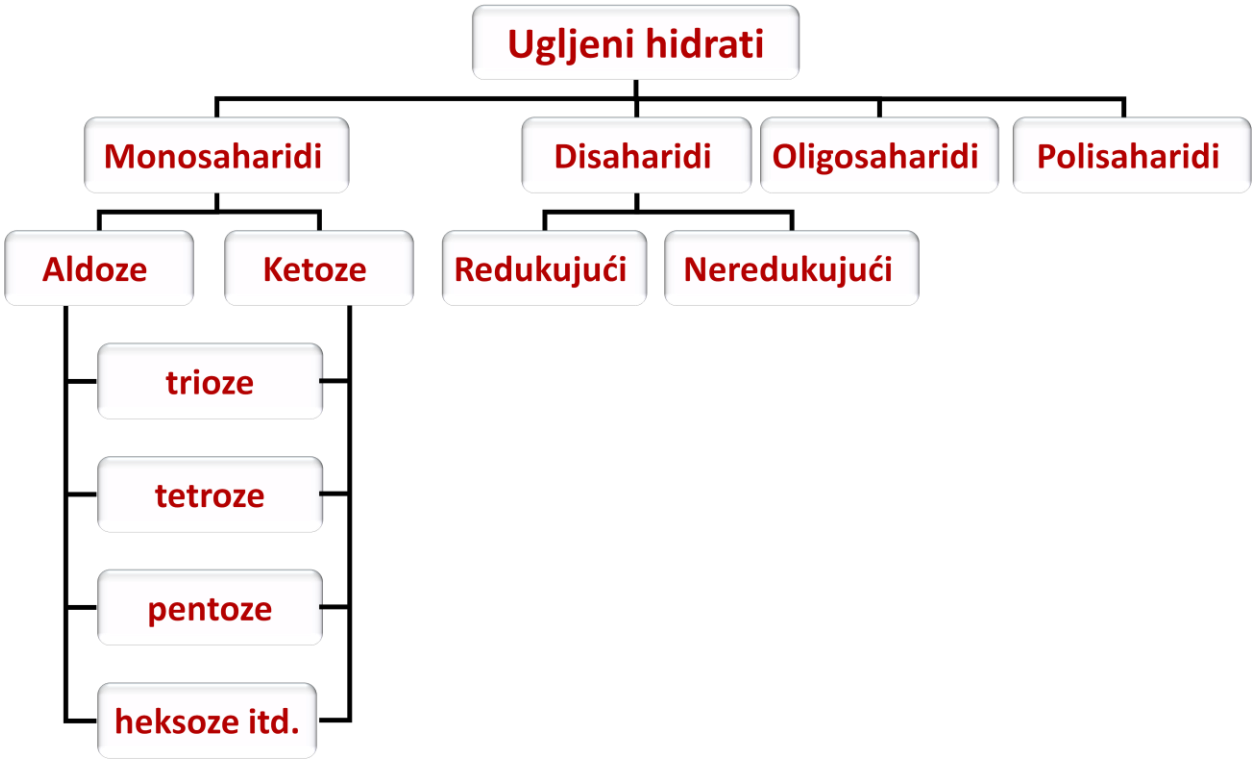
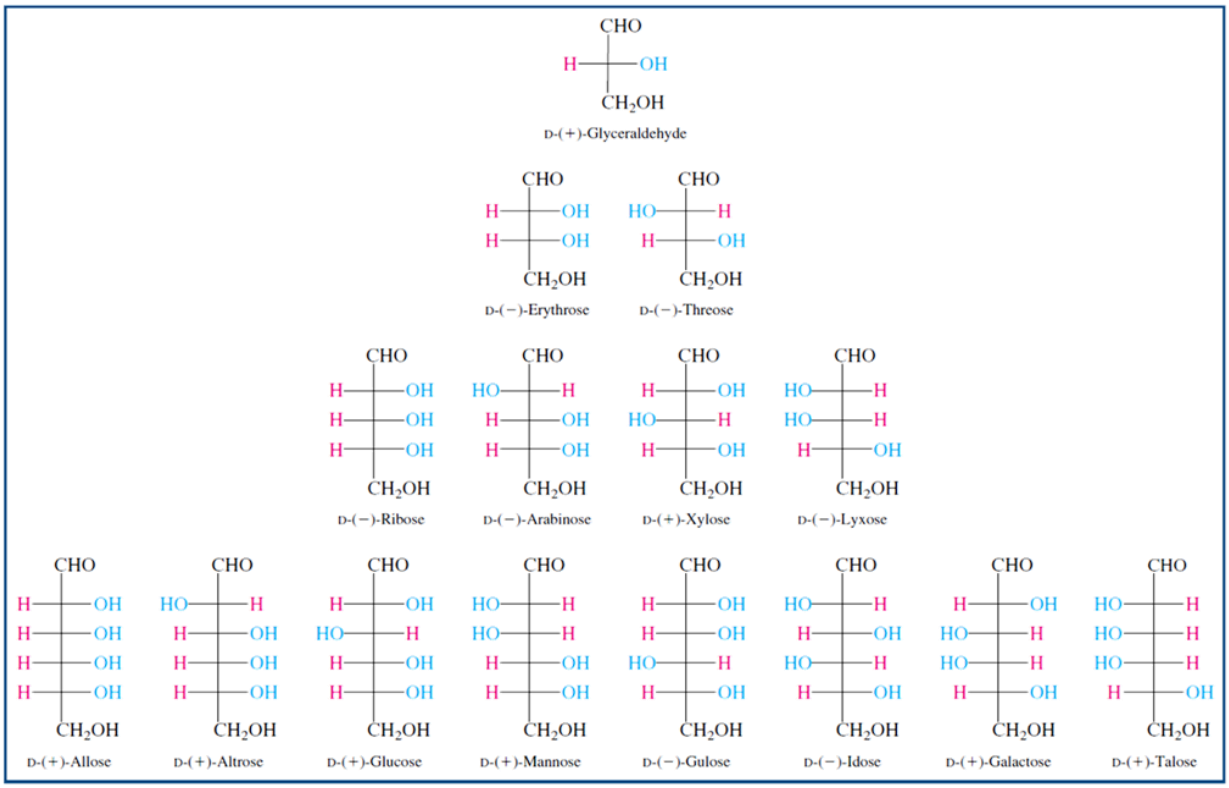
Podela ugljenih hidrata:

