Full wwPDB EM Validation Report

Jul 15, 2025 – 11:10 PM JST

PDB ID	:	8ZDW / pdb_00008zdw
EMDB ID	:	EMD-60015
Title	:	The cryoEM structure of H5N1 HA split from symmetric filament in conformation A
Authors	:	Li, R.; Gao, J.; Wang, L.; Gui, M.; Xiang, Y.
Deposited on	:	2024-05-03
Resolution	:	3.45 Å(reported)

This is a Full wwPDB EM Validation 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/EMValidationReportHelp
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:

EMDB validation analysis	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	FAILED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.44

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.45 Å.

There are no overall percentile quality scores available for this entry.

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 22602 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Hemagglutinin.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	321	Total	C	N	O	S	0	0
			2549	1611	440	483	15		
1	C	321	Total	C	N	O	S	0	0
			2549	1611	440	483	15		
1	H	321	Total	C	N	O	S	0	0
			2549	1611	440	483	15		

- Molecule 2 is a protein called Hemagglutinin.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	174	Total	C	N	O	S	0	0
			1412	878	245	281	8		
2	D	174	Total	C	N	O	S	0	0
			1412	878	245	281	8		
2	I	174	Total	C	N	O	S	0	0
			1412	878	245	281	8		

- Molecule 3 is a protein called H5M9 Fab, light chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	R	217	Total	C	N	O	S	0	0
			1683	1044	291	342	6		
3	E	217	Total	C	N	O	S	0	0
			1683	1044	291	342	6		
3	J	217	Total	C	N	O	S	0	0
			1683	1044	291	342	6		

- Molecule 4 is a protein called Anti-H5N1 hemagglutinin monoclonal anitbody H5M9 heavy chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	U	222	Total	C	N	O	S	0	0
			1682	1062	277	334	9		

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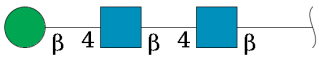
Mol	Chain	Residues	Atoms					AltConf	Trace
4	F	222	Total	C	N	O	S	0	0
			1682	1062	277	334	9		
4	L	222	Total	C	N	O	S	0	0
			1682	1062	277	334	9		

- Molecule 5 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

Mol	Chain	Residues	Atoms				AltConf	Trace
5	G	2	Total	C	N	O	0	0
			28	16	2	10		
5	N	2	Total	C	N	O	0	0
			28	16	2	10		
5	Q	2	Total	C	N	O	0	0
			28	16	2	10		

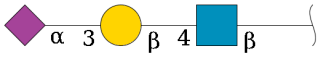
- Molecule 6 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				AltConf	Trace
6	K	3	Total	C	N	O	0	0
			39	22	2	15		
6	M	3	Total	C	N	O	0	0
			39	22	2	15		
6	O	3	Total	C	N	O	0	0
			39	22	2	15		
6	P	3	Total	C	N	O	0	0
			39	22	2	15		
6	S	3	Total	C	N	O	0	0
			39	22	2	15		
6	T	3	Total	C	N	O	0	0
			39	22	2	15		

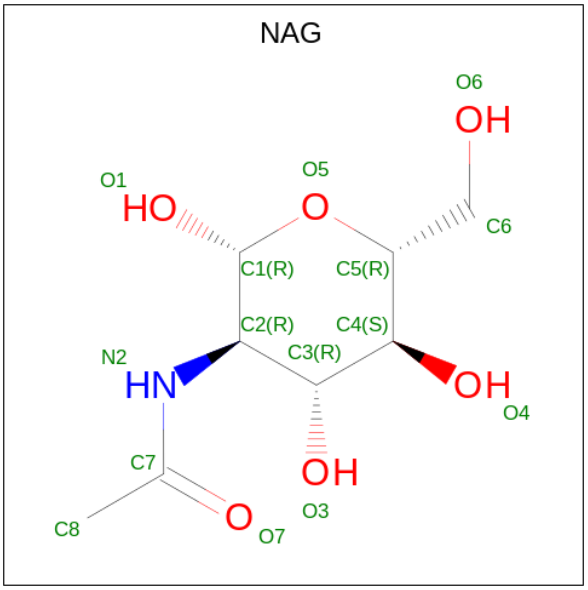
- Molecule 7 is an oligosaccharide called N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galacto

pyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms	AltConf	Trace
7	V	3	Total C N O 46 25 2 19	0	0
7	W	3	Total C N O 46 25 2 19	0	0
7	X	3	Total C N O 46 25 2 19	0	0

- Molecule 8 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$) (labeled as "Ligand of Interest" by depositor).



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

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Mol	Chain	Residues	Atoms				AltConf
8	I	1	Total	C	N	O	0
			14	8	1	5	
8	E	1	Total	C	N	O	0
			14	8	1	5	
8	J	1	Total	C	N	O	0
			14	8	1	5	
8	C	1	Total	C	N	O	0
			14	8	1	5	
8	C	1	Total	C	N	O	0
			14	8	1	5	
8	H	1	Total	C	N	O	0
			14	8	1	5	
8	H	1	Total	C	N	O	0
			14	8	1	5	

MolProbity failed to run properly - this section is therefore empty.

3 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	216514	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	2000	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor

4 Model quality

4.1 Standard geometry

MolProbity failed to run properly - this section is therefore empty.

4.2 Too-close contacts

MolProbity failed to run properly - this section is therefore empty.

4.3 Torsion angles

4.3.1 Protein backbone

MolProbity failed to run properly - this section is therefore empty.

4.3.2 Protein sidechains

MolProbity failed to run properly - this section is therefore empty.

4.3.3 RNA

MolProbity failed to run properly - this section is therefore empty.

4.4 Non-standard residues in protein, DNA, RNA chains

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

4.5 Carbohydrates

33 monosaccharides 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	$\#\|Z\|>2$
5	NAG	G	1	1,5	14,14,15	0.29	0	17,19,21	0.56	0
5	NAG	G	2	5	14,14,15	0.22	0	17,19,21	0.42	0
6	NAG	K	1	6,1	14,14,15	0.28	0	17,19,21	0.46	0
6	NAG	K	2	6	14,14,15	0.45	0	17,19,21	0.64	1 (5%)
6	BMA	K	3	6	11,11,12	0.57	0	15,15,17	0.81	0
6	NAG	M	1	6,1	14,14,15	0.36	0	17,19,21	0.54	0
6	NAG	M	2	6	14,14,15	0.33	0	17,19,21	0.58	0
6	BMA	M	3	6	11,11,12	0.59	0	15,15,17	0.74	0
5	NAG	N	1	1,5	14,14,15	0.29	0	17,19,21	0.56	0
5	NAG	N	2	5	14,14,15	0.22	0	17,19,21	0.43	0
6	NAG	O	1	6,1	14,14,15	0.28	0	17,19,21	0.46	0
6	NAG	O	2	6	14,14,15	0.45	0	17,19,21	0.63	1 (5%)
6	BMA	O	3	6	11,11,12	0.57	0	15,15,17	0.82	0
6	NAG	P	1	6,1	14,14,15	0.34	0	17,19,21	0.54	0
6	NAG	P	2	6	14,14,15	0.33	0	17,19,21	0.58	0
6	BMA	P	3	6	11,11,12	0.59	0	15,15,17	0.74	0
5	NAG	Q	1	1,5	14,14,15	0.29	0	17,19,21	0.56	0
5	NAG	Q	2	5	14,14,15	0.22	0	17,19,21	0.42	0
6	NAG	S	1	6,1	14,14,15	0.28	0	17,19,21	0.45	0
6	NAG	S	2	6	14,14,15	0.45	0	17,19,21	0.63	1 (5%)
6	BMA	S	3	6	11,11,12	0.57	0	15,15,17	0.81	0
6	NAG	T	1	6,1	14,14,15	0.34	0	17,19,21	0.54	0
6	NAG	T	2	6	14,14,15	0.33	0	17,19,21	0.58	0
6	BMA	T	3	6	11,11,12	0.59	0	15,15,17	0.74	0
7	NAG	V	1	7	15,15,15	0.41	0	21,21,21	0.87	1 (4%)
7	GAL	V	2	7	11,11,12	0.53	0	15,15,17	1.52	4 (26%)
7	SIA	V	3	7	20,20,21	0.92	1 (5%)	24,28,31	1.12	3 (12%)
7	NAG	W	1	7	15,15,15	0.41	0	21,21,21	0.87	1 (4%)
7	GAL	W	2	7	11,11,12	0.53	0	15,15,17	1.53	4 (26%)
7	SIA	W	3	7	20,20,21	0.91	1 (5%)	24,28,31	1.12	3 (12%)
7	NAG	X	1	7	15,15,15	0.41	0	21,21,21	0.89	1 (4%)
7	GAL	X	2	7	11,11,12	0.53	0	15,15,17	1.53	4 (26%)
7	SIA	X	3	7	20,20,21	0.91	1 (5%)	24,28,31	1.12	3 (12%)

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
5	NAG	G	1	1,5	-	1/6/23/26	0/1/1/1
5	NAG	G	2	5	-	0/6/23/26	0/1/1/1
6	NAG	K	1	6,1	-	2/6/23/26	0/1/1/1
6	NAG	K	2	6	-	2/6/23/26	0/1/1/1
6	BMA	K	3	6	-	0/2/19/22	0/1/1/1
6	NAG	M	1	6,1	-	1/6/23/26	0/1/1/1
6	NAG	M	2	6	-	1/6/23/26	0/1/1/1
6	BMA	M	3	6	-	0/2/19/22	0/1/1/1
5	NAG	N	1	1,5	-	1/6/23/26	0/1/1/1
5	NAG	N	2	5	-	0/6/23/26	0/1/1/1
6	NAG	O	1	6,1	-	2/6/23/26	0/1/1/1
6	NAG	O	2	6	-	2/6/23/26	0/1/1/1
6	BMA	O	3	6	-	0/2/19/22	0/1/1/1
6	NAG	P	1	6,1	-	1/6/23/26	0/1/1/1
6	NAG	P	2	6	-	1/6/23/26	0/1/1/1
6	BMA	P	3	6	-	0/2/19/22	0/1/1/1
5	NAG	Q	1	1,5	-	1/6/23/26	0/1/1/1
5	NAG	Q	2	5	-	0/6/23/26	0/1/1/1
6	NAG	S	1	6,1	-	2/6/23/26	0/1/1/1
6	NAG	S	2	6	-	2/6/23/26	0/1/1/1
6	BMA	S	3	6	-	0/2/19/22	0/1/1/1
6	NAG	T	1	6,1	-	1/6/23/26	0/1/1/1
6	NAG	T	2	6	-	1/6/23/26	0/1/1/1
6	BMA	T	3	6	-	0/2/19/22	0/1/1/1
7	NAG	V	1	7	-	4/6/26/26	0/1/1/1
7	GAL	V	2	7	-	1/2/19/22	0/1/1/1
7	SIA	V	3	7	-	4/18/34/38	0/1/1/1
7	NAG	W	1	7	-	4/6/26/26	0/1/1/1
7	GAL	W	2	7	-	1/2/19/22	0/1/1/1
7	SIA	W	3	7	-	4/18/34/38	0/1/1/1
7	NAG	X	1	7	-	4/6/26/26	0/1/1/1
7	GAL	X	2	7	-	1/2/19/22	0/1/1/1
7	SIA	X	3	7	-	4/18/34/38	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	X	3	SIA	O1B-C1	-3.23	1.20	1.30
7	V	3	SIA	O1B-C1	-3.23	1.20	1.30
7	W	3	SIA	O1B-C1	-3.21	1.20	1.30

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
7	W	2	GAL	O5-C5-C6	3.02	111.93	107.20
7	X	2	GAL	O5-C5-C6	2.99	111.90	107.20
7	V	2	GAL	O5-C5-C6	2.97	111.86	107.20
7	V	3	SIA	O1B-C1-C2	2.96	121.49	113.03
7	X	3	SIA	O1B-C1-C2	2.96	121.48	113.03
7	W	3	SIA	O1B-C1-C2	2.96	121.47	113.03
7	W	3	SIA	C3-C4-C5	-2.76	108.12	111.46
7	V	3	SIA	C3-C4-C5	-2.75	108.13	111.46
7	X	3	SIA	C3-C4-C5	-2.75	108.14	111.46
7	X	2	GAL	C1-C2-C3	2.29	112.49	109.67
7	V	2	GAL	O5-C5-C4	-2.29	105.25	110.83
7	W	2	GAL	C1-C2-C3	2.29	112.48	109.67
7	V	2	GAL	C1-C2-C3	2.29	112.48	109.67
7	X	2	GAL	O5-C5-C4	-2.29	105.26	110.83
7	W	2	GAL	O5-C5-C4	-2.28	105.27	110.83
7	X	1	NAG	C4-C3-C2	-2.23	107.07	110.34
7	V	1	NAG	C4-C3-C2	-2.21	107.10	110.34
7	W	1	NAG	C4-C3-C2	-2.21	107.11	110.34
7	W	2	GAL	C1-O5-C5	2.14	115.10	112.19
7	W	3	SIA	O1A-C1-C2	-2.12	117.56	122.57
7	X	2	GAL	C1-O5-C5	2.12	115.06	112.19
7	V	3	SIA	O1A-C1-C2	-2.11	117.58	122.57
7	X	3	SIA	O1A-C1-C2	-2.11	117.58	122.57
7	V	2	GAL	C1-O5-C5	2.10	115.04	112.19
6	K	2	NAG	C1-O5-C5	2.08	115.00	112.19
6	O	2	NAG	C1-O5-C5	2.06	114.99	112.19
6	S	2	NAG	C1-O5-C5	2.06	114.98	112.19

There are no chirality outliers.

