



wwPDB X-ray Structure Validation Summary Report ⓘ

Apr 18, 2026 – 02:24 PM UTC

PDB ID : 3GXF / pdb_00003gxf
Title : Crystal structure of acid-beta-glucosidase with isofagomine at neutral pH
Authors : Lieberman, R.L.
Deposited on : 2009-04-02
Resolution : 2.40 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

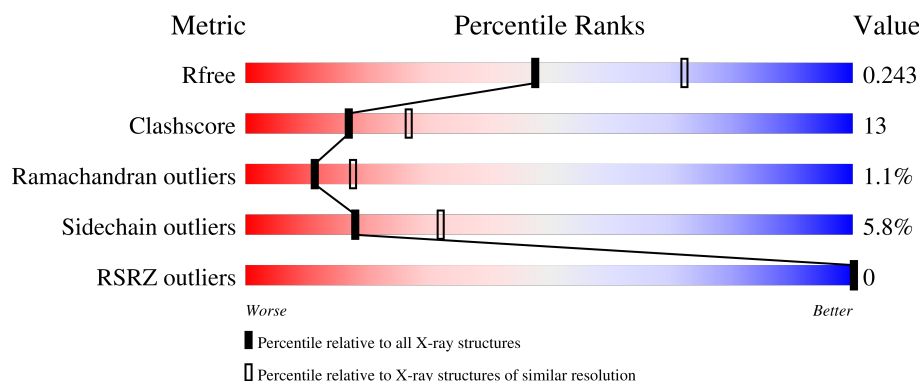
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	497	 76% 20% . .
1	B	497	 75% 22% .
1	C	497	 74% 21% 5% .
1	D	497	 75% 21% . .

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	PO4	A	501	-	-	X	-
2	PO4	A	509	-	-	X	-
2	PO4	B	499	-	-	X	-
2	PO4	B	502	-	-	X	-
2	PO4	B	506	-	-	X	-
2	PO4	C	500	-	-	X	-
2	PO4	D	507	-	-	X	-
4	GOL	A	517	-	-	X	-
4	GOL	B	519	-	-	X	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 17051 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

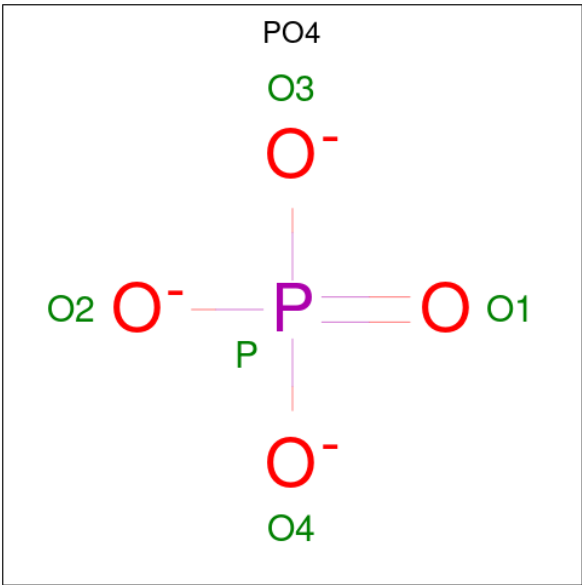
- Molecule 1 is a protein called Glucosylceramidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	497	Total	C	N	O	S	0	0	0
			3930	2532	671	711	16			
1	B	497	Total	C	N	O	S	0	0	0
			3930	2532	671	711	16			
1	C	497	Total	C	N	O	S	0	0	0
			3930	2532	671	711	16			
1	D	497	Total	C	N	O	S	0	0	0
			3930	2532	671	711	16			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	495	HIS	ARG	variant	UNP P04062
B	495	HIS	ARG	variant	UNP P04062
C	495	HIS	ARG	variant	UNP P04062
D	495	HIS	ARG	variant	UNP P04062

- Molecule 2 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	A	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		