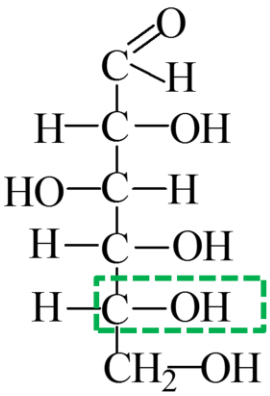


Monosaharidi

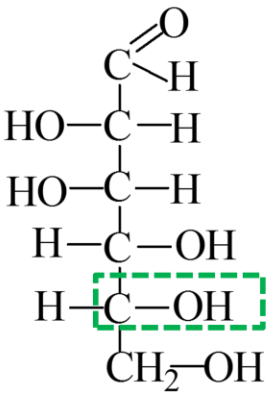
D- serija šećera



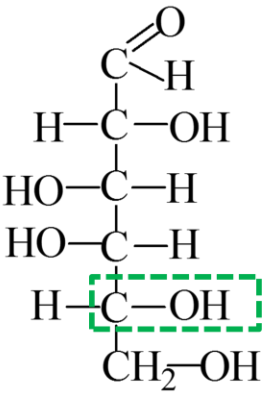
Značajne D- aldoheksoze



(+)-glukoza

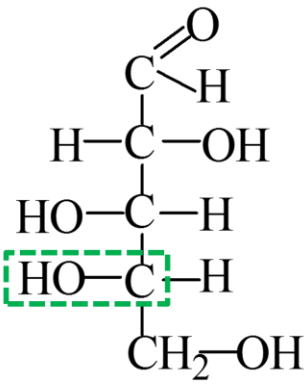


(+)-manoza

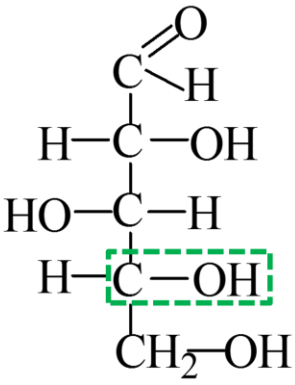


(+)-galaktoza

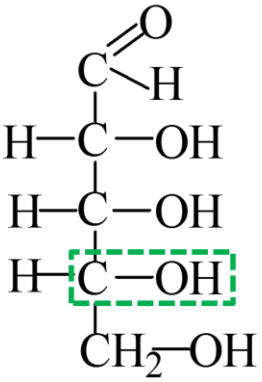
Značajne aldopentoze



L- (+)-arabinoza

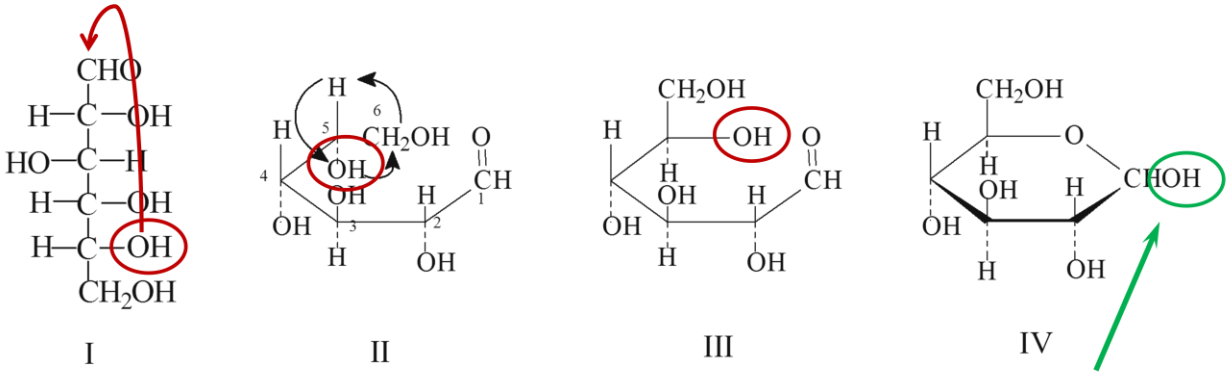


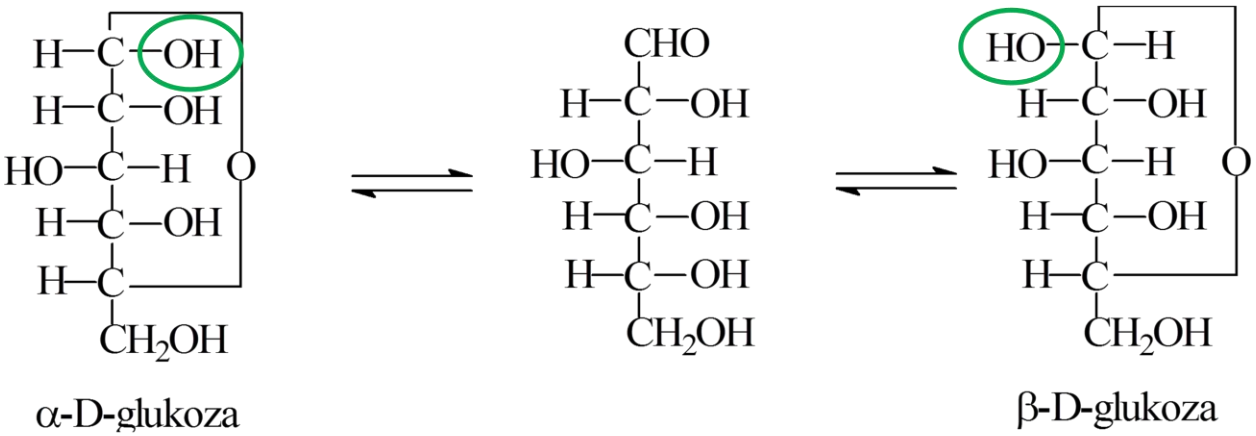
D- (+)-ksiloza



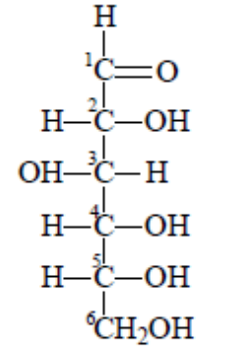
D- (-)-riboza

Stvaranja poluacetala



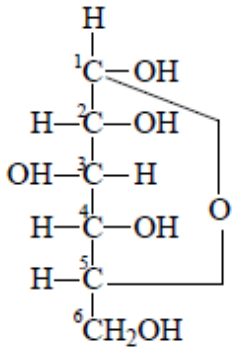


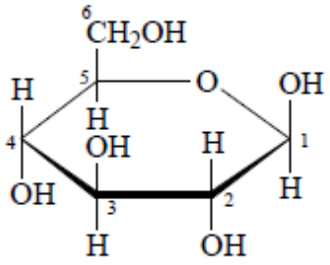
Postoje piranozni i furanozni poluacetalni oblici heksoza



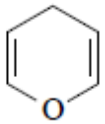
D-GLUKOZA

OTVORENI NIZ

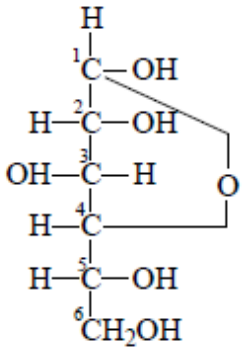


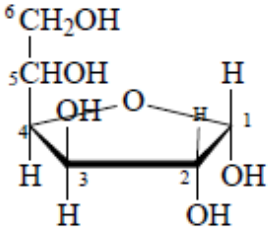


D-GLUKOPIRANOZA

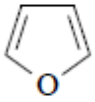


PIRAN

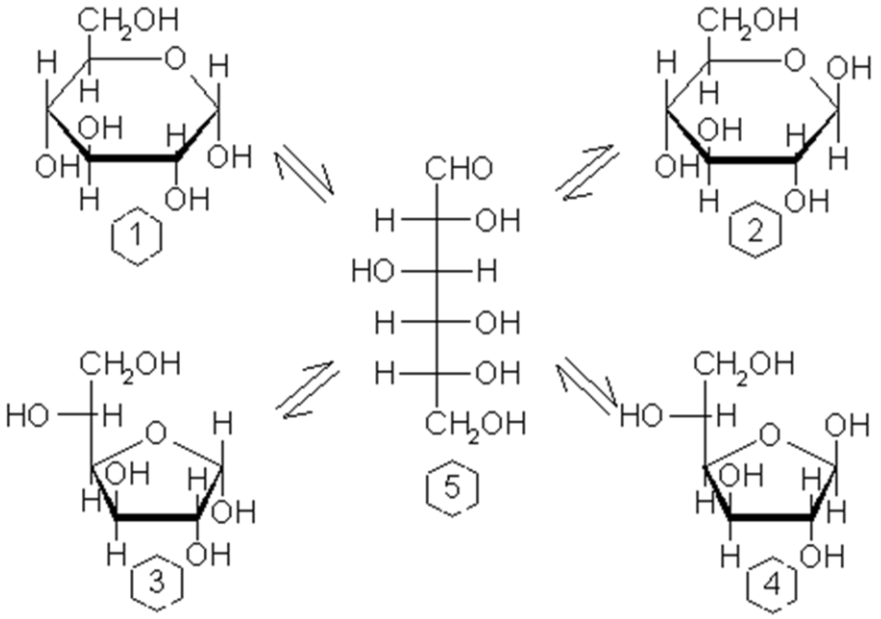




D-GLUKOFURANOZA

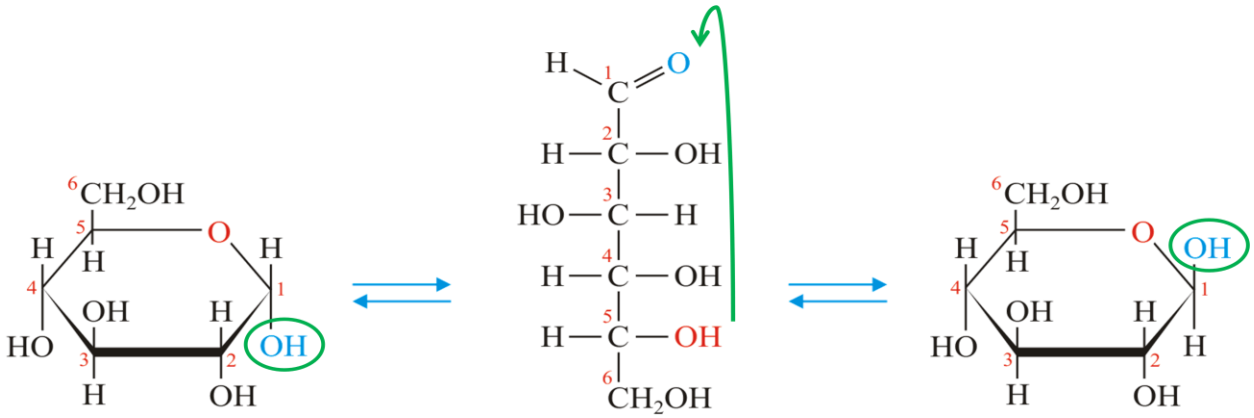


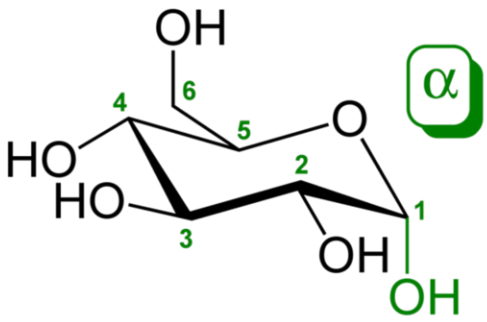
FURAN



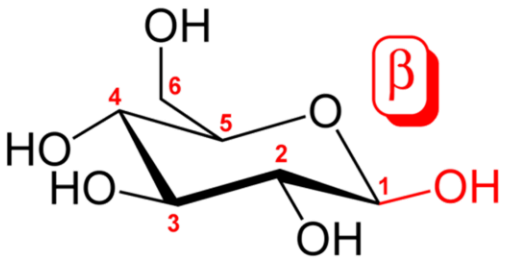
1. α-D-glukopiranoza
2. β-D-glukopiranoza
3. α-D-glukofuranoza
4. β-D-glukofuranoza
5. D-glukoza