All (48) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	V	1	NAG	C1-C2-N2-C7
7	V	1	NAG	C3-C2-N2-C7
7	V	1	NAG	C8-C7-N2-C2
7	V	1	NAG	O7-C7-N2-C2
7	V	3	SIA	C7-C8-C9-O9
7	V	3	SIA	O8-C8-C9-O9
7	W	1	NAG	C1-C2-N2-C7
7	W	1	NAG	C3-C2-N2-C7
7	W	1	NAG	C8-C7-N2-C2

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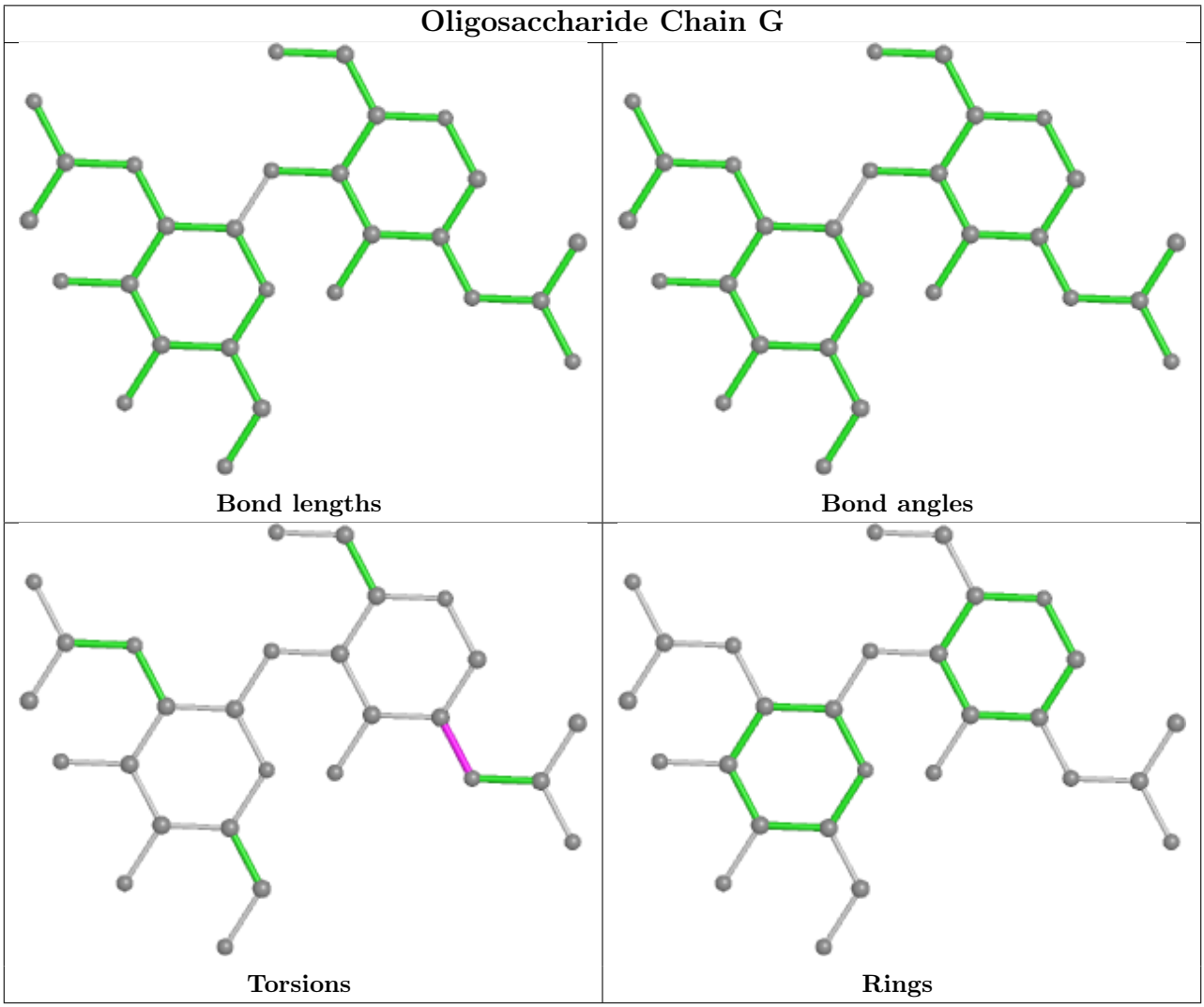
Mol	Chain	Res	Type	Atoms
7	W	1	NAG	O7-C7-N2-C2
7	W	3	SIA	C7-C8-C9-O9
7	W	3	SIA	O8-C8-C9-O9
7	X	1	NAG	C1-C2-N2-C7
7	X	1	NAG	C3-C2-N2-C7
7	X	1	NAG	C8-C7-N2-C2
7	X	1	NAG	O7-C7-N2-C2
7	X	3	SIA	C7-C8-C9-O9
7	X	3	SIA	O8-C8-C9-O9
6	K	1	NAG	O5-C5-C6-O6
6	O	1	NAG	O5-C5-C6-O6
6	S	1	NAG	O5-C5-C6-O6
6	K	1	NAG	C4-C5-C6-O6
6	O	1	NAG	C4-C5-C6-O6
6	S	1	NAG	C4-C5-C6-O6
6	K	2	NAG	C8-C7-N2-C2
6	K	2	NAG	O7-C7-N2-C2
6	O	2	NAG	C8-C7-N2-C2
6	O	2	NAG	O7-C7-N2-C2
6	S	2	NAG	C8-C7-N2-C2
6	S	2	NAG	O7-C7-N2-C2
7	V	3	SIA	C11-C10-N5-C5
7	W	3	SIA	C11-C10-N5-C5
7	X	3	SIA	C11-C10-N5-C5
7	V	3	SIA	O10-C10-N5-C5
7	W	3	SIA	O10-C10-N5-C5
7	X	3	SIA	O10-C10-N5-C5
7	V	2	GAL	C4-C5-C6-O6
7	W	2	GAL	C4-C5-C6-O6
7	X	2	GAL	C4-C5-C6-O6
5	G	1	NAG	C3-C2-N2-C7
5	N	1	NAG	C3-C2-N2-C7
5	Q	1	NAG	C3-C2-N2-C7
6	M	2	NAG	C3-C2-N2-C7
6	P	2	NAG	C3-C2-N2-C7
6	T	2	NAG	C3-C2-N2-C7
6	M	1	NAG	C3-C2-N2-C7
6	P	1	NAG	C3-C2-N2-C7
6	T	1	NAG	C3-C2-N2-C7

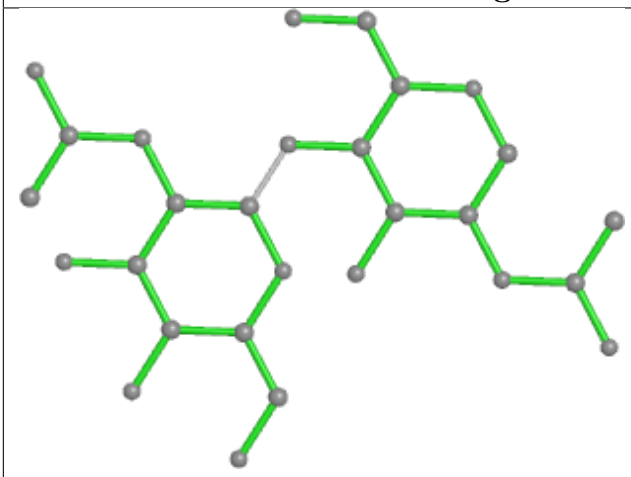
There are no ring outliers.

No monomer is involved in short contacts.

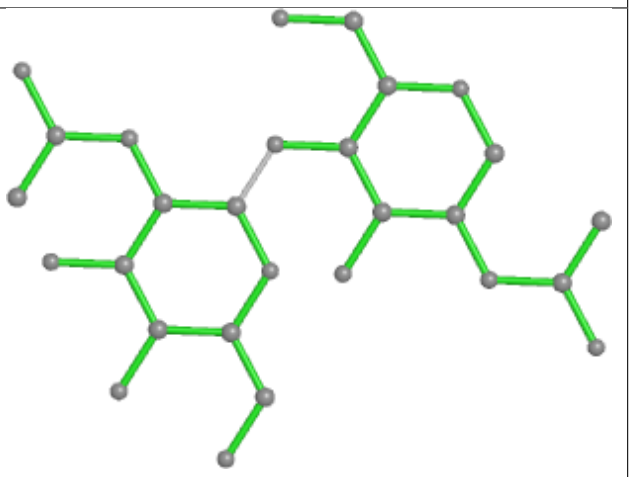
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