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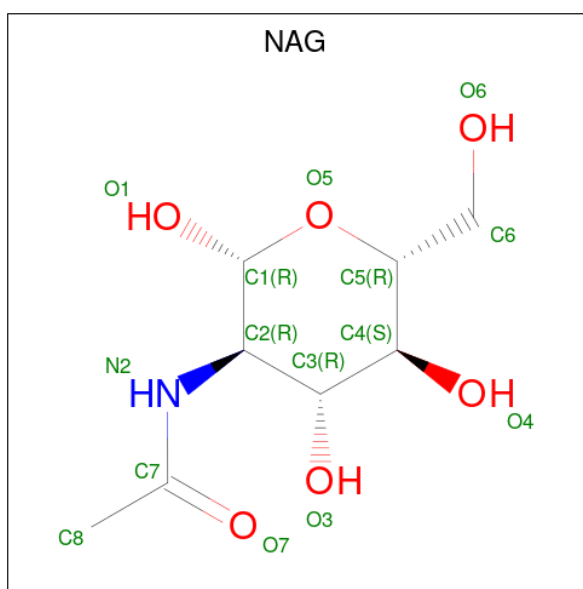
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	B	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	C	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		
2	D	1	Total	O	P	0	0
			5	4	1		

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



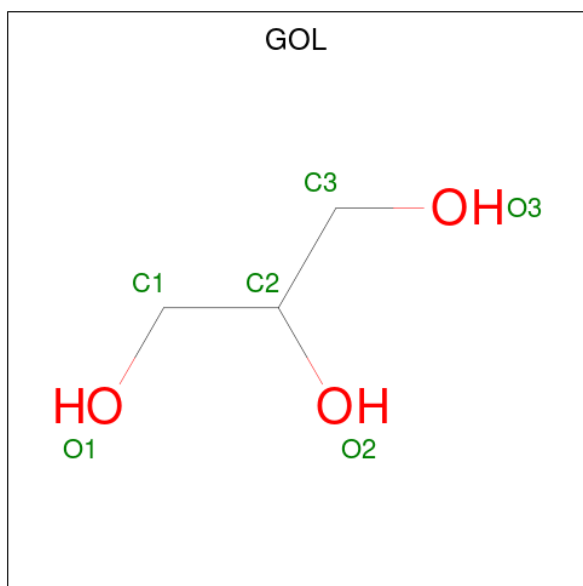
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	B	1	Total	C	N	O	0	0
			14	8	1	5		
3	C	1	Total	C	N	O	0	0
			14	8	1	5		

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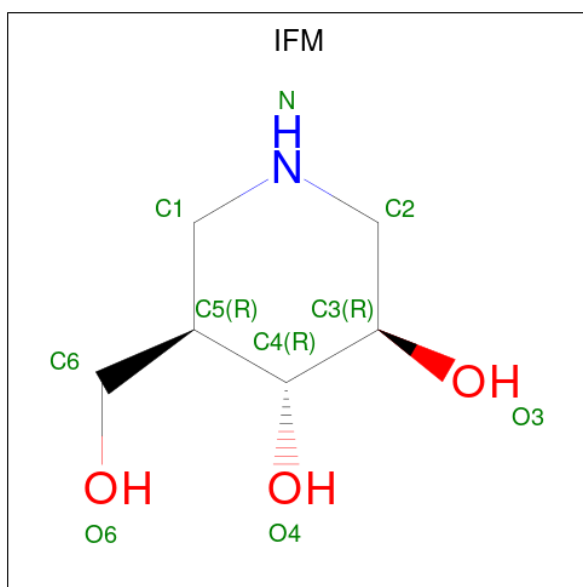
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	D	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		
4	C	1	Total	C	O	0	0
			6	3	3		

- Molecule 5 is 5-HYDROXYMETHYL-3,4-DIHYDROXYPIPERIDINE (CCD ID: IFM) (formula: $C_6H_{13}NO_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	B	1	Total	C	N	O	0	0
			10	6	1	3		
5	D	1	Total	C	N	O	0	0
			10	6	1	3		