Nastajanje **α i β izomera (anomera)** D-glukoze

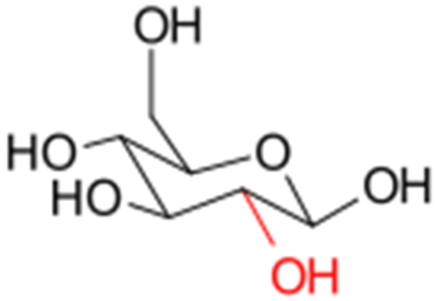




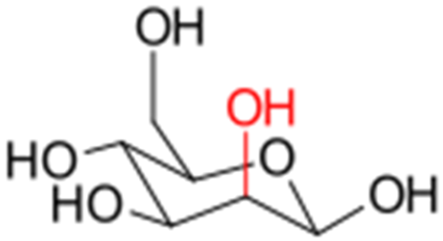
α-D-glukopiranoza



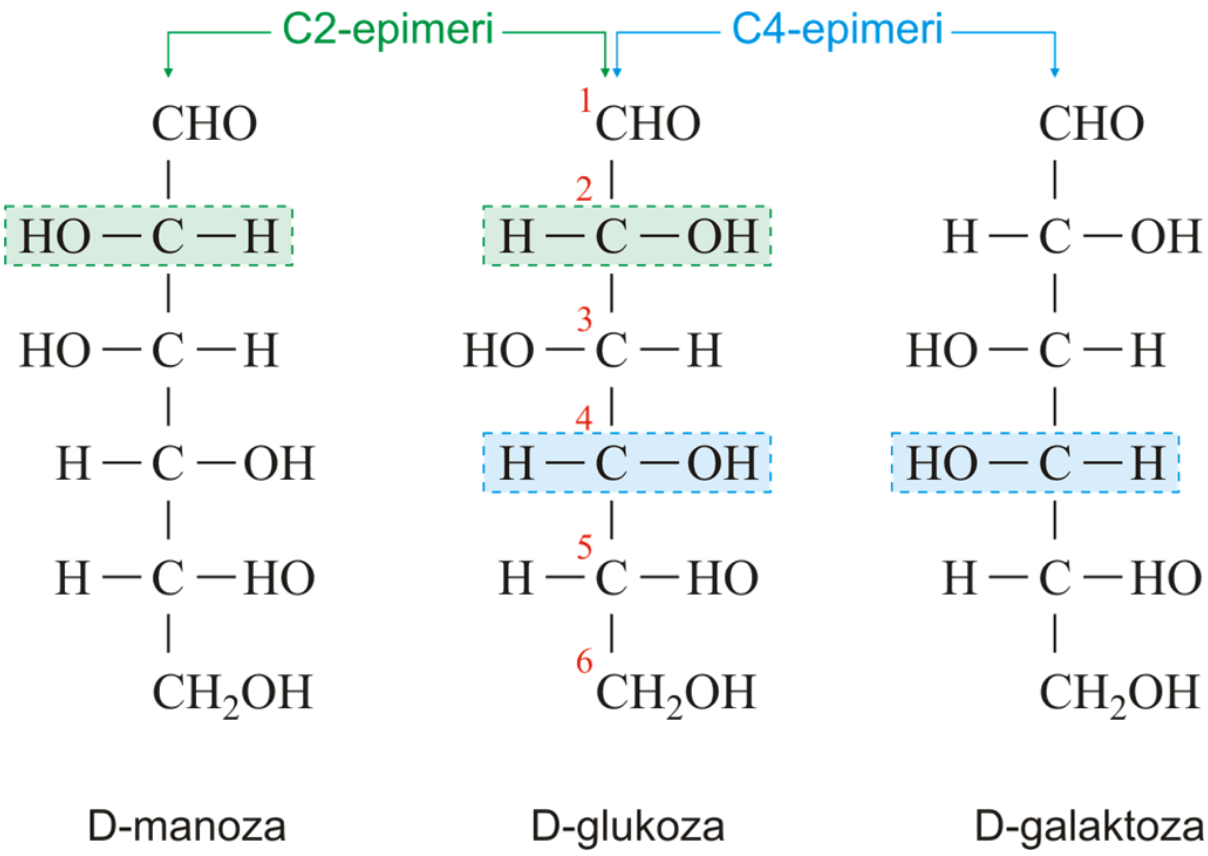
β-D-glukopiranoza

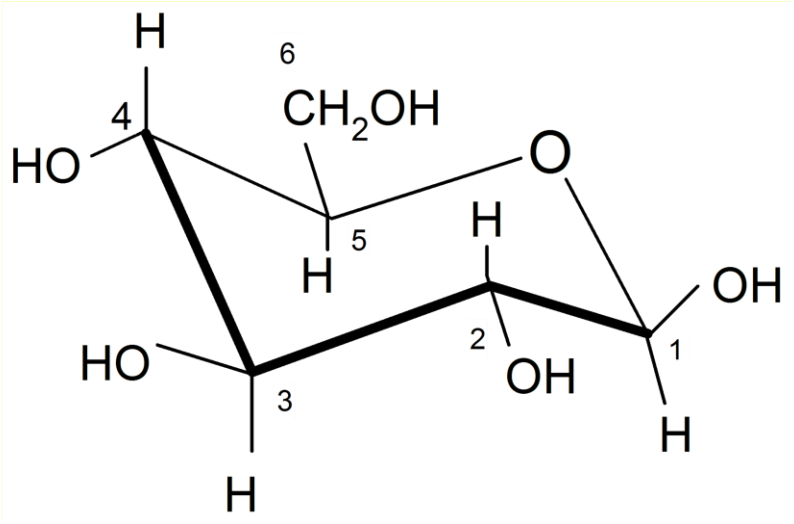


β-D-glukopiranoza

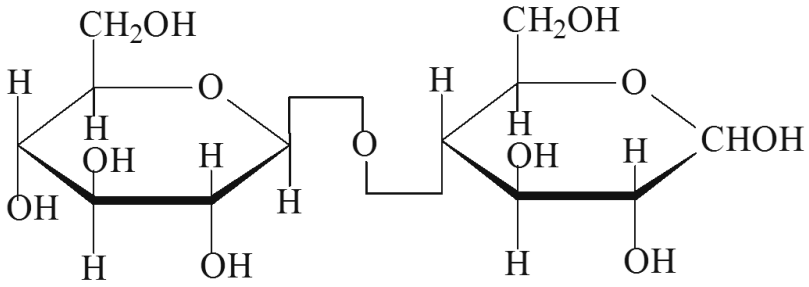


β-D-manopiranoza

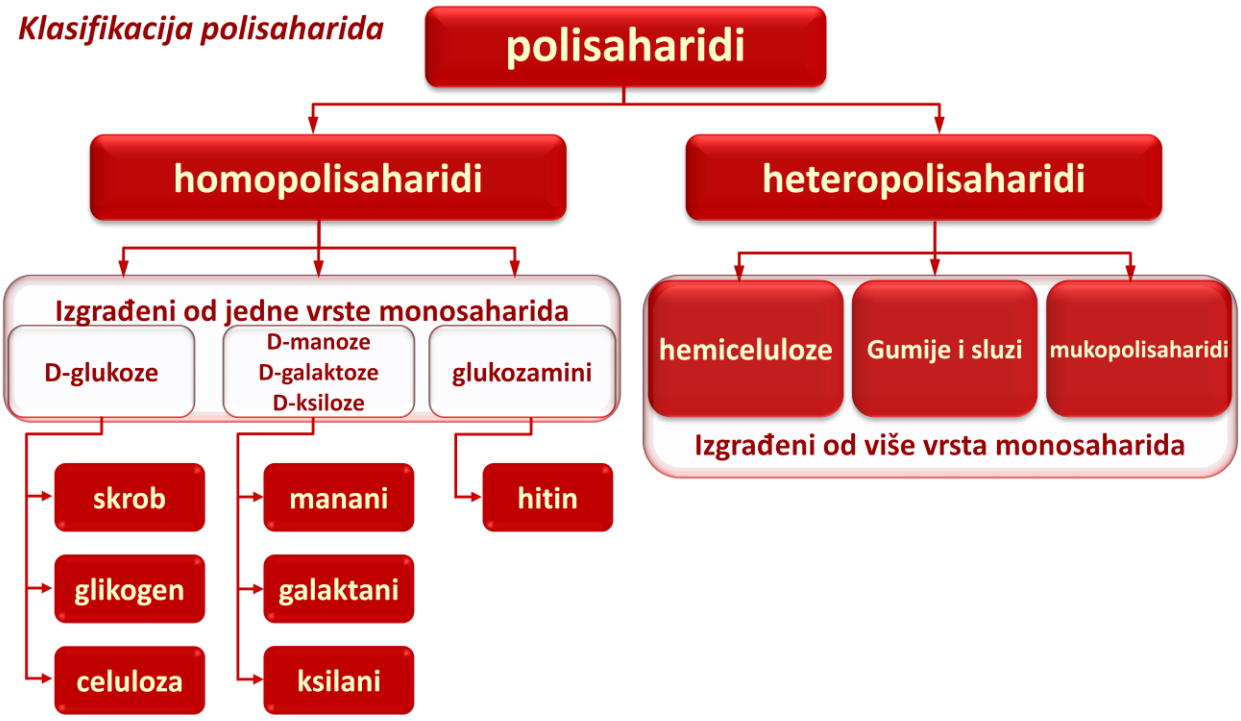




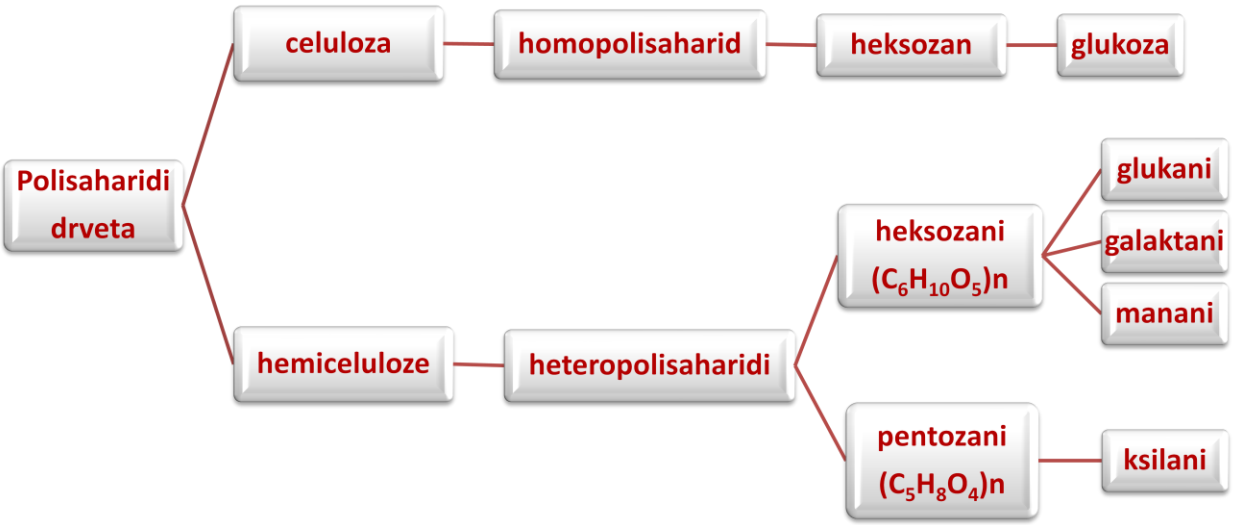
C1 konformacioni oblik β-D-glukopiranoze