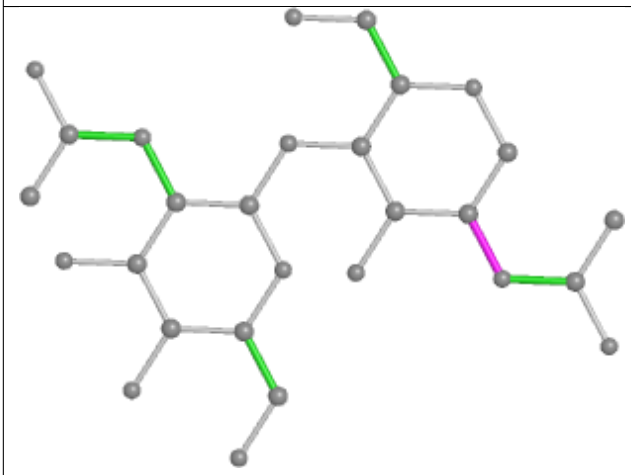
Oligosaccharide Chain N



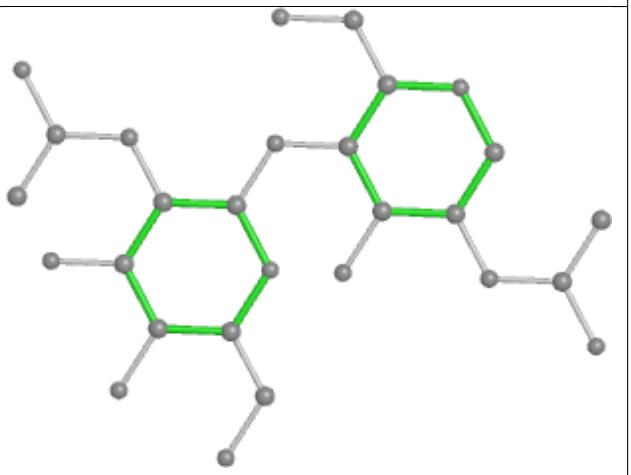
Bond lengths



Bond angles

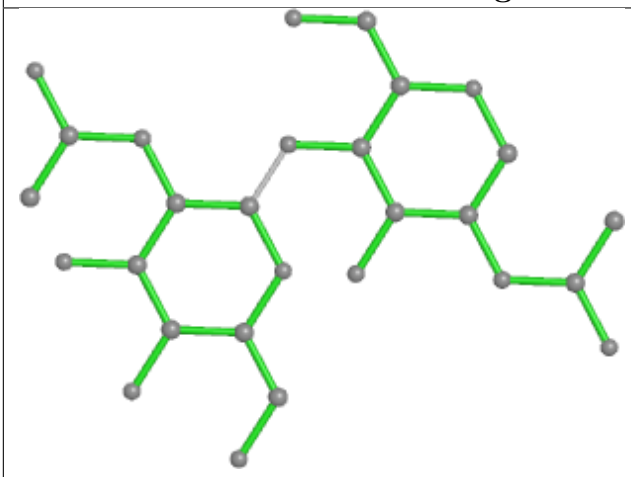


Torsions

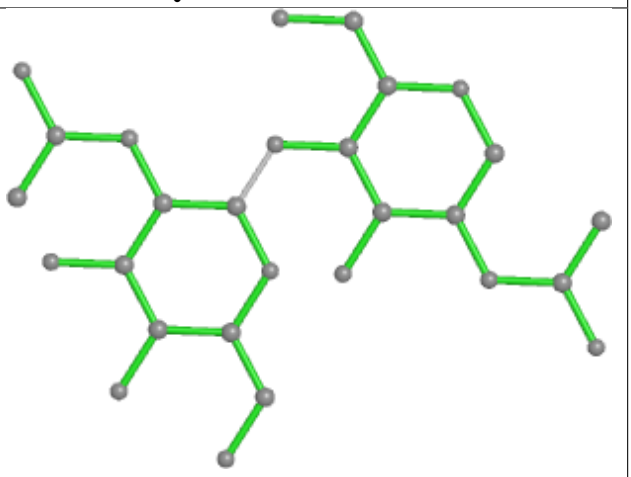


Rings

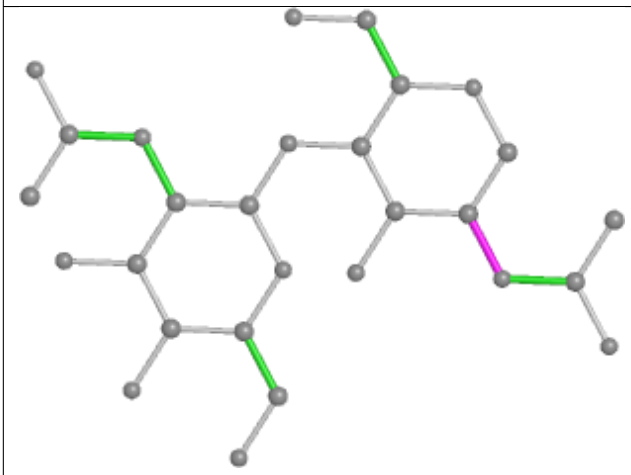
Oligosaccharide Chain Q



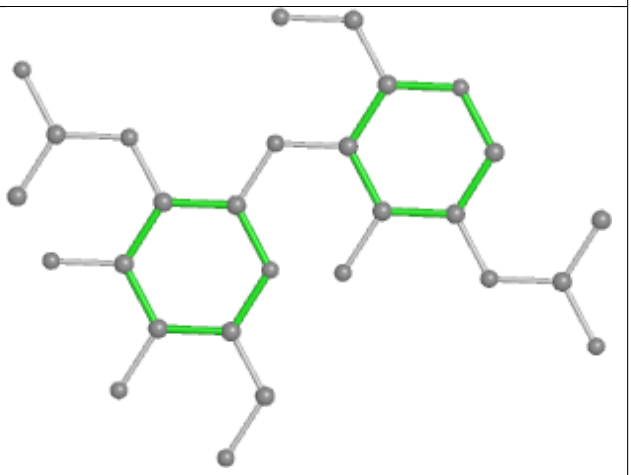
Bond lengths



Bond angles

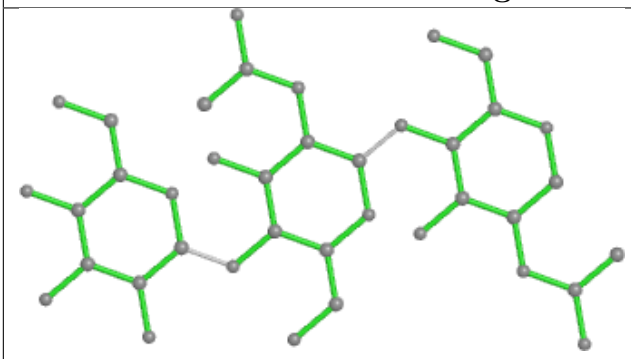


Torsions

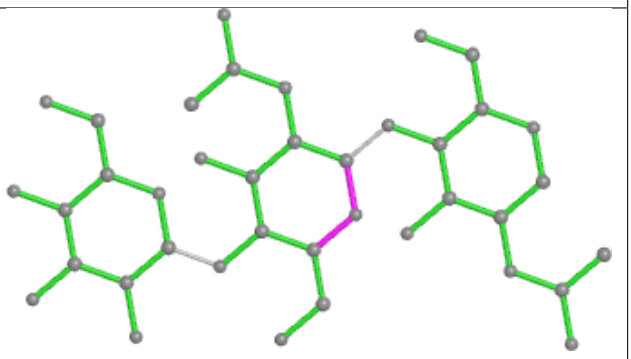


Rings

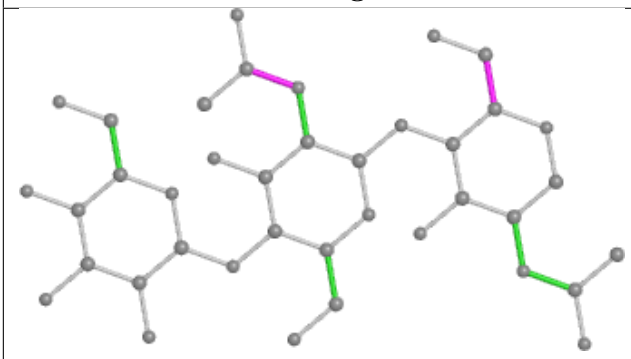
Oligosaccharide Chain K



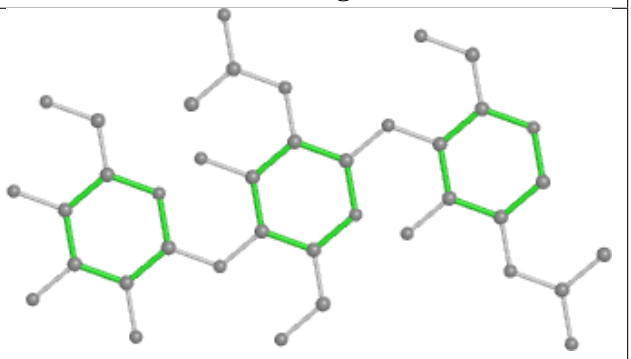
Bond lengths



Bond angles

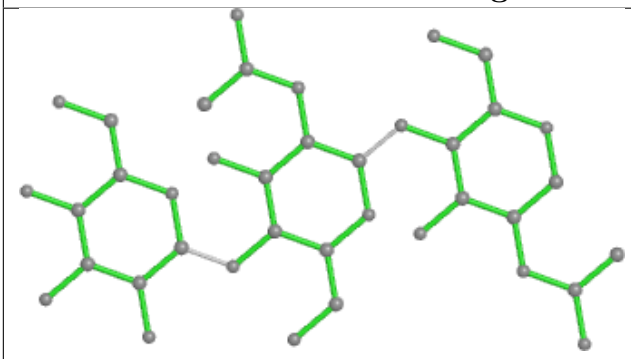


Torsions

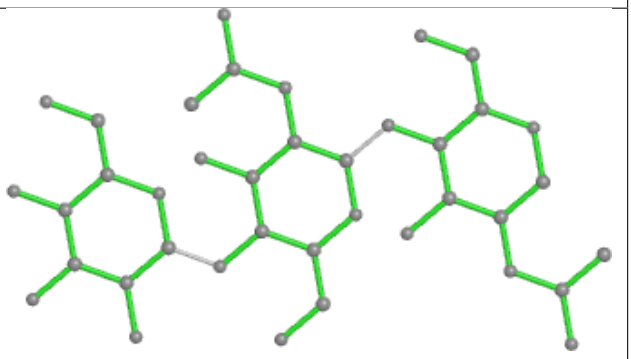


Rings

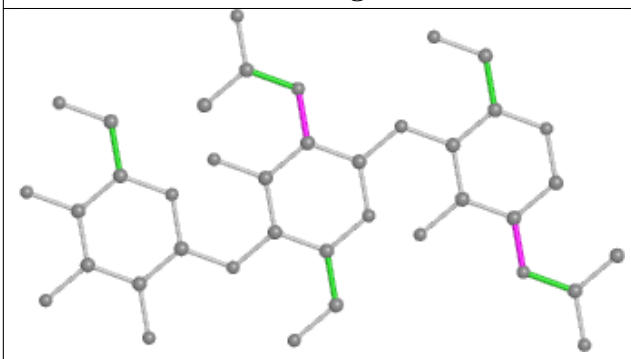
Oligosaccharide Chain M



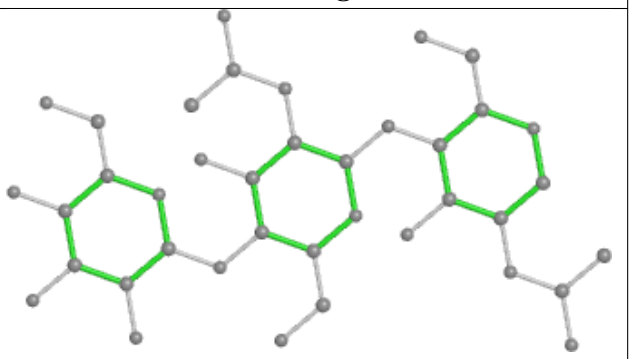
Bond lengths



Bond angles

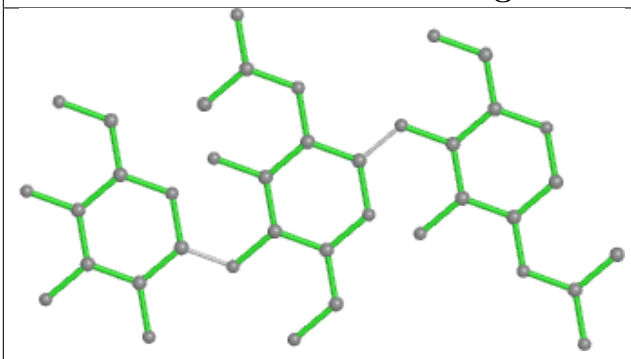


Torsions

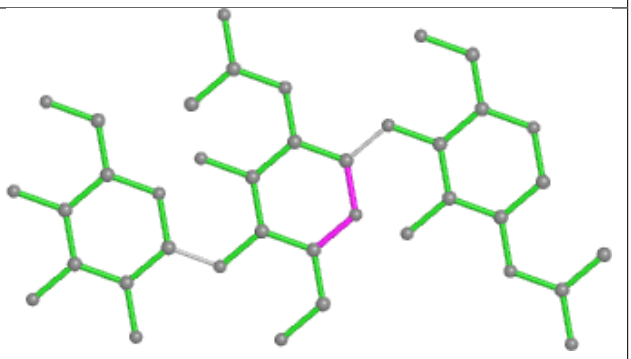


Rings

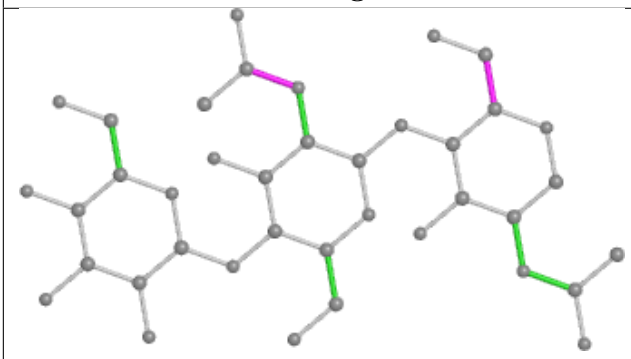
Oligosaccharide Chain O



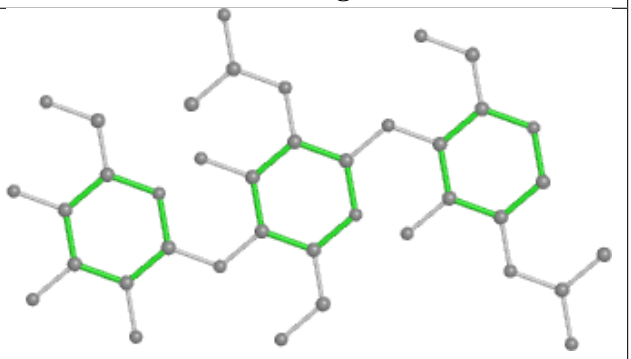
Bond lengths



Bond angles

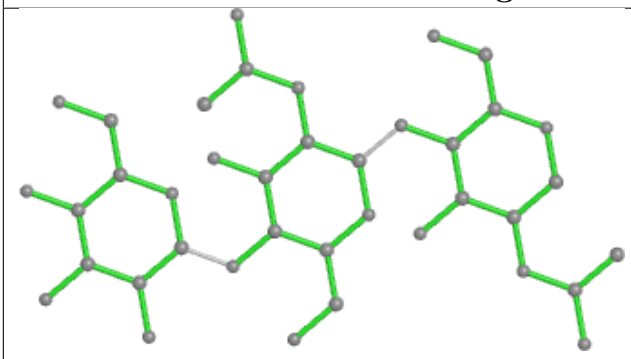


Torsions

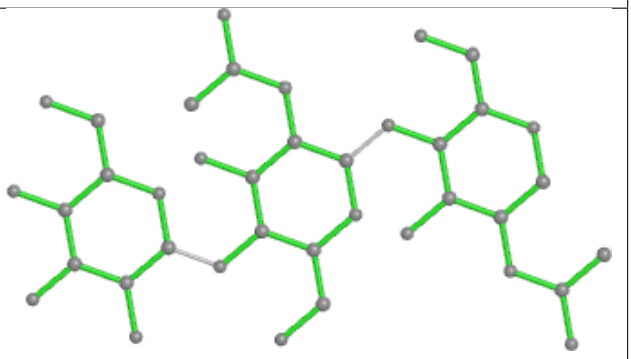


Rings

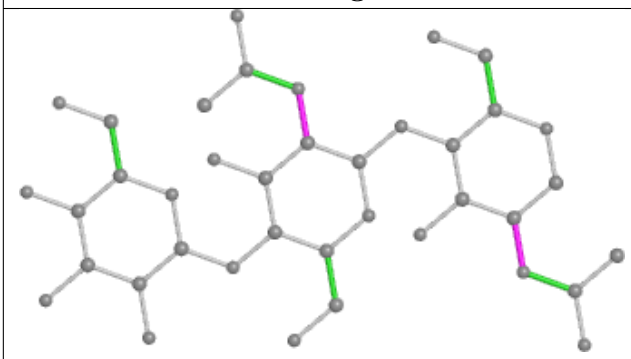
Oligosaccharide Chain P



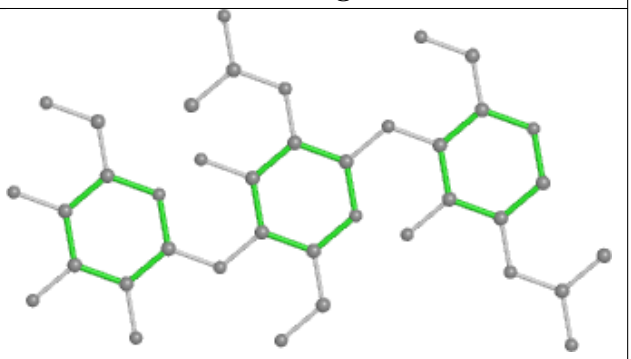
Bond lengths