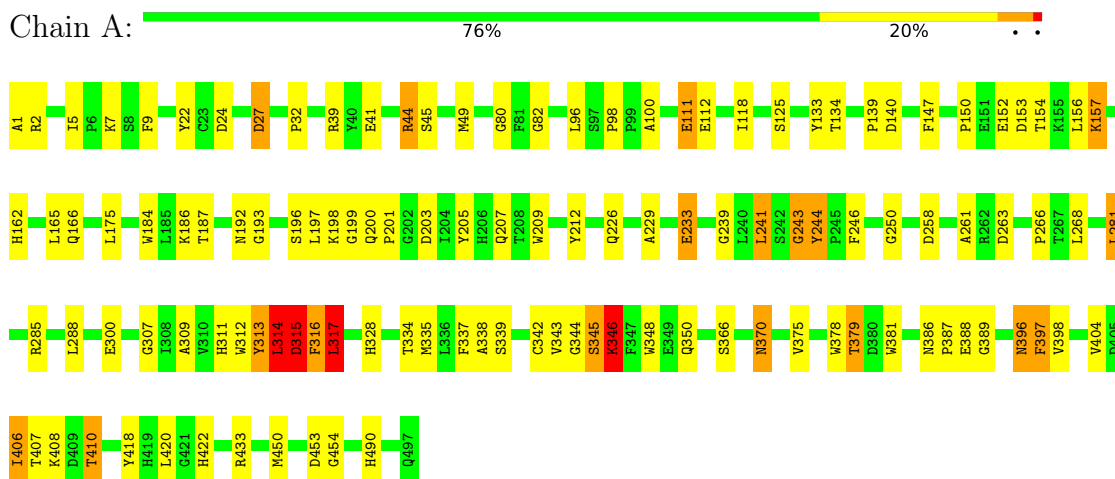
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	236	Total	O	0	0
			236	236		
6	B	243	Total	O	0	0
			243	243		
6	C	198	Total	O	0	0
			198	198		
6	D	228	Total	O	0	0
			228	228		

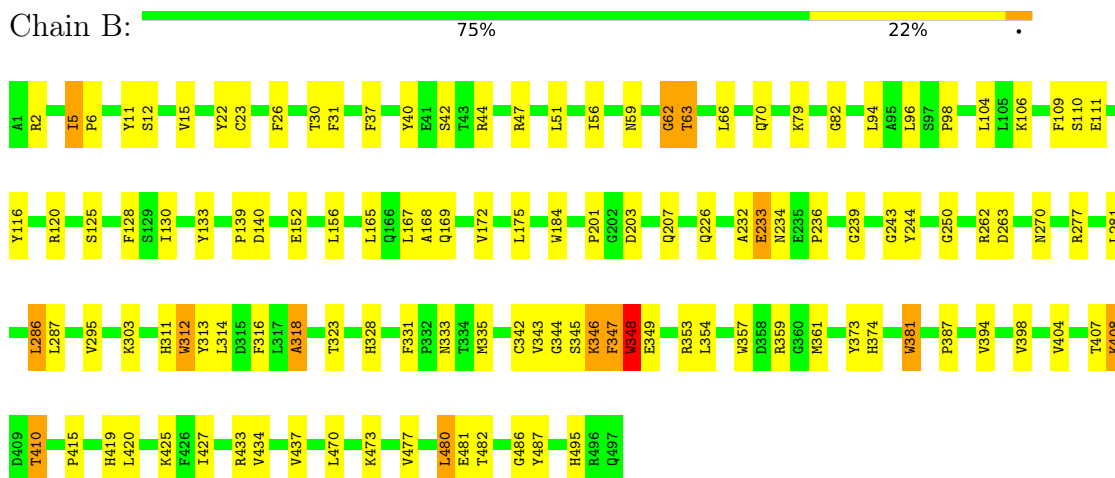
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Glucosylceramidase