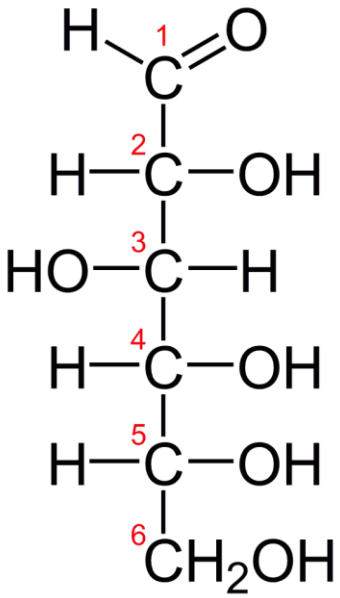


celobioza
4-O-(β–D–glukopiranozil)-D-glukopiranoza

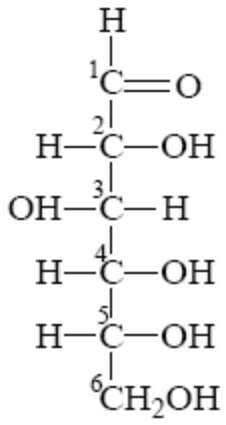


Polisaharidi drveta

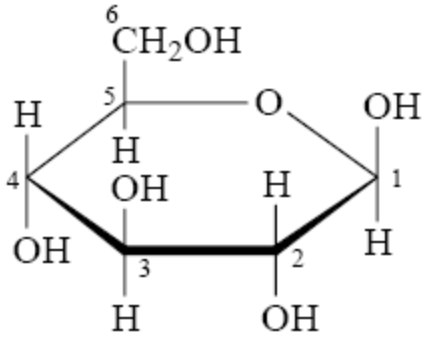




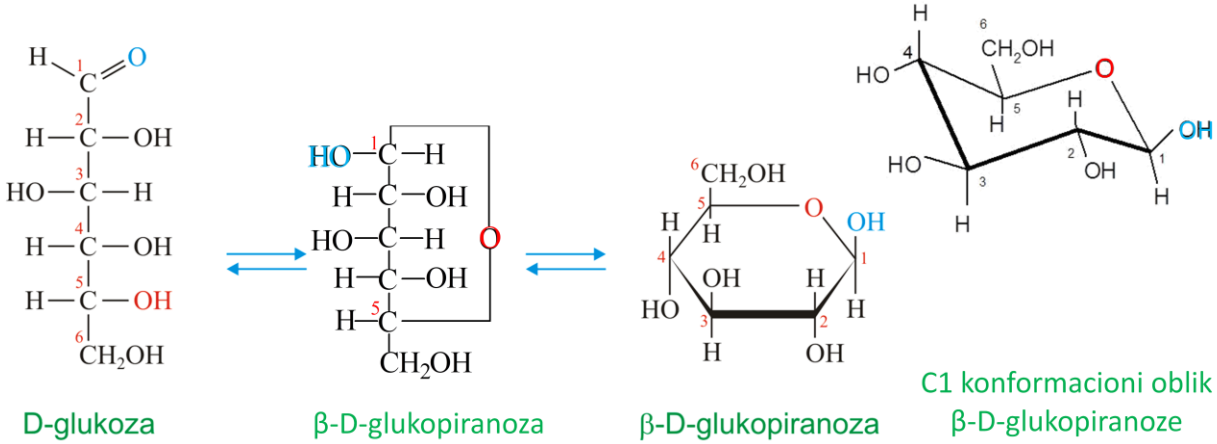
β–D-glukoza



Fisher-ova projekciona formula D-glukoze



Haworth-ova perspektivna formula β–D-glukoze

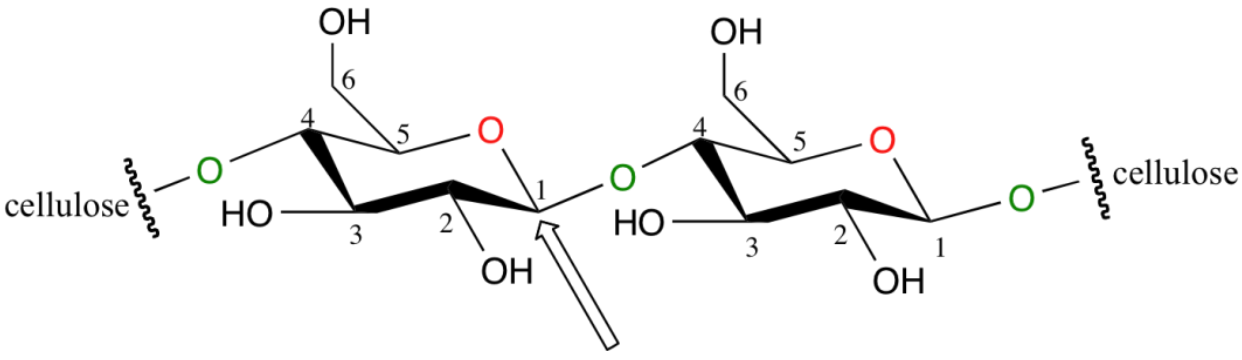


D-glukoza

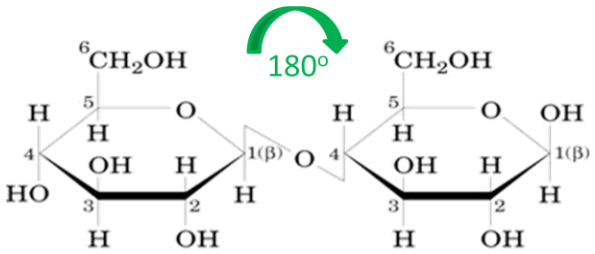
β-D-glukopiranoza

β-D-glukopiranoza

C1 konformacioni oblik β-D-glukopiranoze



β - (1,4) glikozidna veza

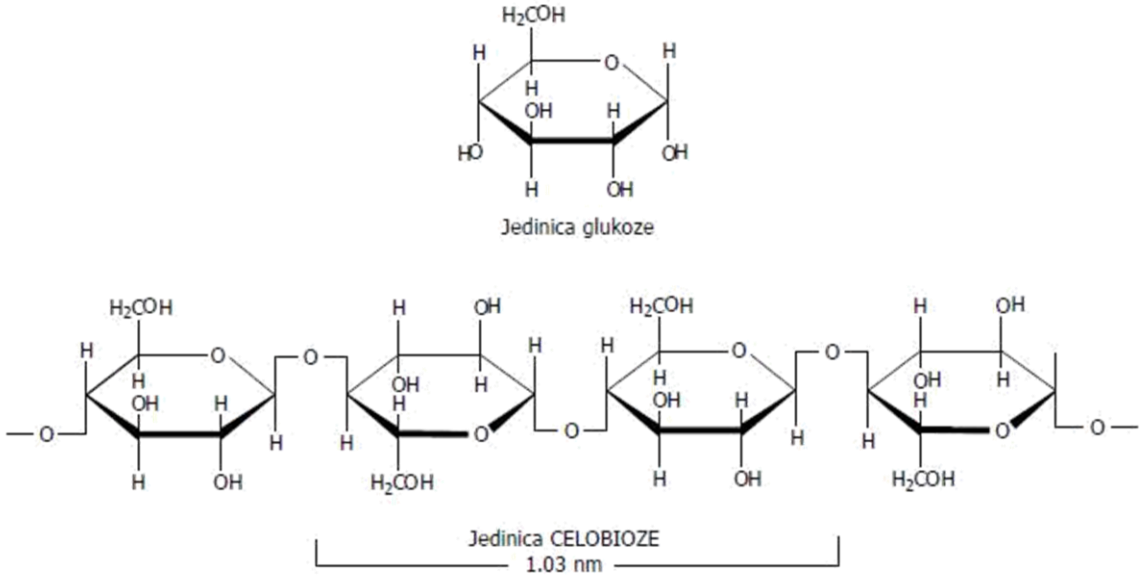


β-celobioza

celobioza

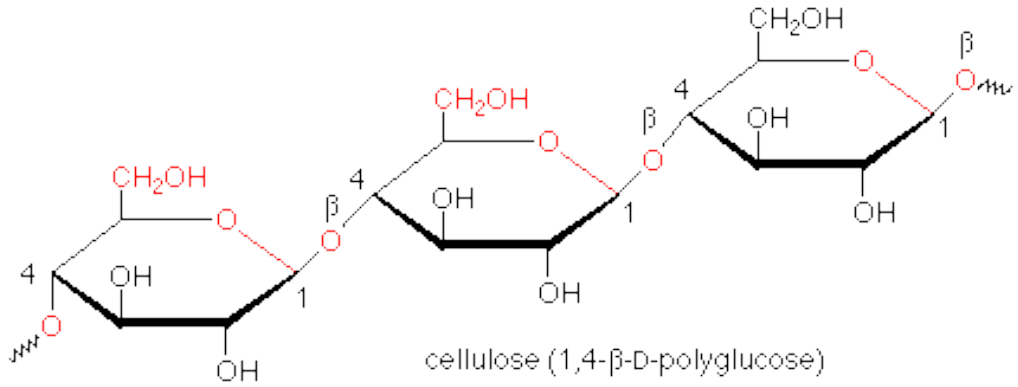
Celuloza $(C_6H_{10}O_5)n$

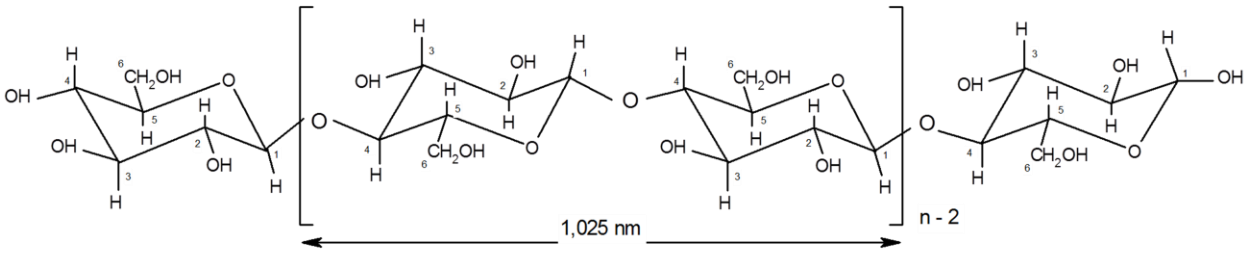
Molekulska struktura celuloze



Jedinica glukoze

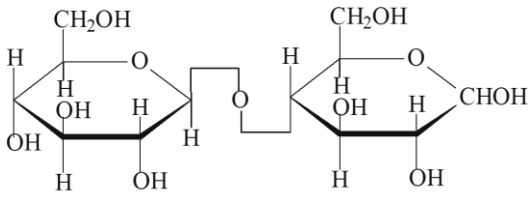
Jedinica CELOBIOZE
1.03 nm



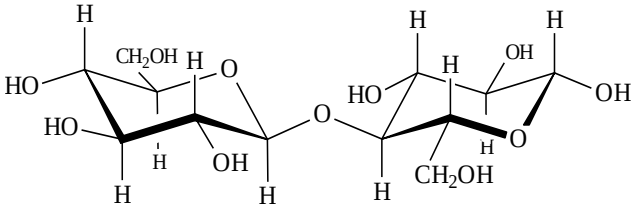


