

Table 1. *Amino acid residue volumes*

Residue	Cohn & Edsall [3]	Densitometry (Zamyatnin, 1972 [4])	Densitometry (Zamyatnin, 1984 [5])	Molar group summations (method B) [71]	Protein crystal structures [6]	Amino acid crystal structures (Methods)	Consensus volume (average of six sets)	
	$\times 10^{-3} \text{ nm}^3$							
Hydrophobic	Ile	168.9	166.1	164.6	173.8	168.8 \pm 9.8 (69)	170.1 \pm 2.1 (2)	166.1 \pm 3.4
	Phe	187.9	189.2	187.2	182.5	203.4 \pm 10.3 (29)	203.9 \pm 2.5 (4)	189.7 \pm 7.4
	Val	141.4	139.4	136.8	147.3	141.7 \pm 8.4 (91)	142.3 \pm 2.9 (9)	138.8 \pm 3.6
	Leu	168.9	166.1	164.6	173.8	167.9 \pm 10.2 (57)	182.8 \pm 7.5 (6)	168.0 \pm 4.3
	Trp	228.5	226.9	225.1	236.6	237.6 \pm 13.6 (9)	228.9 \pm 1.4 (4)	227.9 \pm 3.8
	Met	163.1	162.3	161.0	173.7	170.8 \pm 8.9 (19)	176.0 \pm 1.5 (2)	165.2 \pm 1.8
	Ala	87.2	88.3	86.4	92.1	91.5 \pm 6.7 (71)	97.1 \pm 5.6 (6)	87.8 \pm 2.3
	Gly	60.6	59.9	57.8	62.5	66.4 \pm 4.7 (60)	68.2 \pm 1.8 (15)	59.9 \pm 2.2
	Cys	106.7 ^b	108.1	107.9	107.9	105.6 \pm 6.0 (16)	112.4 \pm 2.6 (5)	105.4 \pm 5.0
	Tyr	192.1	192.9	190.5	181.5	203.6 \pm 9.6 (13)	202.3 \pm 4.1 (12)	191.2 \pm 8.0
	Pro	122.4	122.2	120.6	132.3	129.3 \pm 7.3 (16)	129.0 \pm 6.1 (3)	123.3 \pm 1.8
Hydrophilic	Thr	117.4	115.7	113.5	127.9	122.1 \pm 6.7 (32)	129.0 \pm 3.6 (4)	118.3 \pm 2.3
	Ser	91.0	88.6	86.2	97.8	99.1 \pm 7.4 (46)	103.3 \pm 0.7 (5)	91.7 \pm 1.8
	His	152.4	152.5	150.1	172.9	167.3 \pm 7.4 (8)	158.3 \pm 7.7 (10)	156.3 \pm 6.1
	Glu	141.4	137.8	128.7	150.3	155.1 \pm 11.4 (13)	148.0 \pm 2.8 (4)	140.9 \pm 5.3
	Asn	117.4	117.3	115.6	123.8	135.2 \pm 10.1 (12)	127.4 \pm 0.5 (2)	120.1 \pm 4.1
	Gln	142.4	143.3	141.9	150.3	161.1 \pm 13.0 (5)	147.3 \pm 2.5 (2)	145.1 \pm 5.1
	Asp	114.6	110.6	108.5	123.8	124.5 \pm 7.7 (17)	125.5 \pm 1.6 (3)	115.4 \pm 2.2
	Lys	174.3	167.9	166.2	187.8	171.3 \pm 6.8 (5)	184.5 \pm 1.2 (3)	172.7 \pm 5.9
	Arg	181.3	172.7	197.3	198.8	202.1 \pm 3.2 (3) ^a	192.9 \pm 13.6 (4)	188.2 \pm 9.6
Mean difference between calculated and experimental protein \bar{v} values (ml/g)	-0.001 \pm 0.005	-0.011 \pm 0.005	-0.019 \pm 0.005	0.036 \pm 0.006	0.036 \pm 0.005	0.047 \pm 0.005	0.000 \pm 0.005	
Correction constant $\Delta\bar{v}/\Sigma N$ to be added to the above volumes prior to calculation of the consensus volume ($\times 10^{-3} \text{ nm}^3$)	0.3	2.2	3.4	-6.5	-6.9	-8.5	=	

^a From [74].^b See text.

3. Cohn, E. J. & Edsall, J. T. (1943) in *Proteins, amino acids and peptides*, pp. 155–176 & 370–381, Reinhold Publ. Corp., New York.
4. Zamyatnin, A. A. (1972) *Progr. Biophys. Mol. Biol.* 24, 109–123.
5. Zamyatnin, A. A. (1984) *Annu. Rev. Biophys. Bioeng.* 13, 145–165.
6. Chothia, C. (1975) *Nature (Lond.)* 254, 304–308.
71. Richards, F. M. (1974) *J. Mol. Biol.* 82, 1–14.
74. Chothia, C. & Janin, J. (1975) *Nature (Lond.)* 256, 705–708.