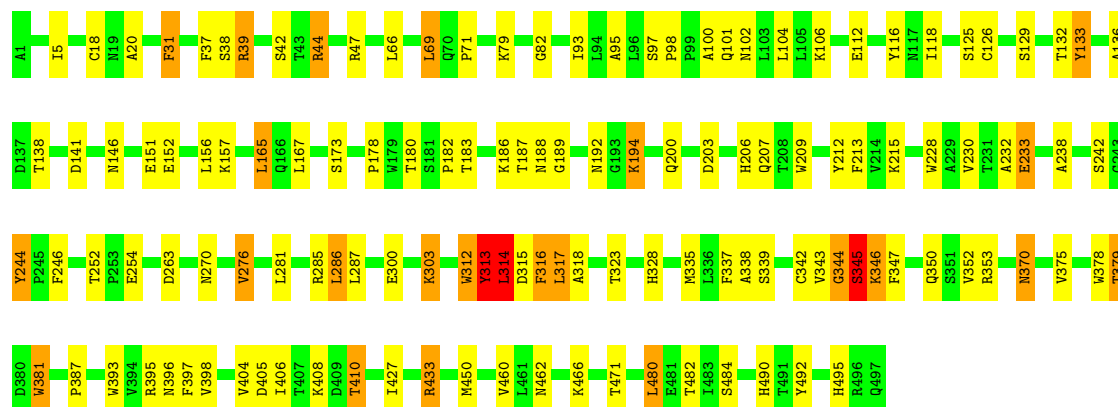


• Molecule 1: Glucosylceramidase



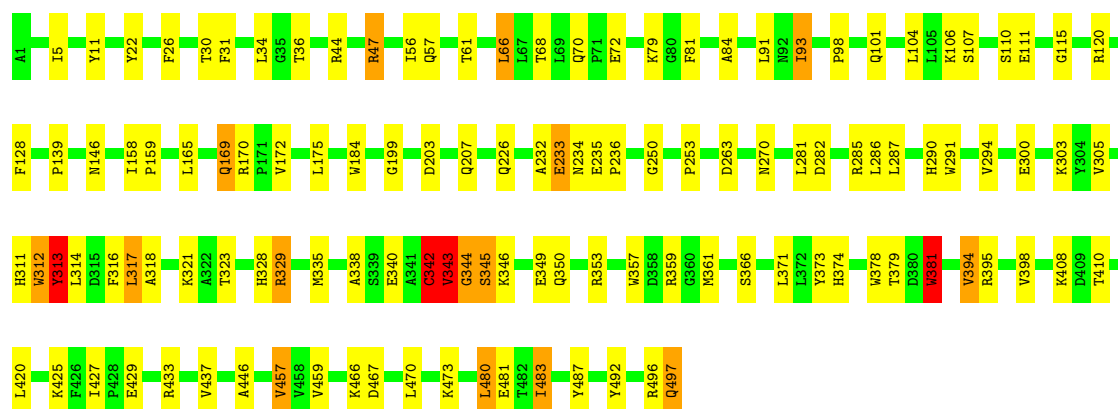
• Molecule 1: Glucosylceramidase





• Molecule 1: Glucosylceramidase

Chain D: 75% 21% ..



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	110.31Å 92.01Å 152.36Å 90.00° 111.21° 90.00°	Depositor
Resolution (Å)	32.12 – 2.40 32.12 – 2.40	Depositor EDS
% Data completeness (in resolution range)	93.2 (32.12-2.40) 93.2 (32.12-2.40)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.33 (at 2.39Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.178 , 0.245 0.178 , 0.243	Depositor DCC
R_{free} test set	5209 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	27.5	Xtriage
Anisotropy	0.028	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 14.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.460 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	17051	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.81% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: NAG, GOL, IFM, PO4

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	1.15	0/4051	1.21	17/5523 (0.3%)
1	B	1.15	3/4051 (0.1%)	1.18	14/5523 (0.3%)
1	C	1.18	6/4051 (0.1%)	1.20	19/5523 (0.3%)
1	D	1.14	5/4051 (0.1%)	1.18	13/5523 (0.2%)
All	All	1.15	14/16204 (0.1%)	1.19	63/22092 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	2
1	C	0	4
1	D	0	1
All	All	0	7

The worst 5 of 14 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	316	PHE	CA-C	6.97	1.56	1.52
1	C	276	VAL	CA-CB	6.14	1.61	1.54
1	D	158	ILE	CA-CB	5.98	1.57	1.54
1	C	460	VAL	CA-CB	5.89	1.62	1.54
1	D	313	TYR	N-CA	5.84	1.53	1.46

The worst 5 of 63 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	343	VAL	N-CA-C	9.95	130.03	109.34

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	347	PHE	N-CA-C	9.48	125.49	113.55
1	A	315	ASP	N-CA-C	9.03	124.29	113.28
1	A	313	TYR	CA-C-N	8.04	136.17	121.70
1	A	313	TYR	C-N-CA	8.04	136.17	121.70

There are no chirality outliers.

5 of 7 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	241	LEU	Peptide
1	A	315	ASP	Peptide
1	C	313	TYR	Peptide
1	C	314	LEU	Peptide
1	C	316	PHE	Peptide

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3930	0	3843	113	0
1	B	3930	0	3843	100	0
1	C	3930	0	3843	97	0
1	D	3930	0	3843	93	0
2	A	90	0	0	9	0
2	B	90	0	0	11	0
2	C	75	0	0	3	0
2	D	65	0	0	5	0
3	A	14	0	13	0	0
3	B	14	0	13	2	0
3	C	14	0	13	0	0
3	D	14	0	13	0	0
4	A	12	0	16	7	0
4	B	12	0	16	4	0
4	C	6	0	8	0	0
5	B	10	0	13	0	0
5	D	10	0	13	2	0
6	A	236	0	0	7	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	243	0	0	8	0
6	C	198	0	0	6	0
6	D	228	0	0	6	0
All	All	17051	0	15490	401	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 13.