neredukujući kraj **ostatak celobioze** **redukujući kraj**

celobioza ($C_{12}H_{22}O_{11}$)



celobioza
4-O-(β–D–glukopiranozil)-D-glukopiranoza

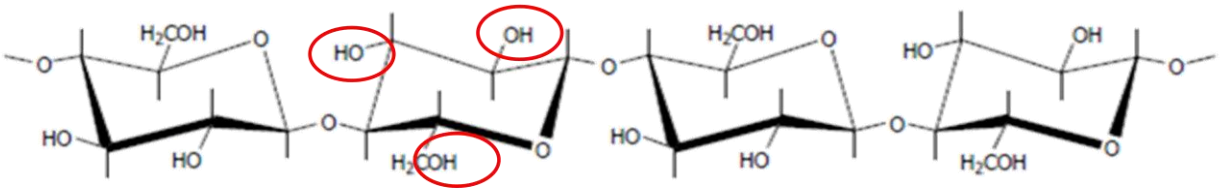


β-celobioza
4-O-(β-D-glukopiranozil)-β-D-glukopiranoza

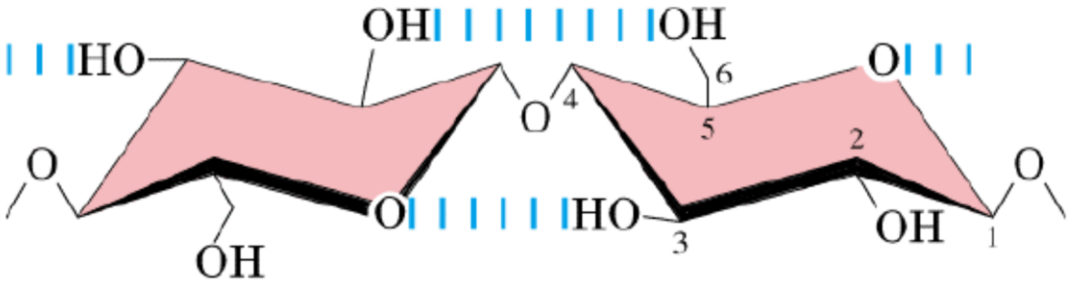
Stepen polimerizacije celuloze

Poreklo celuloze	Stepen polimerizovanja
Niti semenki (pamuk, kapok)	8000 - 15300
Tekstilna vlakna (lan, konoplja, juta)	8600 - 10800
Drvo i kora (lišćari, četinari)	7100 - 10300
Sirovi pamuk	2000 - 3000
Mercerizovan pamuk	1100 - 1600
Beljeni pamuk	900 - 1100
Veštačka svila (kuoksan postupak)	400 - 500
Viskoza	300 - 500
Celofan	250 – 300

-OH grupe celuloze



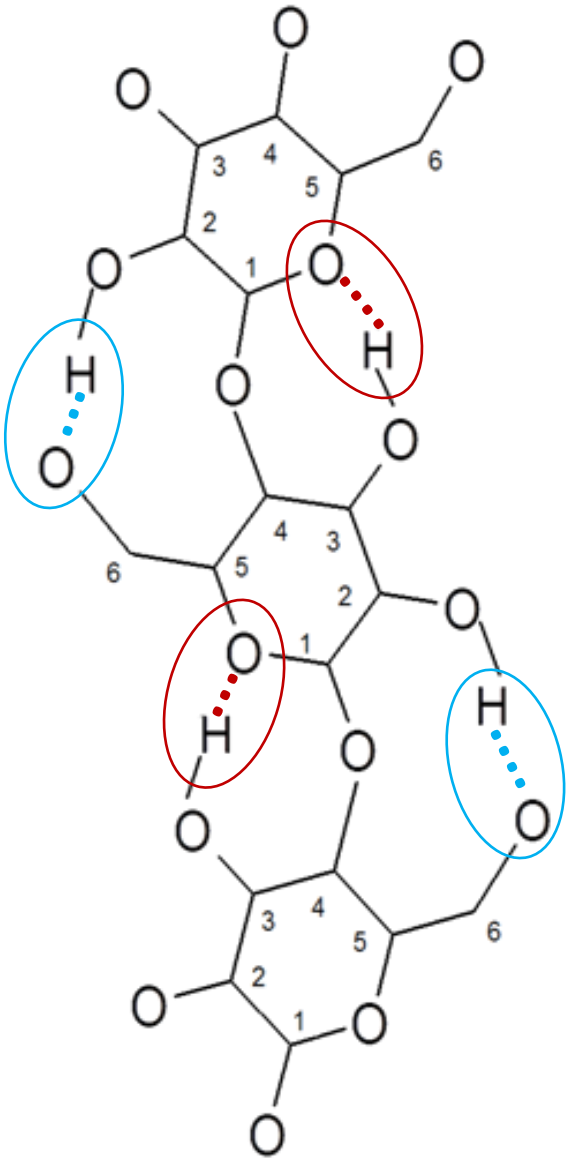
Nadmolekulska struktura celuloze



(3)OH·····O(5)

(2)OH·····OH(6)

Šema obrazovanja intramolekulskih vodoničnih veza



(3)OH·····O(5)

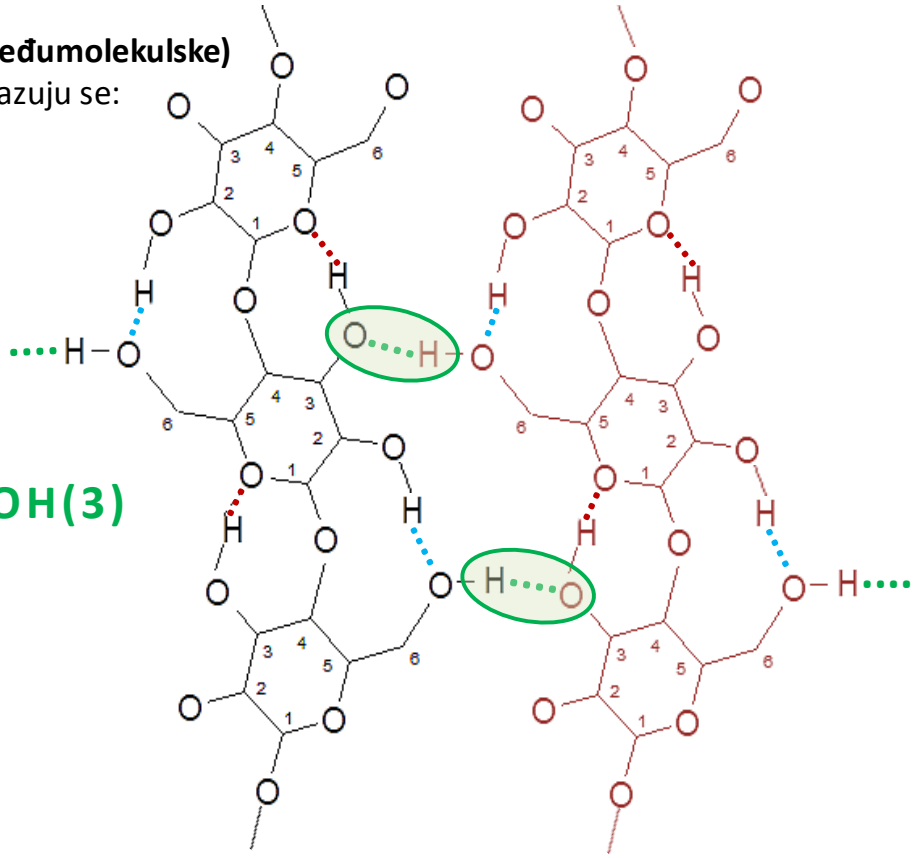
(2)OH·····OH(6)