Bond angles

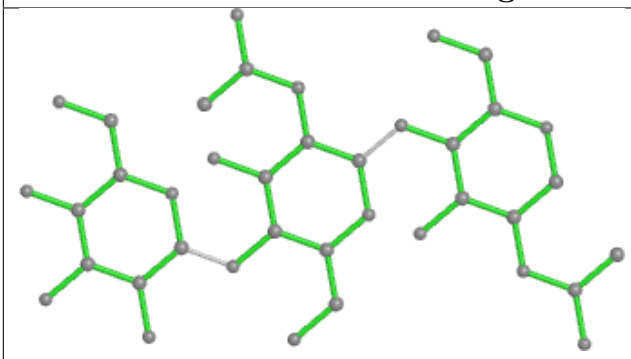


Torsions

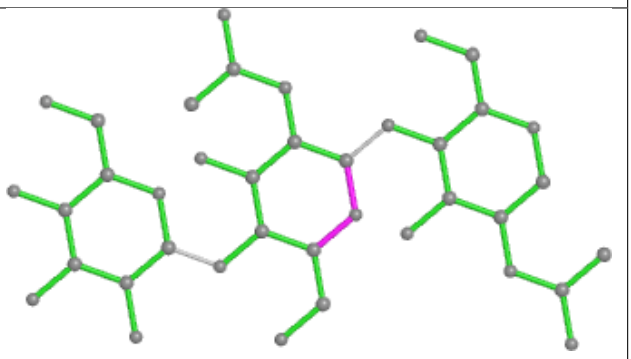


Rings

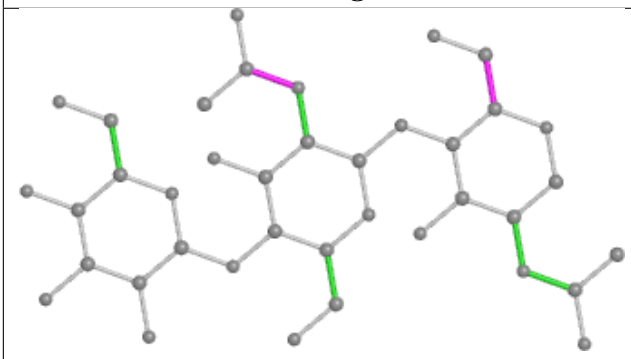
Oligosaccharide Chain S



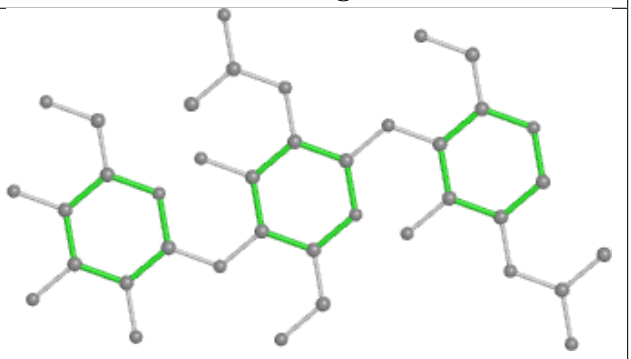
Bond lengths



Bond angles

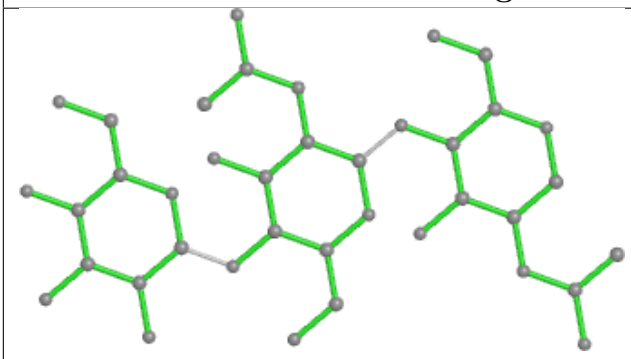


Torsions

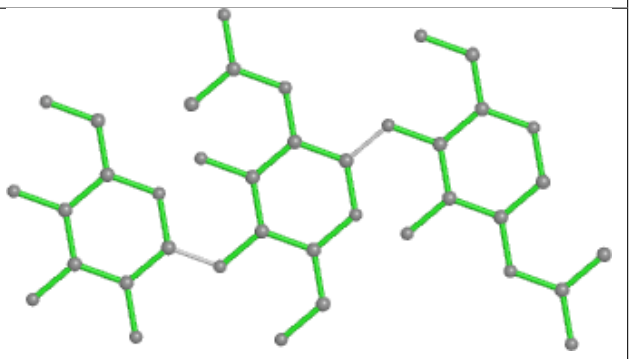


Rings

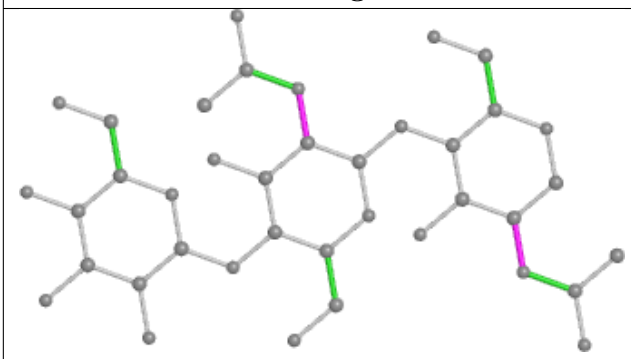
Oligosaccharide Chain T



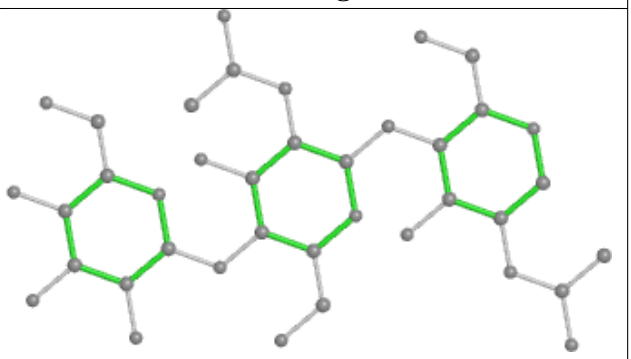
Bond lengths



Bond angles

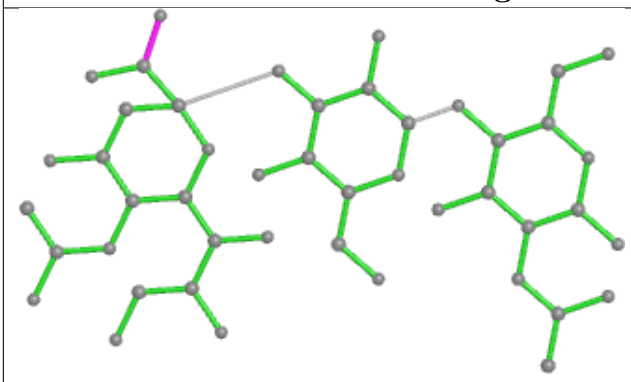


Torsions

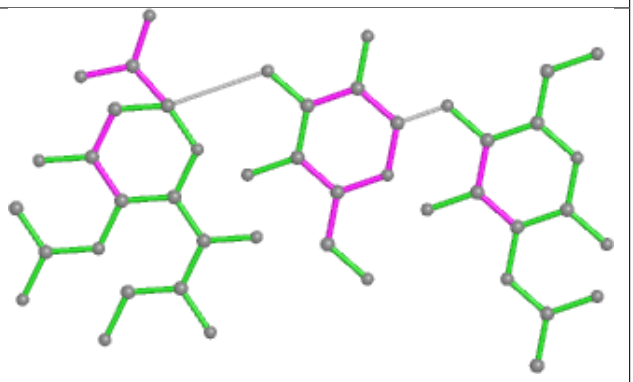


Rings

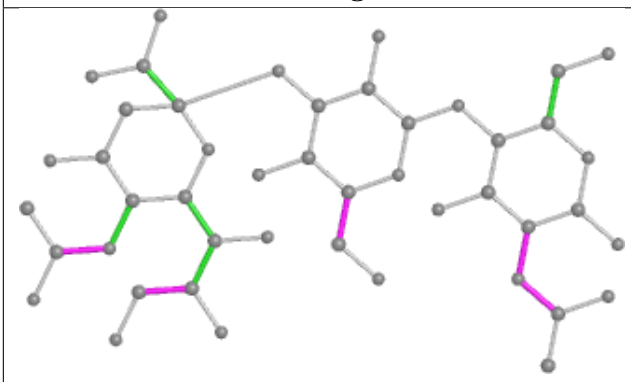
Oligosaccharide Chain V



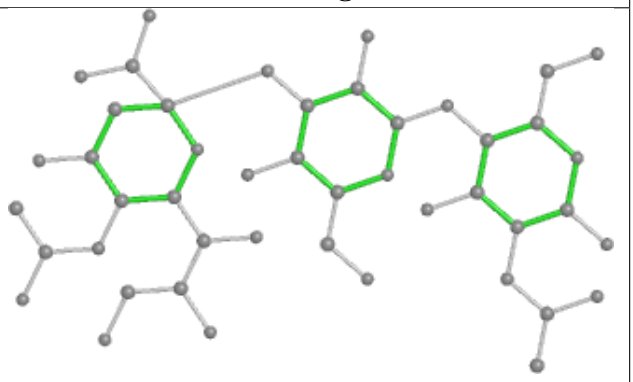
Bond lengths



Bond angles

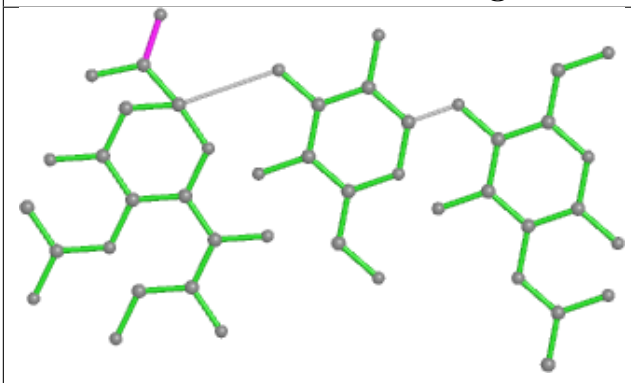


Torsions

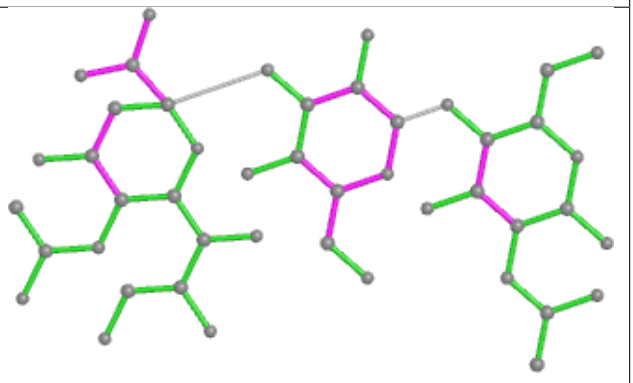


Rings

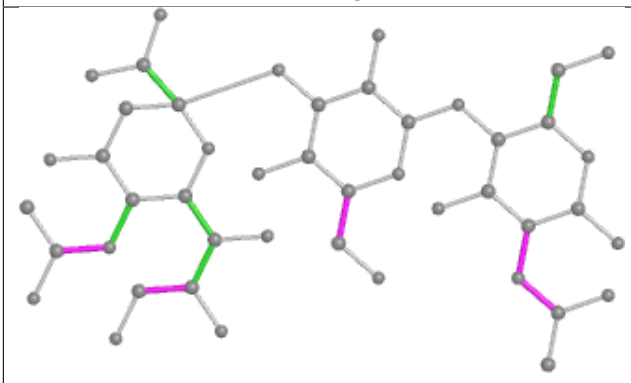
Oligosaccharide Chain W



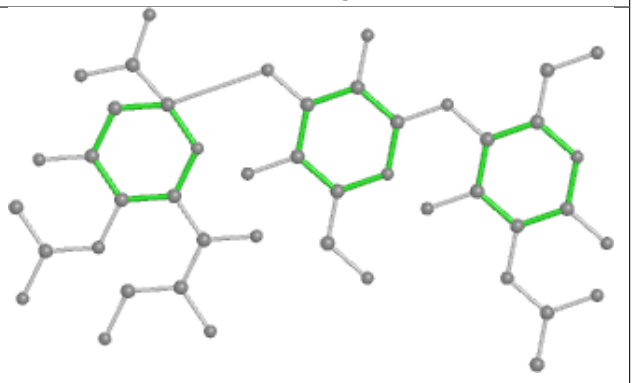
Bond lengths



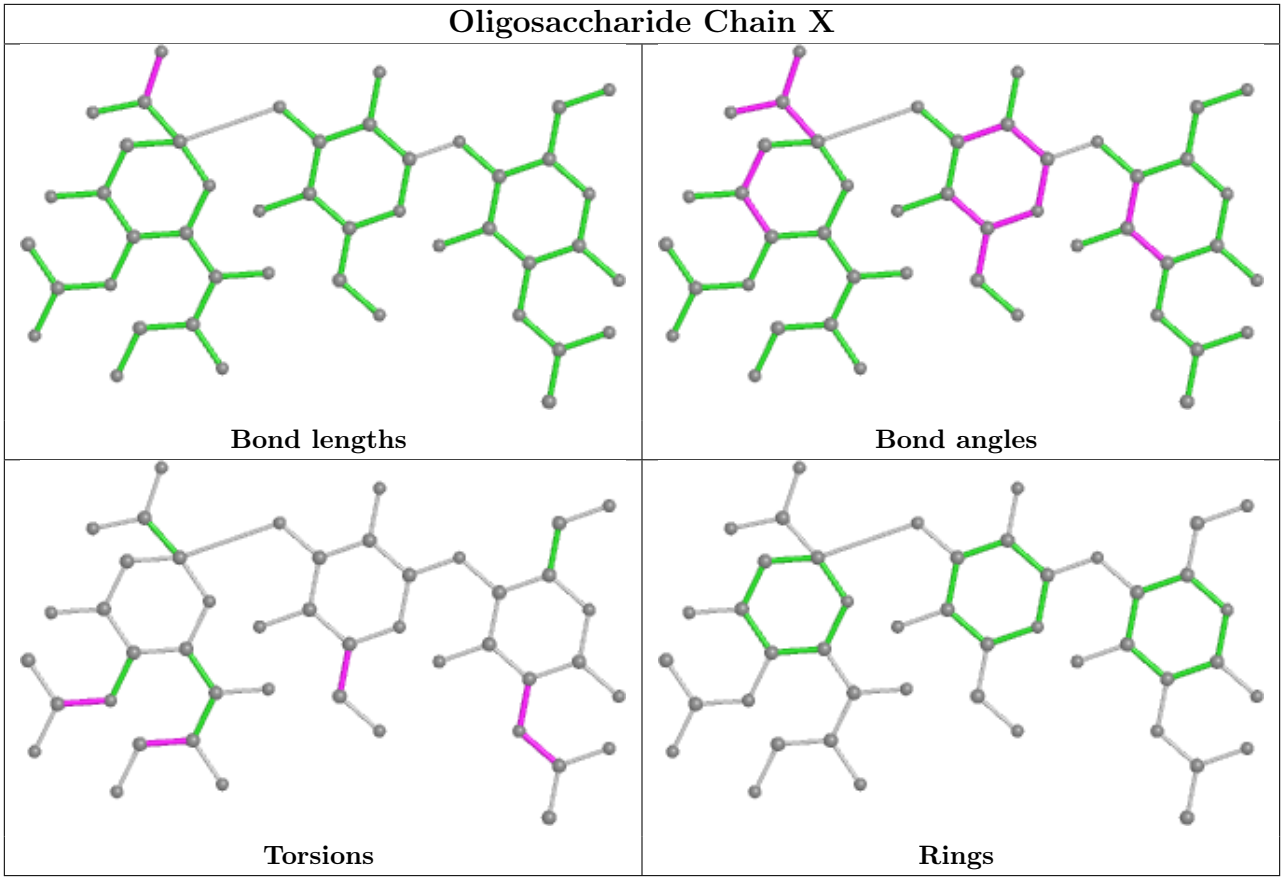
Bond angles



Torsions



Rings



4.6 Ligand geometry (i)

12 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	$\#\|Z\| > 2$
8	NAG	A	401	1	14,14,15	0.22	0	17,19,21	0.40	0
8	NAG	H	402	1	14,14,15	0.23	0	17,19,21	0.41	0
8	NAG	J	301	3	14,14,15	0.37	0	17,19,21	0.46	0
8	NAG	C	402	1	14,14,15	0.23	0	17,19,21	0.42	0