The worst 5 of 401 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:345:SER:CA	1:A:346:LYS:HB2	1.73	1.18
1:C:345:SER:HB3	1:C:346:LYS:HA	1.16	1.07
1:A:345:SER:HA	1:A:346:LYS:CB	1.81	1.05
1:C:39:ARG:HG2	1:C:39:ARG:HH11	1.21	1.04
1:A:313:TYR:HH	1:B:347:PHE:HZ	1.06	1.03

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	495/497 (100%)	451 (91%)	37 (8%)	7 (1%)	9	13
1	B	495/497 (100%)	462 (93%)	29 (6%)	4 (1%)	16	25
1	C	495/497 (100%)	455 (92%)	34 (7%)	6 (1%)	10	16
1	D	495/497 (100%)	461 (93%)	29 (6%)	5 (1%)	12	20
All	All	1980/1988 (100%)	1829 (92%)	129 (6%)	22 (1%)	11	18

5 of 22 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	233	GLU
1	A	314	LEU
1	A	316	PHE
1	A	317	LEU
1	A	346	LYS

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	424/424 (100%)	400 (94%)	24 (6%)	18	33
1	B	424/424 (100%)	403 (95%)	21 (5%)	22	38
1	C	424/424 (100%)	400 (94%)	24 (6%)	18	33
1	D	424/424 (100%)	395 (93%)	29 (7%)	14	25
All	All	1696/1696 (100%)	1598 (94%)	98 (6%)	18	32

5 of 98 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	315	ASP
1	D	36	THR
1	C	345	SER
1	C	410	THR
1	D	72	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 22 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	328	HIS
1	D	146	ASN
1	C	495	HIS
1	D	226	GLN
1	B	143	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