Intramolekulske vodonične veze u celulozi

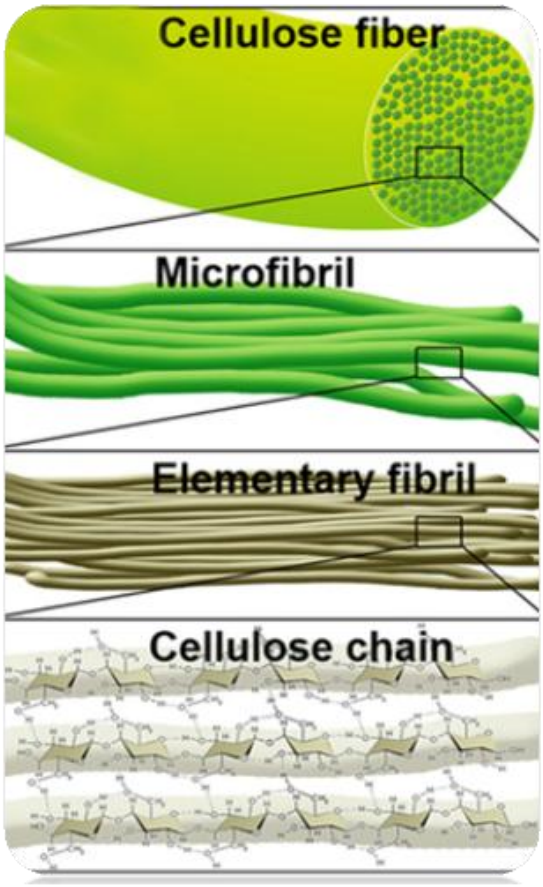
Šema vodoničnih veza za dva paralelna lanca celuloze

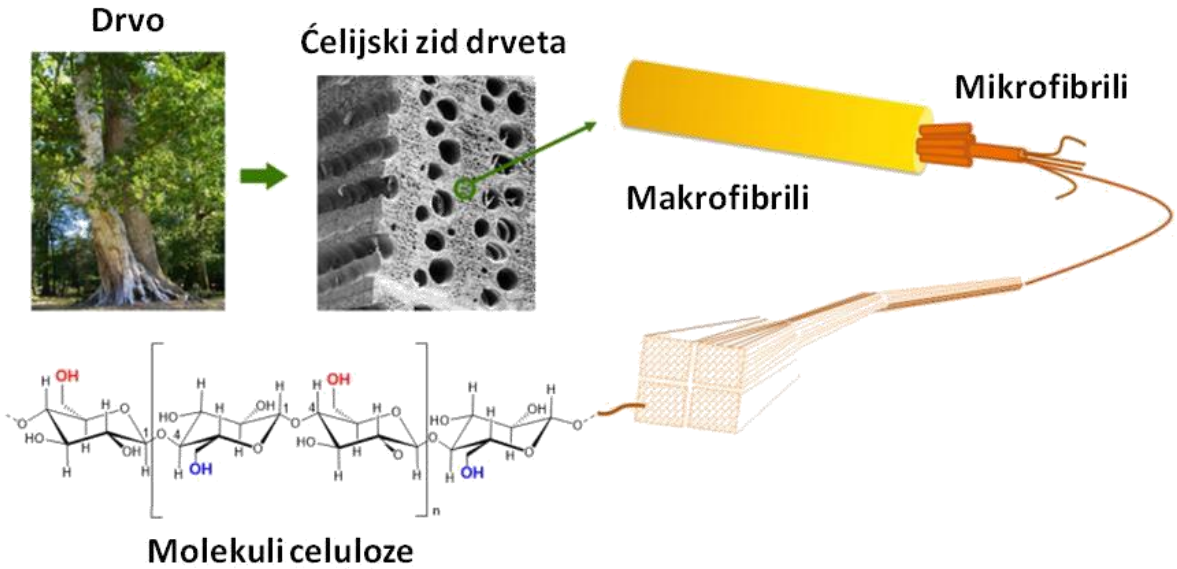
Intermolekulske (međumolekulske) vodonične veze obrazuju se:

(6)OH·····OH(3)

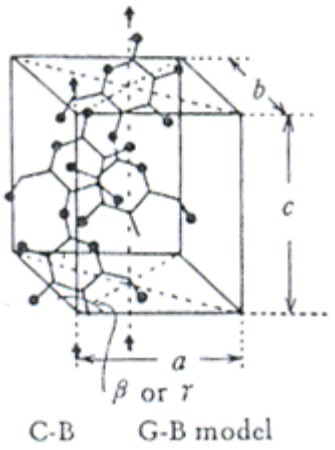


Intermolekulske vodonične veze u celulozi

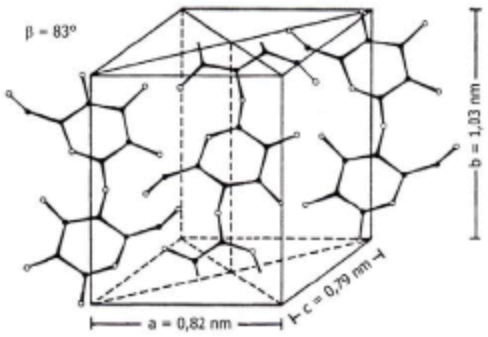

Cellulose fiber
Microfibril
Elementary fibril
Cellulose chain

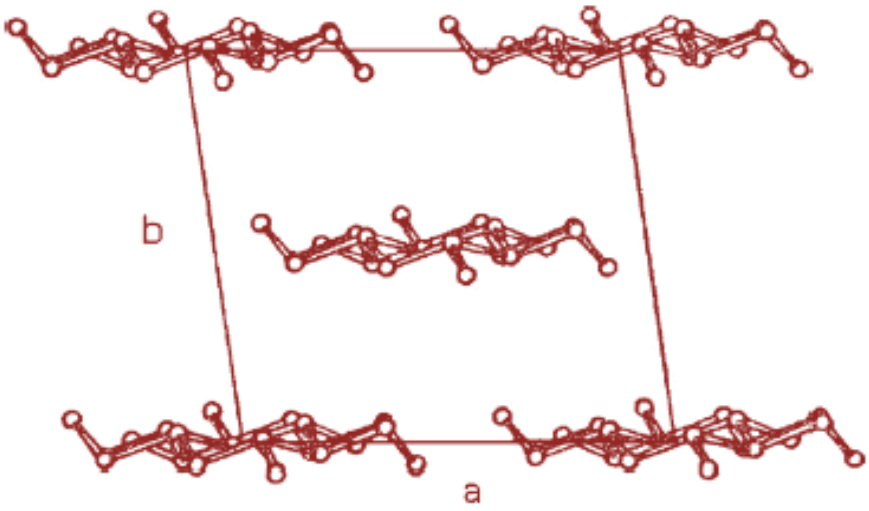

Drvo
Ćelijski zid drveta
Mikrofibrili
Makrofibrili
Molekuli celuloze

Kristalna struktura celuloze

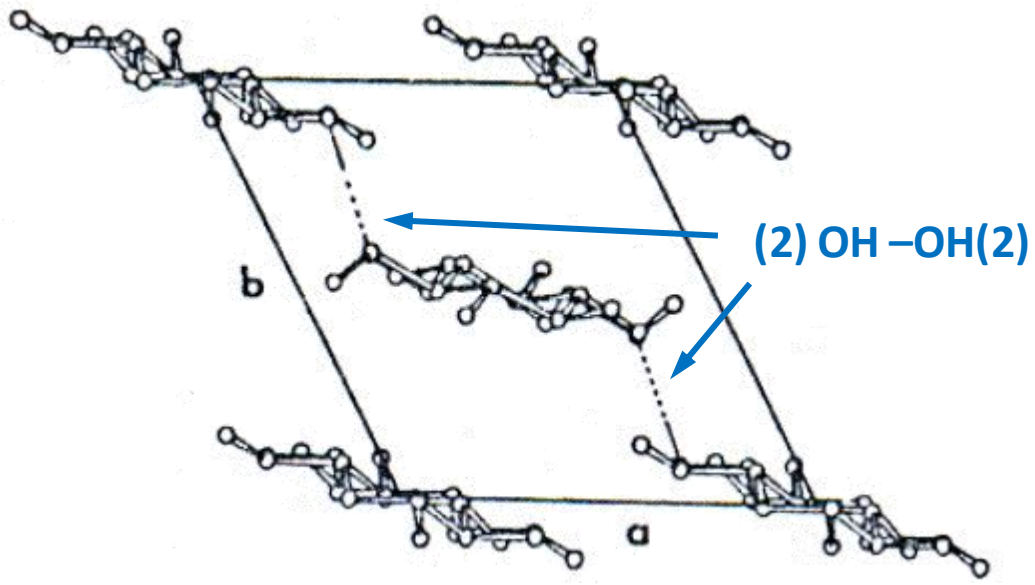


C-B G-B model





Projekcija normalno na ravan ab jedinične ćelije kristalne rešetke celuloze I duž ose vlakna