8	NAG	B	301	2	14,14,15	0.25	0	17,19,21	0.49	0
8	NAG	R	301	3	14,14,15	0.38	0	17,19,21	0.45	0
8	NAG	D	301	2	14,14,15	0.25	0	17,19,21	0.48	0
8	NAG	C	401	1	14,14,15	0.22	0	17,19,21	0.41	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
8	NAG	E	301	3	14,14,15	0.38	0	17,19,21	0.45	0
8	NAG	H	401	1	14,14,15	0.22	0	17,19,21	0.40	0
8	NAG	I	301	2	14,14,15	0.25	0	17,19,21	0.49	0
8	NAG	A	402	1	14,14,15	0.23	0	17,19,21	0.42	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
8	NAG	A	401	1	-	1/6/23/26	0/1/1/1
8	NAG	H	402	1	-	0/6/23/26	0/1/1/1
8	NAG	J	301	3	-	2/6/23/26	0/1/1/1
8	NAG	C	402	1	-	0/6/23/26	0/1/1/1
8	NAG	B	301	2	-	1/6/23/26	0/1/1/1
8	NAG	R	301	3	-	2/6/23/26	0/1/1/1
8	NAG	D	301	2	-	1/6/23/26	0/1/1/1
8	NAG	C	401	1	-	1/6/23/26	0/1/1/1
8	NAG	E	301	3	-	2/6/23/26	0/1/1/1
8	NAG	H	401	1	-	1/6/23/26	0/1/1/1
8	NAG	I	301	2	-	1/6/23/26	0/1/1/1
8	NAG	A	402	1	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	R	301	NAG	O5-C5-C6-O6
8	E	301	NAG	O5-C5-C6-O6
8	J	301	NAG	O5-C5-C6-O6
8	R	301	NAG	C4-C5-C6-O6
8	E	301	NAG	C4-C5-C6-O6
8	J	301	NAG	C4-C5-C6-O6
8	A	401	NAG	O5-C5-C6-O6
8	C	401	NAG	O5-C5-C6-O6
8	H	401	NAG	O5-C5-C6-O6
8	B	301	NAG	O5-C5-C6-O6

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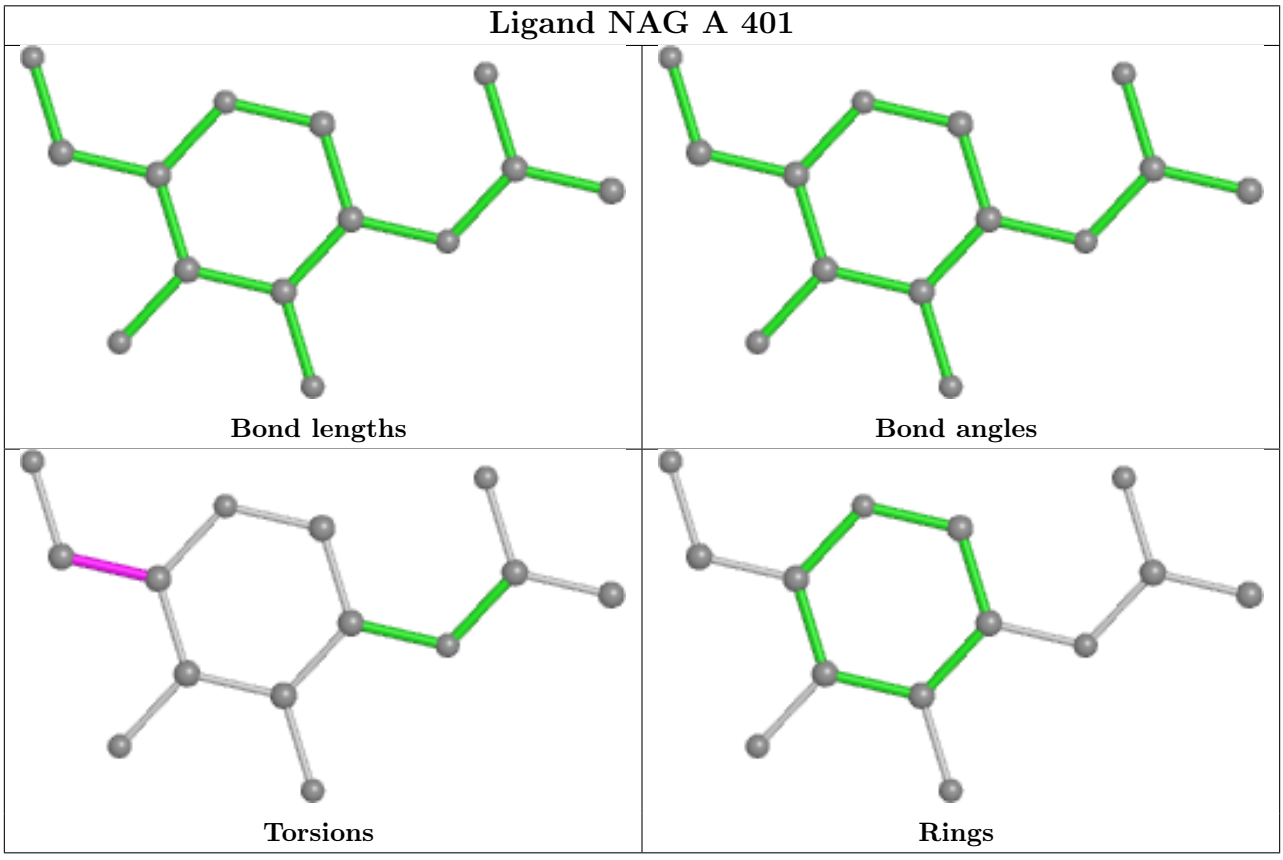
Mol	Chain	Res	Type	Atoms
8	D	301	NAG	O5-C5-C6-O6
8	I	301	NAG	O5-C5-C6-O6

