2.32	9.30			
Creatine	$C_4H_9N_3O_2$	131.13	303	2.63	14.30			16
L-Cysteic acid	$C_3H_7NO_5S$	169.16	260	1.89	8.70	1.30		v.s.
L-Cystine	$C_6H_{12}N_2O_4S_2$	240.30	260	1.50	8.80	2.05	8.03	0.11
L-3,5-Diiodotyrosine	$C_9H_9I_2NO_3$	432.98	213	2.12	9.10	6.16		0.62
Dopamine	$C_8H_{11}NO_2$	153.18			10.36	8.88		
L-Ethionine	$C_6H_{13}NO_2S$	163.24	273	2.18	9.05	13.10		
Glycocyamine	$C_3H_7N_3O_2$	117.11	282	2.82				5
N-Glycylglycine	$C_4H_8N_2O_3$	132.12	263	3.13	8.10			
Histamine	$C_5H_9N_3$	111.15	83		9.83	6.11		v.s.
Homocysteine	$C_4H_9NO_2S$	135.19	232	2.15	8.57	10.38		
Homocystine	$C_8H_{16}N_2O_4S_2$	268.36	264	1.59	9.44	2.54	8.52	0.2
L-Homoserine	$C_4H_9NO_3$	119.12	203	2.27	9.28			1100
5-Hydroxylysine	$C_6H_{14}N_2O_3$	162.19		2.13	8.85	9.83		
trans-4-Hydroxyproline	$C_5H_9NO_3$	131.13	274	1.82	9.47			361
L-3-Iodotyrosine	$C_9H_{10}INO_3$	307.09	205	2.20	9.10	8.70		sl.s.
L-Kynurenine	$C_{10}H_{12}N_2O_3$	208.22	185					sl.s.
L-Lanthionine	$C_6H_{12}N_2O_4S$	208.24	295					1.5
Levodopa	$C_9H_{11}NO_4$	197.19	277	2.20	8.75	9.81	13.40	1650
2-Methylalanine	$C_4H_9NO_2$	103.12	335	2.36	10.21			137
L-1-Methylhistidine	$C_7H_{11}N_3O_2$	169.18	250	1.69	8.85	6.48		
L-Norleucine	$C_6H_{13}NO_2$	131.17	301	2.31	9.68			15
L-Norvaline	$C_5H_{11}NO_2$	117.15	305	2.31	9.65			107
L-Ornithine	$C_5H_{12}N_2O_2$	132.16	140	1.94	8.78	10.52		v.s.
O-Phosphoserine	$C_3H_8NO_6P$	185.07	166	2.14	9.80	5.70		
L-Pyroglutamic acid	$C_5H_7NO_3$	129.12	162	3.32				
Sarcosine	$C_3H_7NO_2$	89.09	212	2.18	9.97			428
L-Thyroxine	$C_{15}H_{11}I_4NO_4$	776.87	235	2.20	10.01	6.45		sl.s.

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