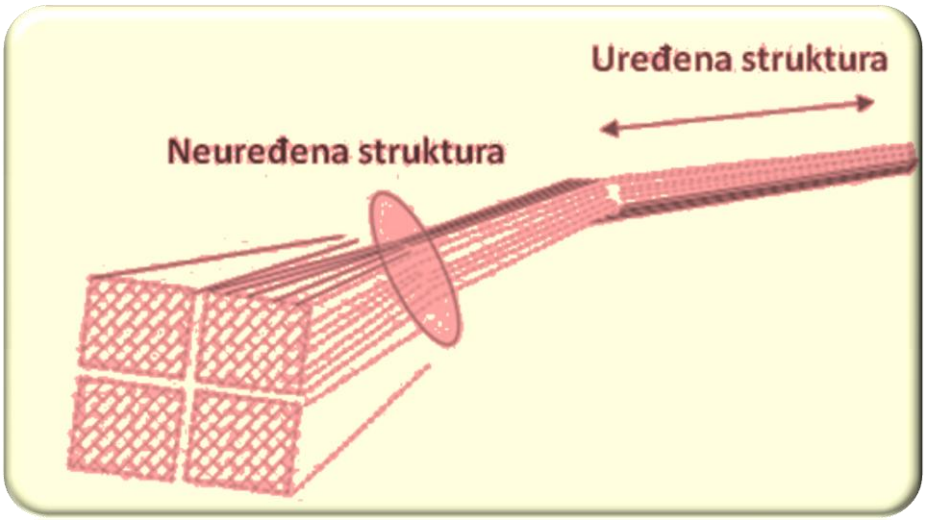


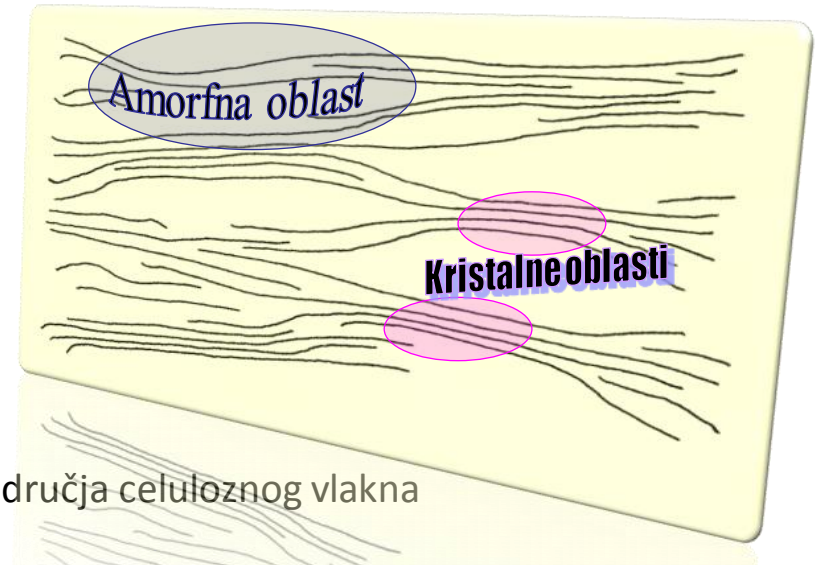
Projekcija normalno na ravan ab jedinične ćelije kristalne rešetke celuloze II duž ose vlakna, sa naznačenim vodoničnim vezama između centralnih (antiparalelnih) i ivičnih ravni - (susednih slojeva)

Tablica 5-3. Dimenzije osnovnih jedinica polimorfnih oblika celuloze

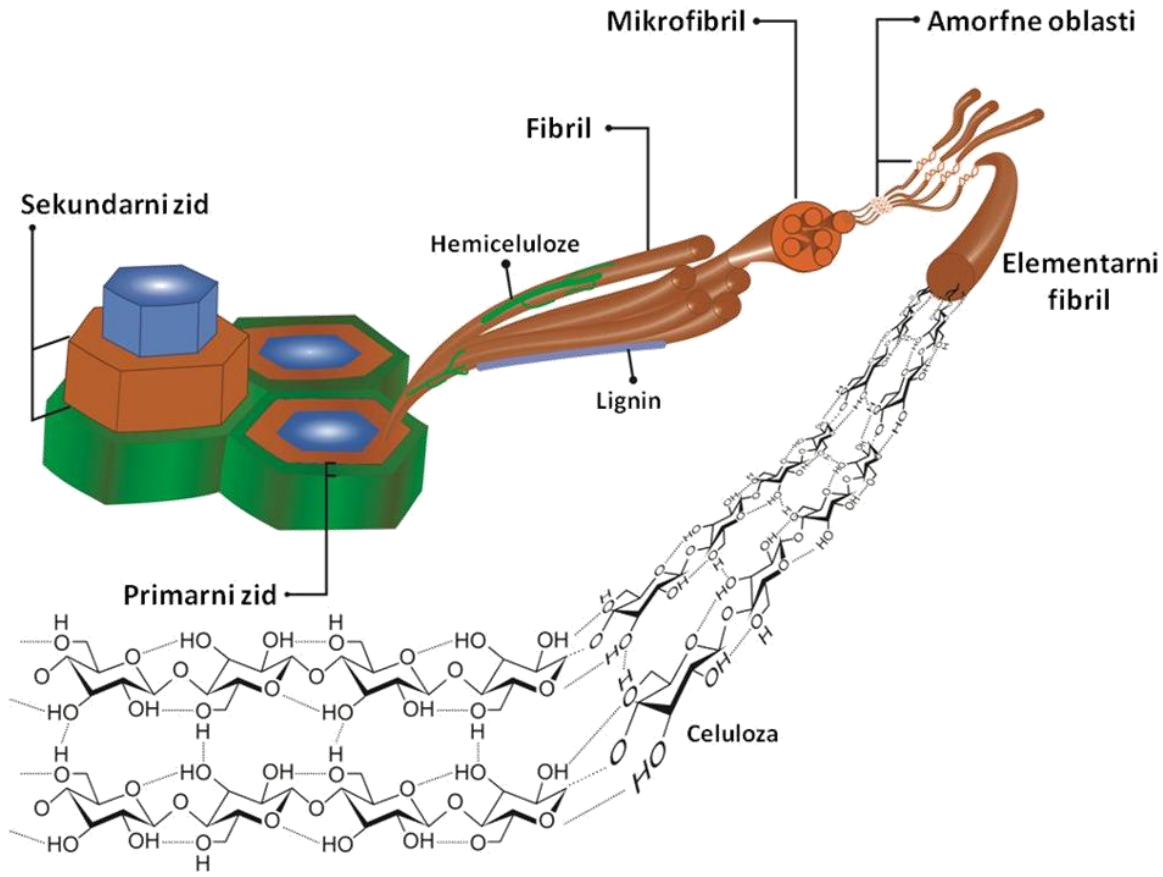
Celuloza	Kristalni sastav	a (nm)	b (nm)	c (nm)	β°
I	monoklinski	0,82	1,03	0,79	83
II	monoklinski	0,80	1,03	0,91	62
III	monoklinski (heksanogalni)	0,86	1,03	0,86	60
IV	ortoromboedrijski	0,81	1,03	0,79	90

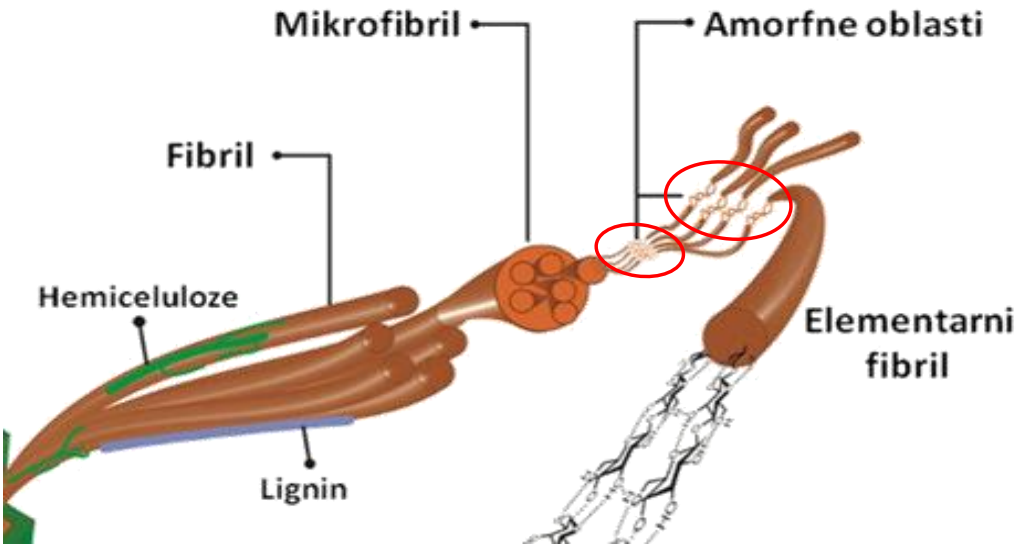
Unutrašnja struktura mikrofibrila celuloze





Kristalna i amorfna područja celuloznog vlakna





Kristalna i amorfna područja celuloznog vlakna

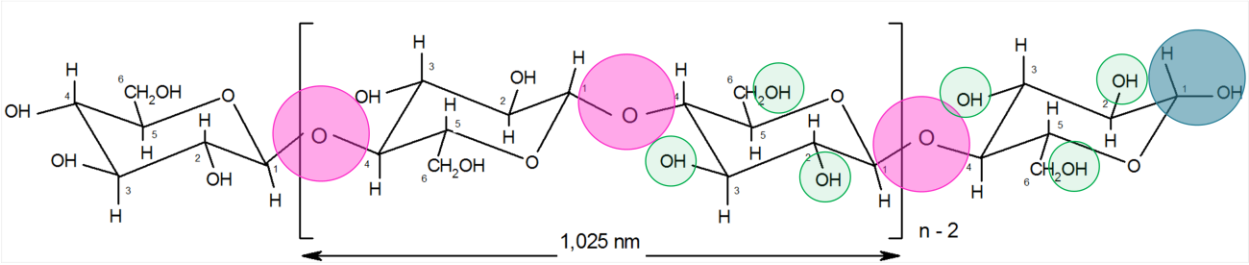
Dimenzije jedinične ćelije kristalne rešetke *polimorfa celuloze*