75 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	PO4	C	504	-	4,4,4	0.86	0	6,6,6	0.95	0
2	PO4	C	510	-	4,4,4	0.69	0	6,6,6	0.90	0
2	PO4	D	501	-	4,4,4	0.77	0	6,6,6	1.38	1 (16%)
2	PO4	A	501	-	4,4,4	1.10	0	6,6,6	1.53	2 (33%)
2	PO4	A	509	-	4,4,4	1.07	0	6,6,6	0.67	0
2	PO4	C	500	-	4,4,4	0.93	0	6,6,6	1.46	1 (16%)
2	PO4	C	499	-	4,4,4	0.73	0	6,6,6	2.00	3 (50%)
2	PO4	C	512	-	4,4,4	0.81	0	6,6,6	0.88	0
2	PO4	A	505	-	4,4,4	0.76	0	6,6,6	0.55	0
2	PO4	A	503	-	4,4,4	0.90	0	6,6,6	0.64	0
2	PO4	D	498	-	4,4,4	1.05	0	6,6,6	1.95	2 (33%)
2	PO4	B	498	-	4,4,4	1.33	0	6,6,6	1.82	2 (33%)
2	PO4	B	505	-	4,4,4	0.86	0	6,6,6	0.97	0
2	PO4	C	506	-	4,4,4	1.11	0	6,6,6	0.97	0
4	GOL	A	518	-	5,5,5	0.35	0	5,5,5	0.69	0
2	PO4	B	503	-	4,4,4	0.87	0	6,6,6	0.50	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	PO4	C	508	-	4,4,4	0.87	0	6,6,6	0.57	0
2	PO4	B	499	-	4,4,4	0.99	0	6,6,6	1.32	0
3	NAG	B	516	1	14,14,15	0.71	0	17,19,21	1.91	6 (35%)
2	PO4	B	500	-	4,4,4	0.86	0	6,6,6	1.31	0
2	PO4	C	509	-	4,4,4	0.79	0	6,6,6	0.93	0
2	PO4	A	502	-	4,4,4	0.86	0	6,6,6	0.83	0
2	PO4	D	510	-	4,4,4	0.91	0	6,6,6	0.48	0
2	PO4	A	513	-	4,4,4	0.95	0	6,6,6	0.54	0
2	PO4	B	510	-	4,4,4	0.80	0	6,6,6	0.70	0
2	PO4	D	500	-	4,4,4	0.87	0	6,6,6	0.88	0
2	PO4	D	502	-	4,4,4	1.06	0	6,6,6	1.25	1 (16%)
2	PO4	D	499	-	4,4,4	0.61	0	6,6,6	0.82	0
2	PO4	B	512	-	4,4,4	0.95	0	6,6,6	0.80	0
2	PO4	B	514	-	4,4,4	0.83	0	6,6,6	0.74	0
3	NAG	D	511	1	14,14,15	0.82	0	17,19,21	1.94	4 (23%)
4	GOL	A	517	-	5,5,5	0.30	0	5,5,5	1.35	0
2	PO4	D	509	-	4,4,4	0.79	0	6,6,6	0.78	0
2	PO4	A	500	-	4,4,4	1.21	0	6,6,6	1.15	0
2	PO4	A	504	-	4,4,4	0.70	0	6,6,6	0.89	0
2	PO4	A	510	-	4,4,4	0.83	0	6,6,6	1.17	0
2	PO4	C	503	-	4,4,4	0.80	0	6,6,6	0.99	1 (16%)
5	IFM	D	512	-	10,10,10	1.29	2 (20%)	9,13,13	4.04	2 (22%)
2	PO4	D	505	-	4,4,4	0.91	0	6,6,6	1.01	0
2	PO4	C	507	-	4,4,4	0.92	0	6,6,6	0.76	0
2	PO4	A	512	-	4,4,4	0.78	0	6,6,6	0.68	0
2	PO4	A	508	-	4,4,4	1.13	0	6,6,6	0.63	0
5	IFM	B	517	-	10,10,10	1.29	2 (20%)	9,13,13	4.23	6 (66%)
2	PO4	B	506	-	4,4,4	1.10	0	6,6,6	0.61	0
2	PO4	B	501	-	4,4,4	0.98	0	6,6,6	1.02	0
2	PO4	C	502	-	4,4,4	1.53	1 (25%)	6,6,6	0.97	0
2	PO4	A	498	-	4,4,4	1.53	0	6,6,6	1.83	2 (33%)
2	PO4	C	511	-	4,4,4	0.63	0	6,6,6	0.56	0
2	PO4	D	503	-	4,4,4	0.77	0	6,6,6	1.09	1 (16%)
2	PO4	A	514	-	4,4,4	0.68	0	6,6,6	1.03	0
2	PO4	D	506	-	4,4,4	0.78	0	6,6,6	0.71	0
2	PO4	D	504	-	4,4,4	0.87	0	6,6,6	0.47	0
2	PO4	B	504	-	4,4,4	0.79	0	6,6,6	0.70	0
2	PO4	B	513	-	4,4,4	0.77	0	6,6,6	0.85	0
2	PO4	C	498	-	4,4,4	1.53	0	6,6,6	0.84	0
3	NAG	A	516	1	14,14,15	0.94	0	17,19,21	1.65	5 (29%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	PO4	B	511	-	4,4,4	0.76	0	6,6,6	1.32	1 (16%)
2	PO4	B	502	-	4,4,4	0.90	0	6,6,6	1.15	1 (16%)
2	PO4	A	507	-	4,4,4	0.90	0	6,6,6	0.22	0
4	GOL	B	519	-	5,5,5	0.59	0	5,5,5	0.79	0
2	PO4	A	511	-	4,4,4	0.74	0	6,6,6	0.80	0
2	PO4	A	506	-	4,4,4	0.68	0	6,6,6	1.07	0
2	PO4	B	508	-	4,4,4	0.74	0	6,6,6	0.79	0
2	PO4	B	515	-	4,4,4	0.98	0	6,6,6	0.62	0
2	PO4	A	515	-	4,4,4	0.63	0	6,6,6	0.99	0
2	PO4	B	507	-	4,4,4	0.86	0	6,6,6	0.96	0
2	PO4	C	501	-	4,4,4	0.97	0	6,6,6	1.48	1 (16%)
2	PO4	D	507	-	4,4,4	0.95	0	6,6,6	1.01	0
2	PO4	D	508	-	4,4,4	0.82	0	6,6,6	0.59	0
3	NAG	C	513	1	14,14,15	0.94	0	17,19,21	1.96	5 (29%)
4	GOL	C	514	-	5,5,5	0.43	0	5,5,5	0.80	0
2	PO4	C	505	-	4,4,4	0.83	0	6,6,6	0.45	0
2	PO4	B	509	-	4,4,4	0.83	0	6,6,6	0.79	0
2	PO4	A	499	-	4,4,4	0.99	0	6,6,6	1.40	1 (16%)
4	GOL	B	518	-	5,5,5	0.32	0	5,5,5	0.66	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	B	516	1	-	0/6/23/26	0/1/1/1
5	IFM	D	512	-	-	0/2/16/16	0/1/1/1
5	IFM	B	517	-	-	0/2/16/16	0/1/1/1
3	NAG	A	516	1	-	0/6/23/26	0/1/1/1
3	NAG	D	511	1	-	0/6/23/26	0/1/1/1
4	GOL	A	517	-	-	1/4/4/4	-
3	NAG	C	513	1	-	0/6/23/26	0/1/1/1
4	GOL	C	514	-	-	3/4/4/4	-
4	GOL	A	518	-	-	0/4/4/4	-
4	GOL	B	519	-	-	4/4/4/4	-
4	GOL	B	518	-	-	4/4/4/4	-