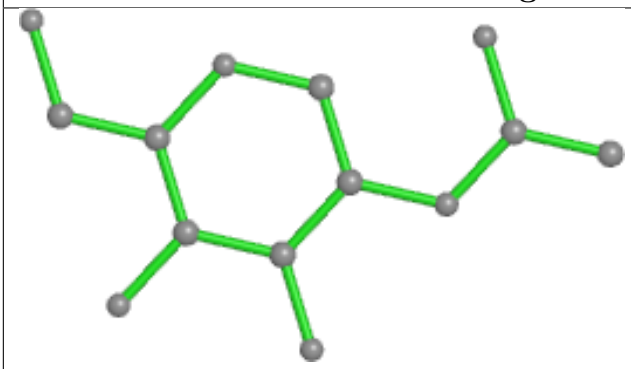
There are no ring outliers.

No monomer is involved in short contacts.

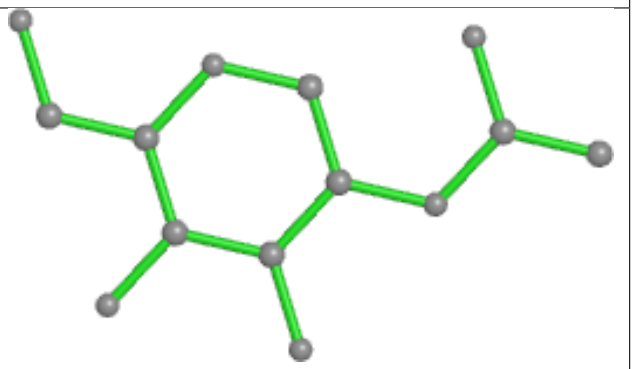
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



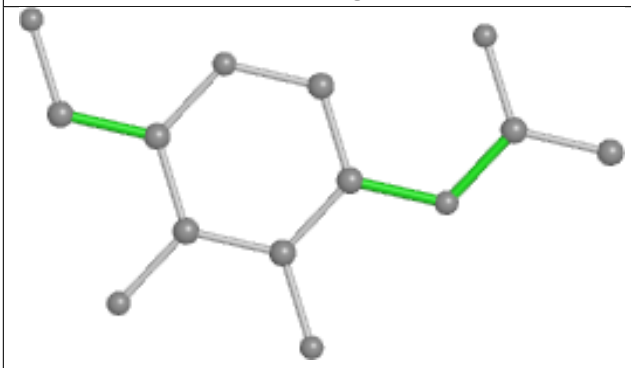
Ligand NAG H 402



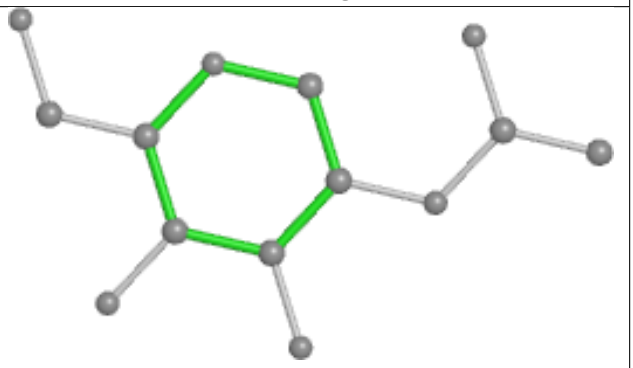
Bond lengths



Bond angles

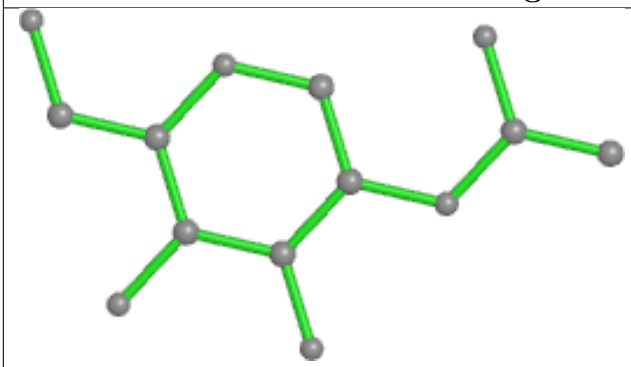


Torsions

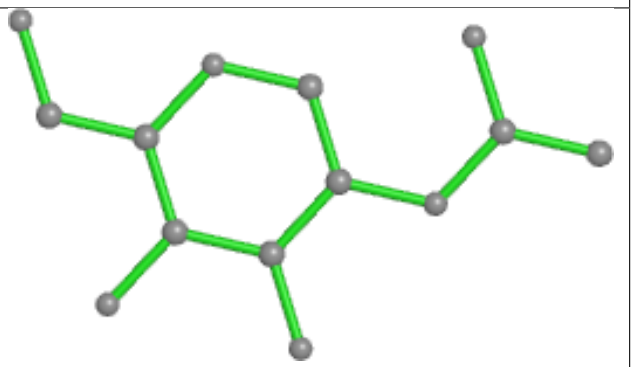


Rings

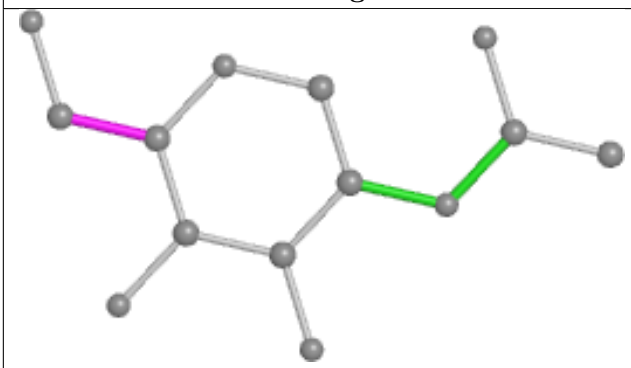
Ligand NAG J 301



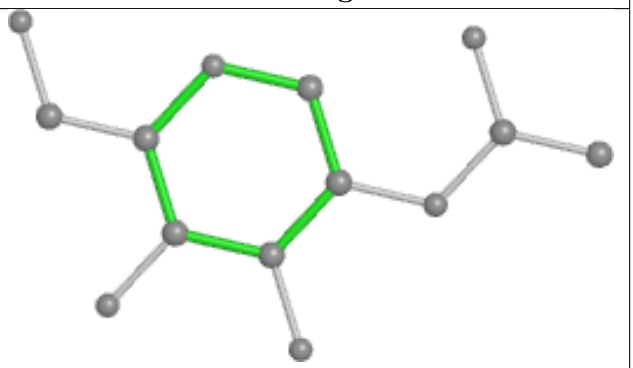
Bond lengths



Bond angles

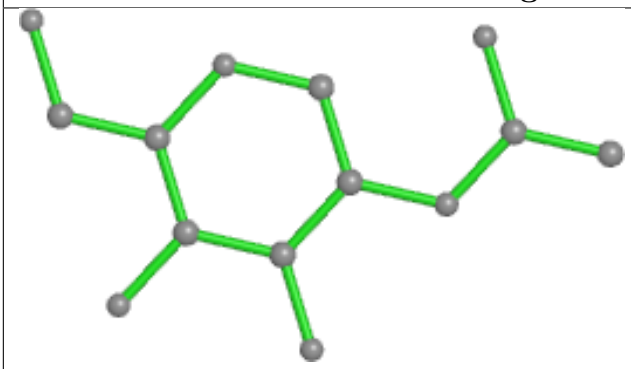


Torsions



Rings

Ligand NAG C 402



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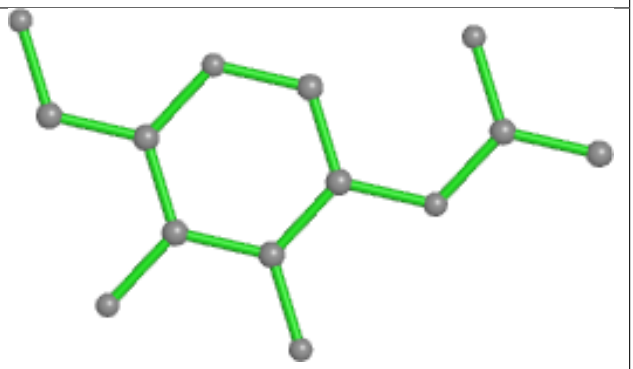
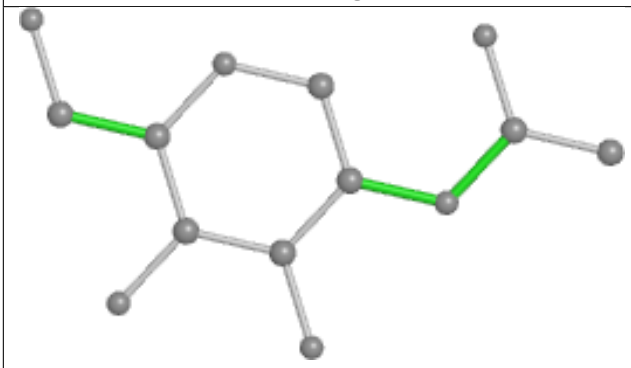


Bond angles



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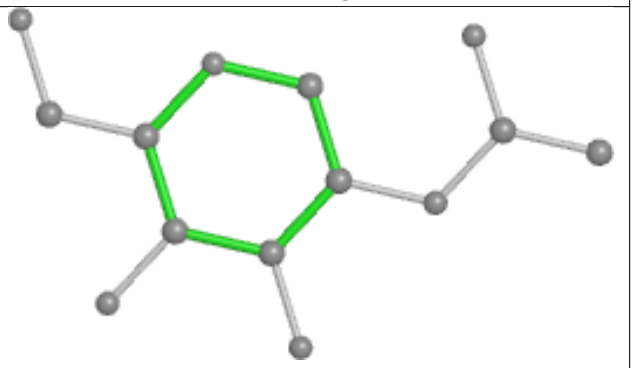
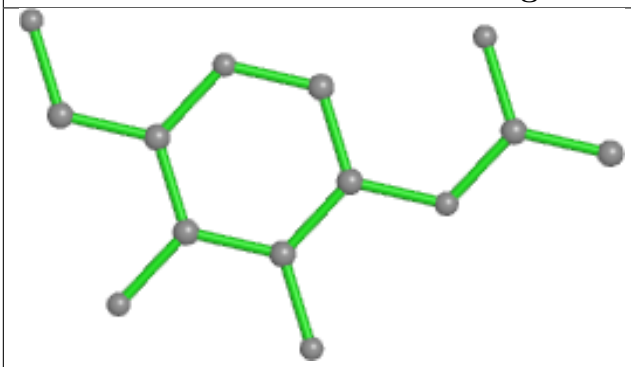