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	517	IFM	C1-C5	2.74	1.55	1.52
5	D	512	IFM	C3-C4	2.45	1.56	1.52
5	B	517	IFM	C6-C5	2.40	1.57	1.52
5	D	512	IFM	C1-C5	2.26	1.54	1.52
2	C	502	PO4	P-O1	2.16	1.55	1.50

The worst 5 of 48 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	D	512	IFM	C1-N-C2	10.75	124.24	111.78
5	B	517	IFM	C1-N-C2	9.12	122.35	111.78
5	B	517	IFM	C2-C3-C4	5.89	117.45	110.25
3	D	511	NAG	C1-O5-C5	5.27	119.25	112.19
5	B	517	IFM	O4-C4-C5	-4.94	101.76	110.01

There are no chirality outliers.

5 of 12 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	518	GOL	C1-C2-C3-O3
4	B	519	GOL	O1-C1-C2-O2
4	B	519	GOL	O1-C1-C2-C3
4	B	519	GOL	C1-C2-C3-O3
4	C	514	GOL	O1-C1-C2-C3

There are no ring outliers.

22 monomers are involved in 43 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	501	PO4	1	0
2	A	501	PO4	4	0
2	A	509	PO4	3	0
2	C	500	PO4	2	0
2	B	498	PO4	1	0
4	A	518	GOL	3	0
2	B	499	PO4	2	0
3	B	516	NAG	2	0
2	B	500	PO4	1	0
2	B	510	PO4	1	0
2	D	502	PO4	1	0
4	A	517	GOL	4	0
2	A	504	PO4	1	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	512	IFM	2	0
2	B	506	PO4	3	0
2	D	503	PO4	1	0
2	A	514	PO4	1	0
2	C	498	PO4	1	0
2	B	502	PO4	2	0
4	B	519	GOL	4	0
2	B	507	PO4	1	0
2	D	507	PO4	2	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	497/497 (100%)	-1.70	0 100 100	14, 24, 44, 62	0
1	B	497/497 (100%)	-1.72	0 100 100	13, 23, 43, 64	0
1	C	497/497 (100%)	-1.70	0 100 100	14, 24, 43, 61	0
1	D	497/497 (100%)	-1.70	0 100 100	13, 23, 42, 64	0
All	All	1988/1988 (100%)	-1.70	0 100 100	13, 24, 43, 64	0