Rings

Ligand NAG B 301



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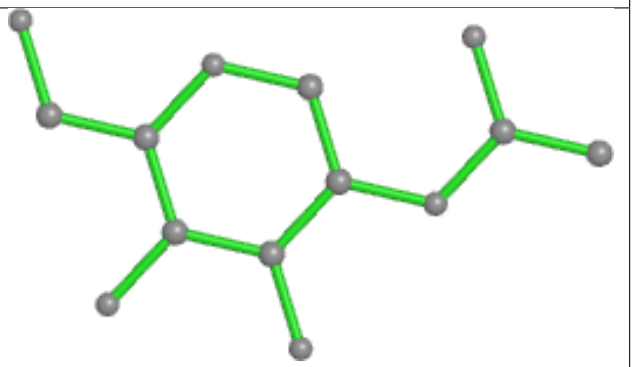
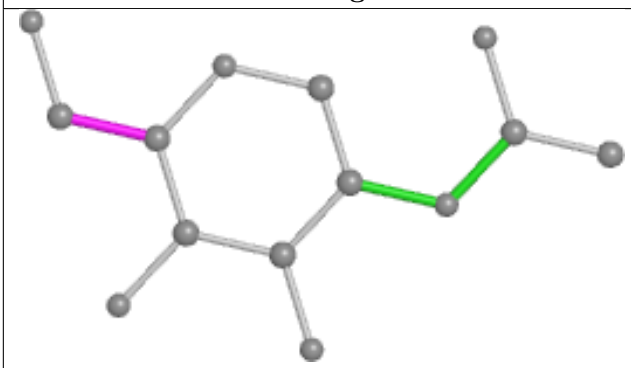
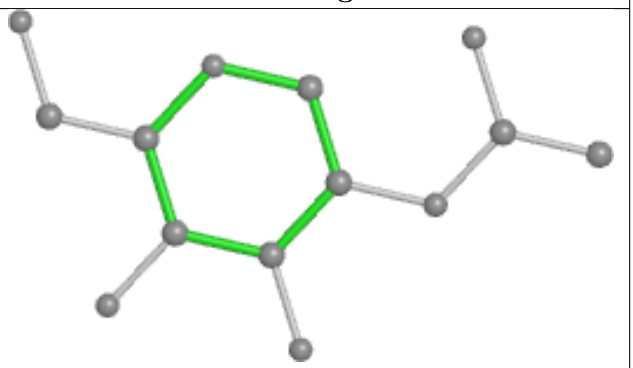


Bond angles

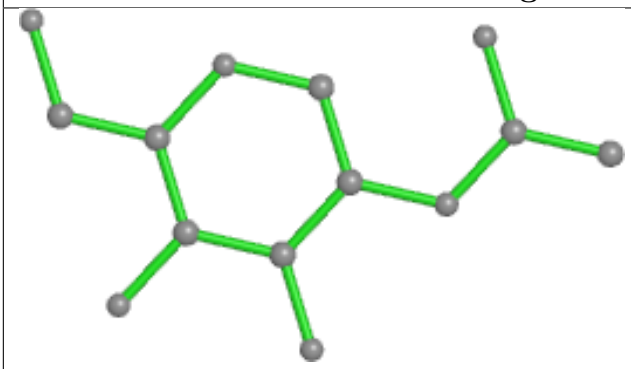


Torsions



Rings

Ligand NAG R 301



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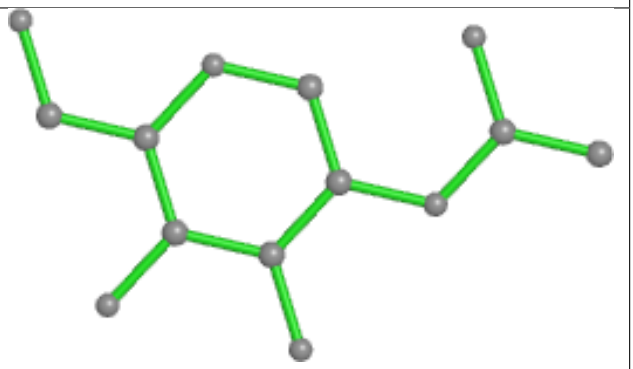
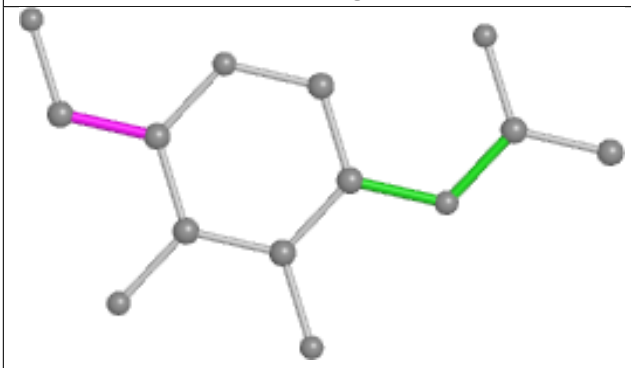
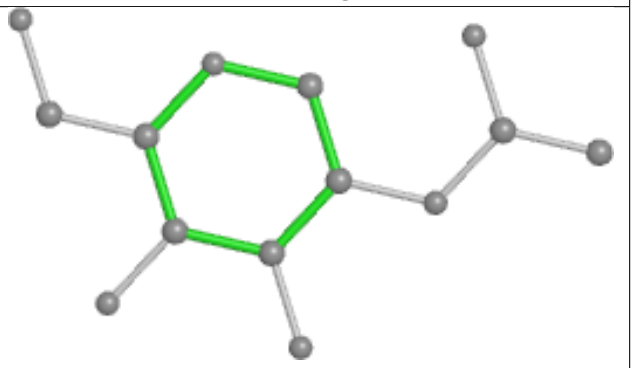