There are no RSRZ outliers to report.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	PO4	B	508	5/5	0.96	0.06	113,113,113,113	0
2	PO4	A	503	5/5	0.97	0.08	100,100,101,101	0
2	PO4	B	510	5/5	0.97	0.05	116,117,117,117	0
2	PO4	A	513	5/5	0.98	0.07	105,106,106,106	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	PO4	B	503	5/5	0.98	0.07	105,106,107,107	0
2	PO4	B	504	5/5	0.98	0.06	89,89,90,91	0
2	PO4	B	506	5/5	0.98	0.06	107,107,108,108	0
2	PO4	A	507	5/5	0.98	0.04	103,104,104,105	0
2	PO4	A	509	5/5	0.98	0.07	98,100,100,101	0
2	PO4	B	514	5/5	0.98	0.04	95,95,95,96	0
2	PO4	C	504	5/5	0.98	0.06	77,78,79,80	0
2	PO4	C	505	5/5	0.98	0.06	103,104,104,105	0
2	PO4	C	506	5/5	0.98	0.06	110,110,111,112	0
2	PO4	C	507	5/5	0.98	0.04	78,80,81,81	0
2	PO4	C	508	5/5	0.98	0.06	107,107,109,109	0
2	PO4	C	509	5/5	0.98	0.05	95,95,96,96	0
2	PO4	D	503	5/5	0.98	0.05	93,93,95,95	0
2	PO4	D	506	5/5	0.98	0.06	101,102,103,103	0
2	PO4	D	507	5/5	0.98	0.04	72,73,75,77	0
2	PO4	D	510	5/5	0.98	0.06	116,117,117,117	0
2	PO4	A	502	5/5	0.99	0.04	74,74,76,77	0
2	PO4	B	507	5/5	0.99	0.05	91,92,94,94	0
2	PO4	A	508	5/5	0.99	0.05	61,61,62,62	0
2	PO4	B	509	5/5	0.99	0.06	81,82,82,83	0
2	PO4	A	501	5/5	0.99	0.03	49,50,52,56	0
2	PO4	B	511	5/5	0.99	0.05	66,66,67,68	0
2	PO4	B	512	5/5	0.99	0.05	51,53,54,54	0
2	PO4	B	513	5/5	0.99	0.03	61,64,65,66	0
2	PO4	A	510	5/5	0.99	0.05	81,82,83,83	0
2	PO4	B	515	5/5	0.99	0.04	67,67,70,70	0
2	PO4	C	500	5/5	0.99	0.04	51,53,54,54	0
2	PO4	C	502	5/5	0.99	0.06	118,118,118,119	0
2	PO4	C	503	5/5	0.99	0.04	61,61,63,63	0
2	PO4	A	511	5/5	0.99	0.06	76,77,78,78	0
2	PO4	A	512	5/5	0.99	0.03	61,63,64,64	0
2	PO4	A	504	5/5	0.99	0.04	60,63,65,65	0
2	PO4	A	514	5/5	0.99	0.04	62,63,64,64	0
2	PO4	A	515	5/5	0.99	0.07	71,72,73,74	0
2	PO4	B	501	5/5	0.99	0.03	42,43,48,49	0
2	PO4	C	510	5/5	0.99	0.04	77,80,80,81	0
2	PO4	C	511	5/5	0.99	0.05	98,98,99,99	0
2	PO4	C	512	5/5	0.99	0.03	69,69,70,71	0
2	PO4	D	501	5/5	0.99	0.06	49,53,55,58	0
2	PO4	D	502	5/5	0.99	0.05	49,55,56,57	0
2	PO4	B	502	5/5	0.99	0.05	77,79,80,80	0
2	PO4	D	504	5/5	0.99	0.04	78,79,79,81	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	PO4	D	505	5/5	0.99	0.05	95,96,96,97	0
2	PO4	A	505	5/5	0.99	0.06	84,85,85,85	0
2	PO4	A	506	5/5	0.99	0.03	67,69,70,71	0
2	PO4	D	508	5/5	0.99	0.07	85,86,87,87	0
2	PO4	D	509	5/5	0.99	0.05	83,85,85,85	0
2	PO4	B	505	5/5	0.99	0.04	72,72,73,75	0
3	NAG	A	516	14/15	0.99	0.03	25,30,32,33	0
3	NAG	B	516	14/15	0.99	0.04	39,41,44,45	0
3	NAG	C	513	14/15	0.99	0.03	25,30,31,34	0
3	NAG	D	511	14/15	0.99	0.03	24,39,42,42	0
4	GOL	A	517	6/6	0.99	0.04	36,42,42,43	0
4	GOL	B	518	6/6	0.99	0.03	38,41,43,44	0
4	GOL	B	519	6/6	0.99	0.06	35,40,41,42	0
4	GOL	C	514	6/6	0.99	0.03	38,39,40,41	0
5	IFM	D	512	10/10	0.99	0.03	24,30,34,34	0
2	PO4	B	499	5/5	1.00	0.03	35,37,38,41	0
2	PO4	B	500	5/5	1.00	0.02	26,34,37,38	0
2	PO4	D	498	5/5	1.00	0.02	21,24,25,26	0
2	PO4	D	499	5/5	1.00	0.02	37,39,40,41	0
2	PO4	D	500	5/5	1.00	0.02	33,33,39,39	0
2	PO4	A	498	5/5	1.00	0.02	24,25,32,32	0
2	PO4	A	499	5/5	1.00	0.03	40,41,42,43	0
2	PO4	A	500	5/5	1.00	0.02	41,41,43,45	0
4	GOL	A	518	6/6	1.00	0.03	54,57,57,57	0
2	PO4	C	498	5/5	1.00	0.02	25,27,30,30	0
2	PO4	C	499	5/5	1.00	0.05	35,36,38,42	0
2	PO4	B	498	5/5	1.00	0.02	24,25,30,31	0
5	IFM	B	517	10/10	1.00	0.03	22,24,30,31	0
2	PO4	C	501	5/5	1.00	0.02	37,38,42,42	0

6.5 Other polymers

There are no such residues in this entry.