Bond angles

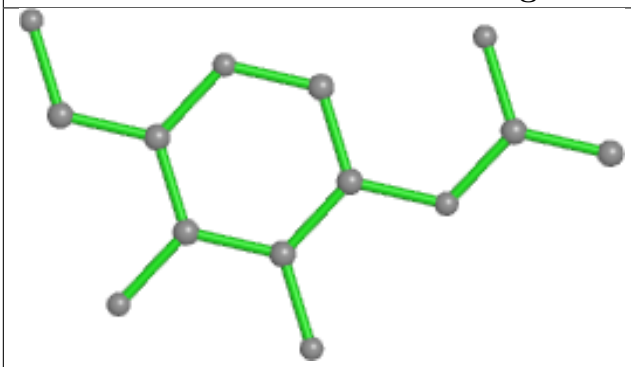


Torsions

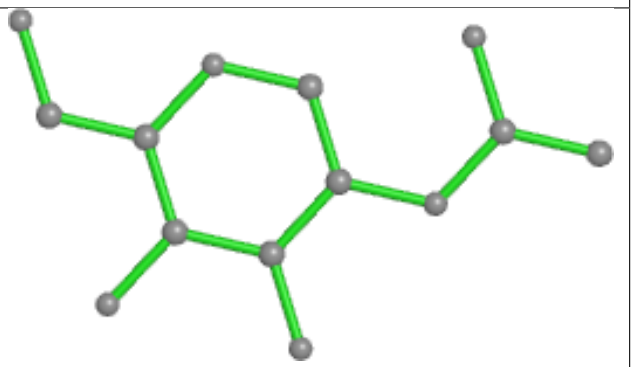


Rings

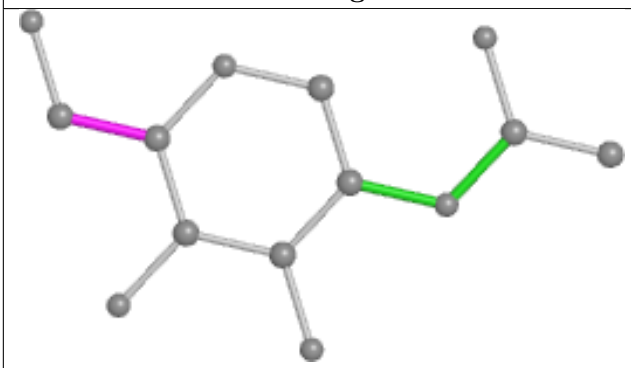
Ligand NAG D 301



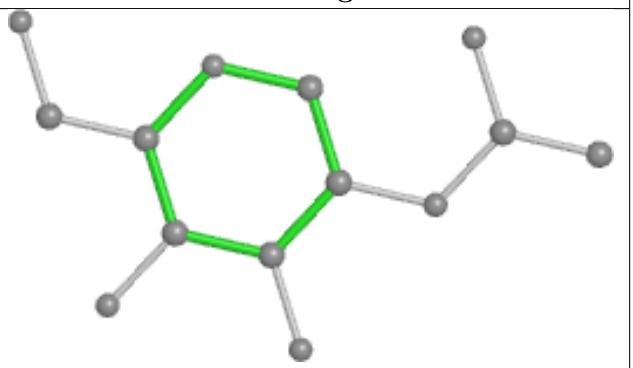
Bond lengths



Bond angles

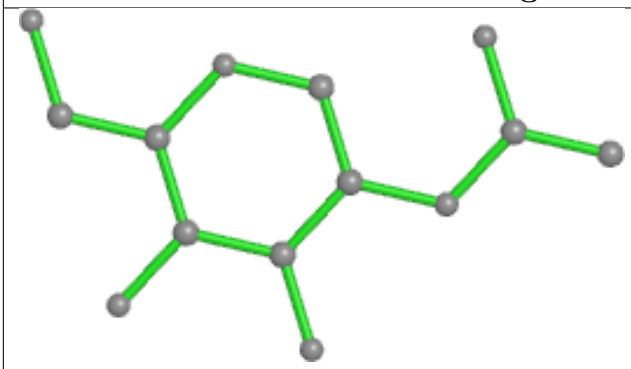


Torsions

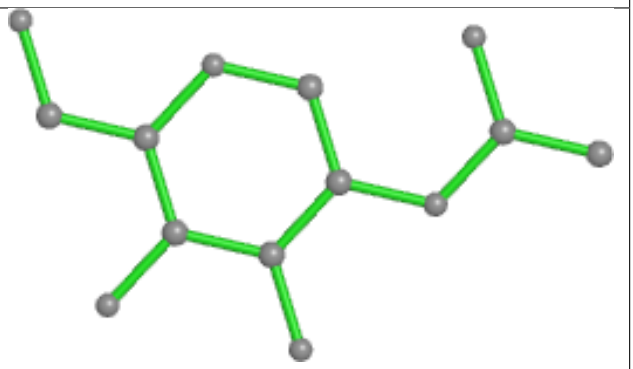


Rings

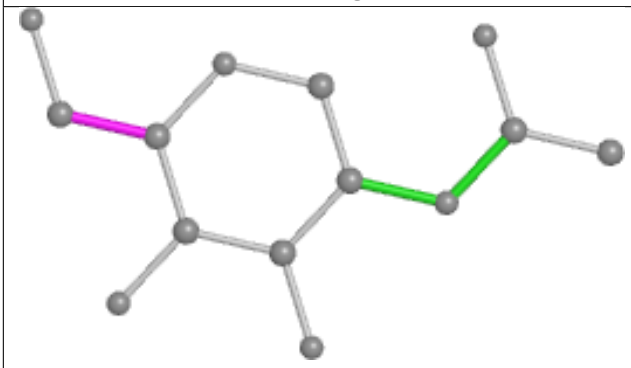
Ligand NAG C 401



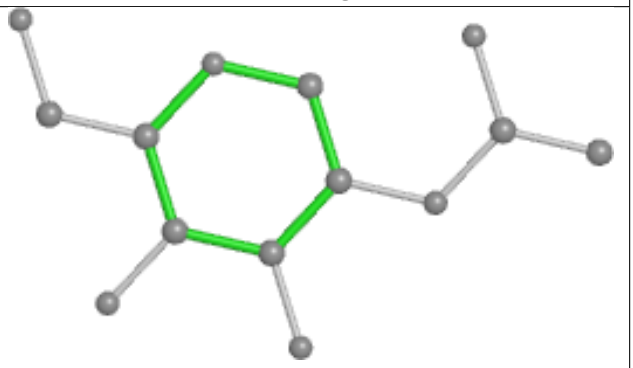
Bond lengths



Bond angles

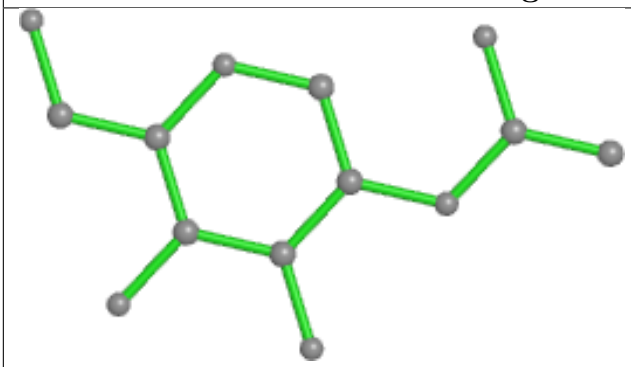


Torsions

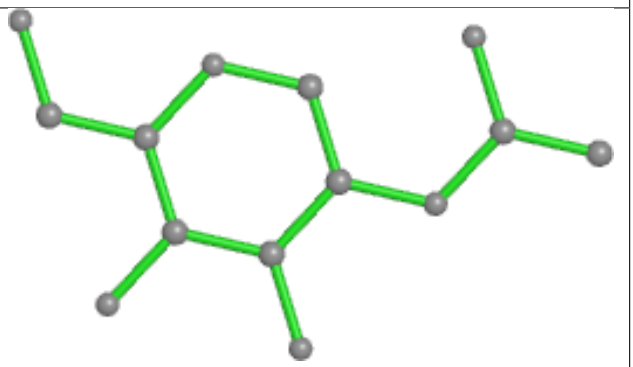


Rings

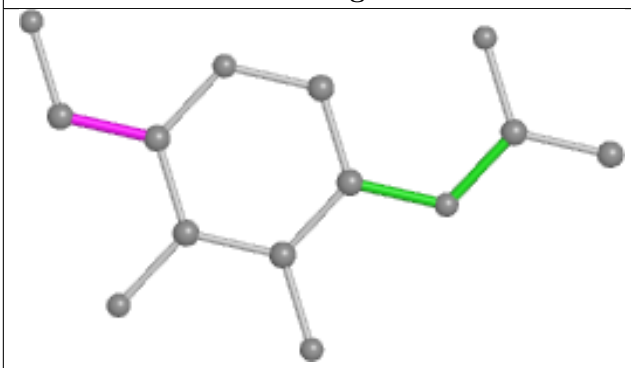
Ligand NAG E 301



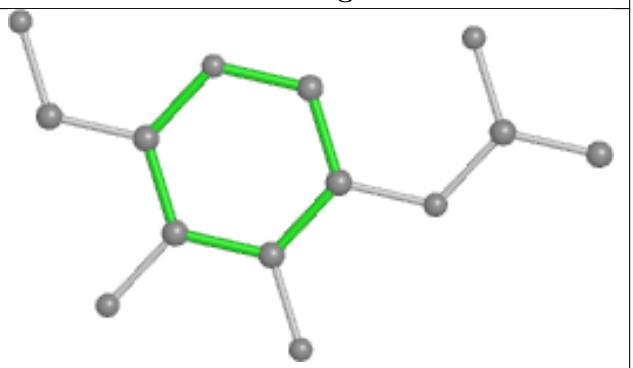
Bond lengths



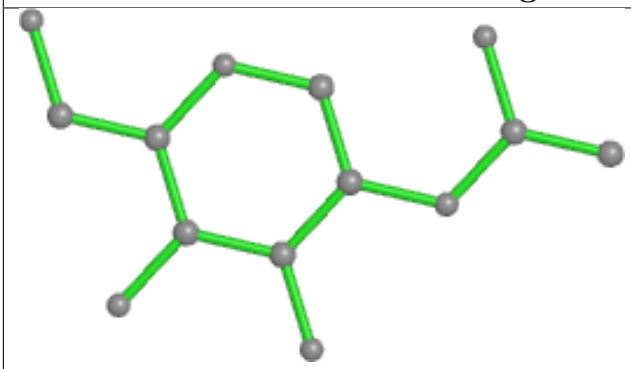
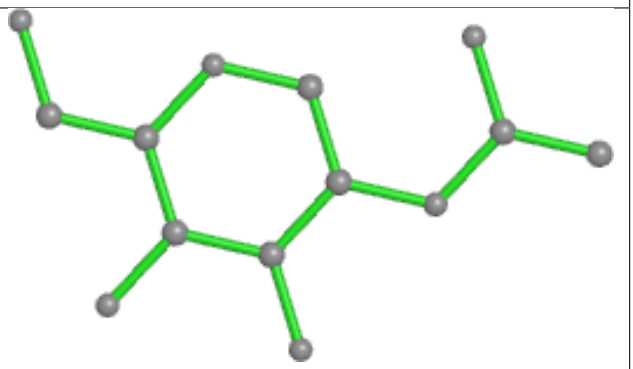
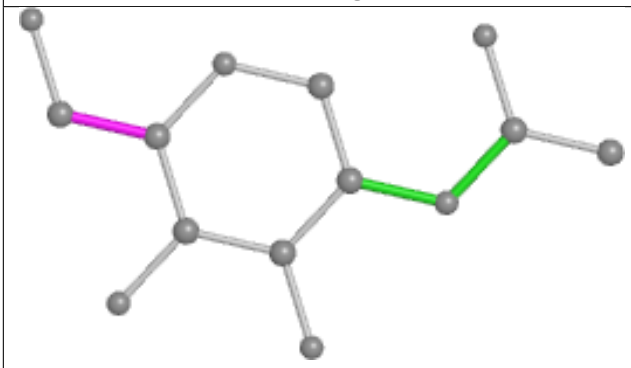
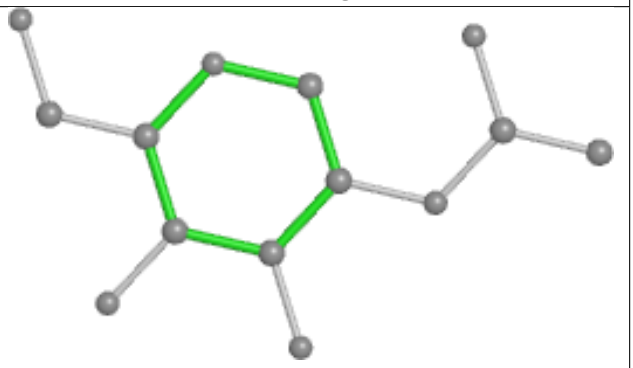
Bond angles

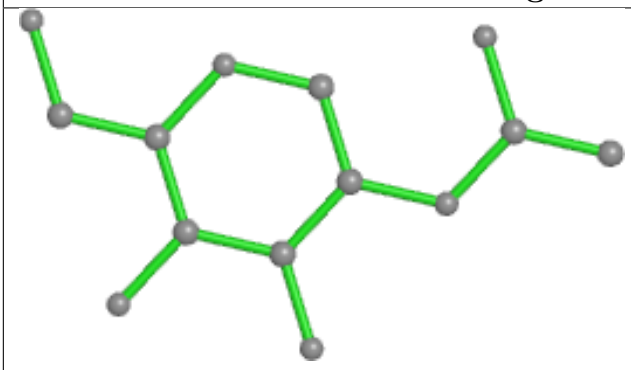
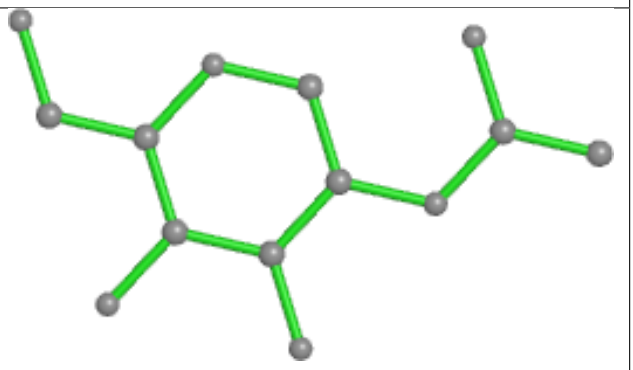
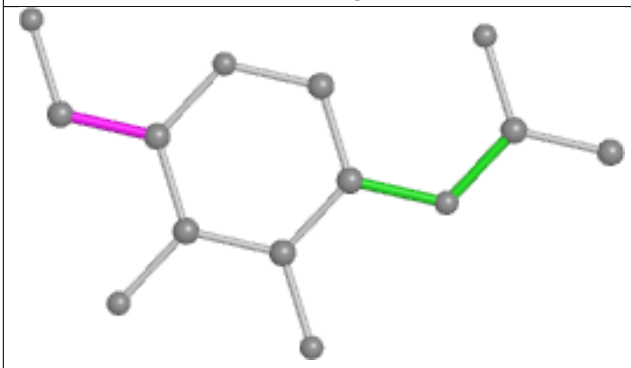
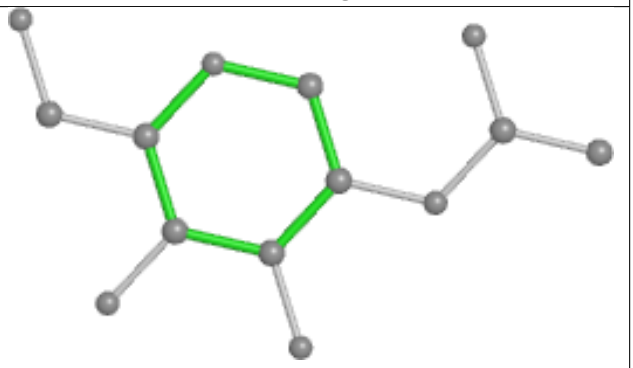


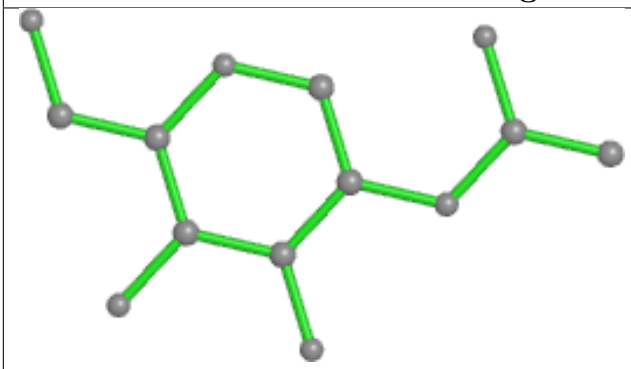
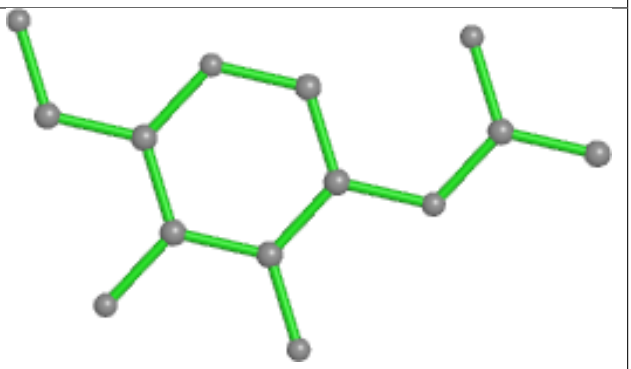
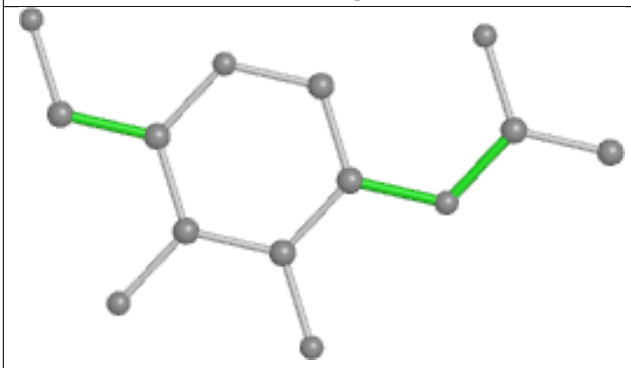
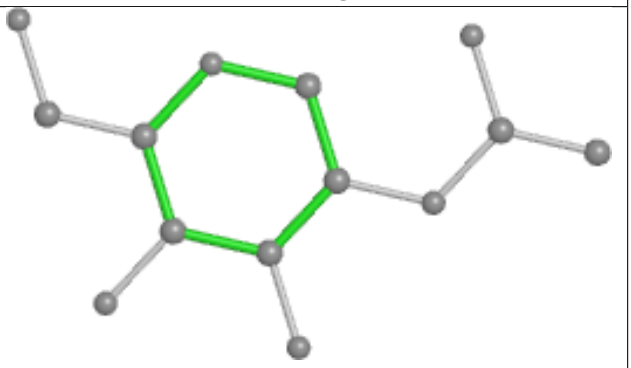
Torsions



Rings

Ligand NAG H 401	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand NAG I 301	
 Bond lengths	 Bond angles
 Torsions	 Rings

Ligand NAG A 402	
 Bond lengths	 Bond angles
 Torsions	 Rings

4.7 Other polymers (i)

There are no such residues in this entry.

4.8 Polymer linkage issues (i)

There are no chain breaks in this entry.