Tip polimorfa	Poreklo uzorka	Dimenzije, nm			β (°)
		a	b	c	
Celuloza I	*Valonia*	0,817	0,786	1,038	83,0
Na-celuloza I	Celulozna pulpa iz drveta	**1,280**	**1,320**	**2,050**	40,0
Celuloza II	Celulozna pulpa	0,802	0,903	1,030	62,8
	Mercerizovan pamuk	0,801	0,904	1,036	62,9

Reaktivnost celuloze

Određena je ***funkcionalnim grupama*** koje celuloza sadrži:

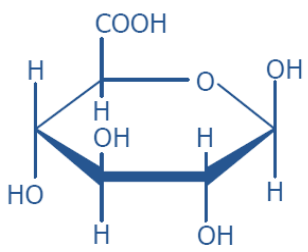
- **Reakcije na glikozidnim vezama**
- **Reakcije hidroksilnih grupa**
- **Reakcije poluacetalnog hidroksila (redukujući kraj)**



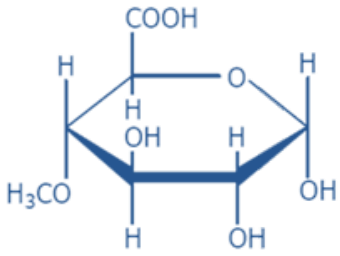
Hemiceluloze

Hemiceluloze lišćara

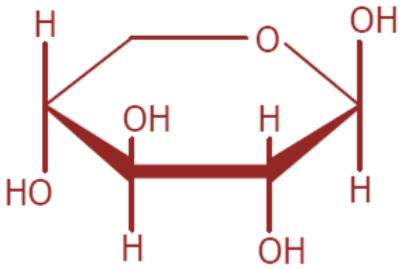
- **Ksilani** lišćara
- **O-acetil-4-O-metilglukouronoksilan**



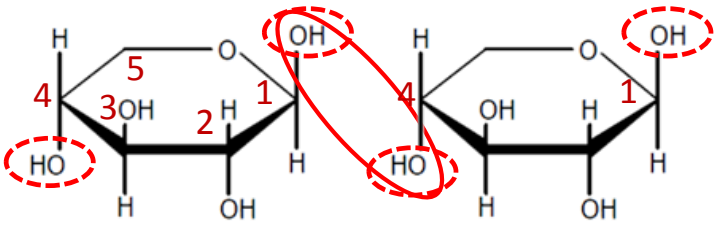
β-D-Glukuronska kiselina



α-D-4-O-Metilglukuronska kiselina

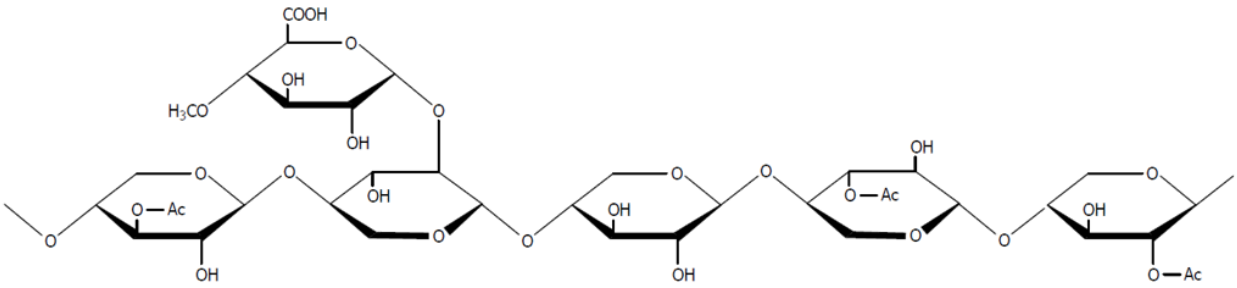


β-D-Ksiloza

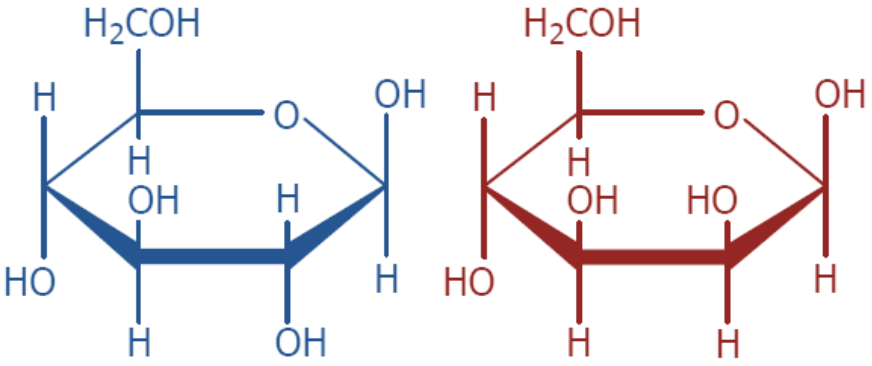


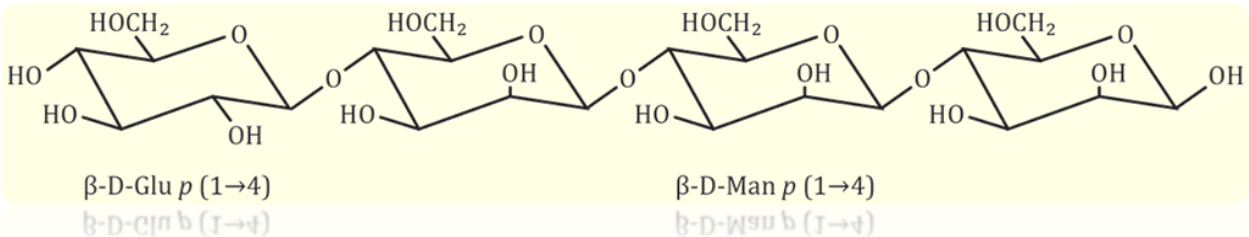
β-D-Ksiloza β-D-Ksiloza

β -(1,4) glikozidna veza



- **Manani** lišćara
- **Glukomanani**



- 

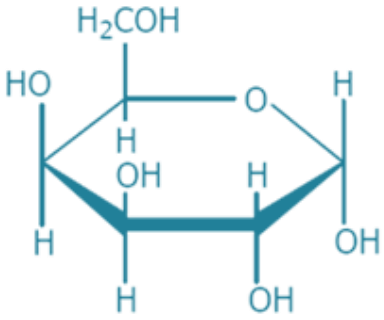
Pregled najznačajnijih hemiceluloza drveta lišćara i njihovih svojstava

Naziv polisaharida	Stepen polimeriz	%od suve supst.drveta	Sastav	Odnos monosah	Tip glik. veze
O-acetil-4-O-metil-glukuronoksilan	**100 - 200**	**10-35**	β-D-Xylp 4-O-Me-α-D-GlupU O-acetil	**10** **1** 7	**β-(1, 4)** **α-(1, 2)**
Glukomanani	**60 - 70**	**3-5**	β-D-Manp β-D-Glup	**1** **1,5 - 2**	**β-(1, 4)**

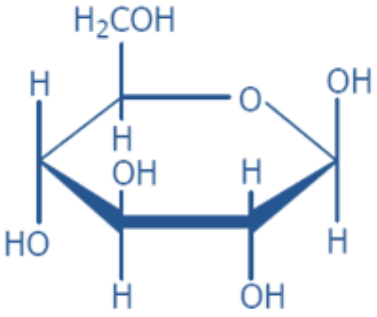
Hemiceluloze četinara

- **Manani** četinara

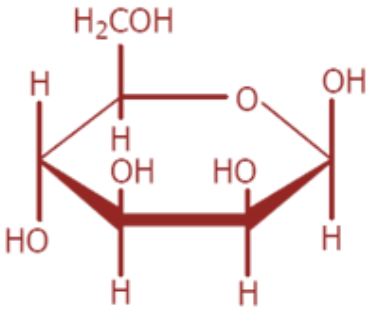
O-acetil-galaktoglukomanan



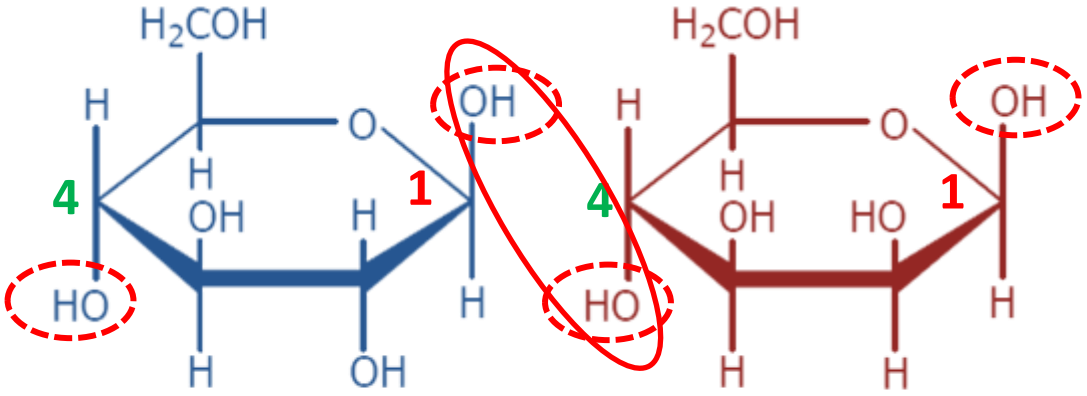
α-D-Galaktoza



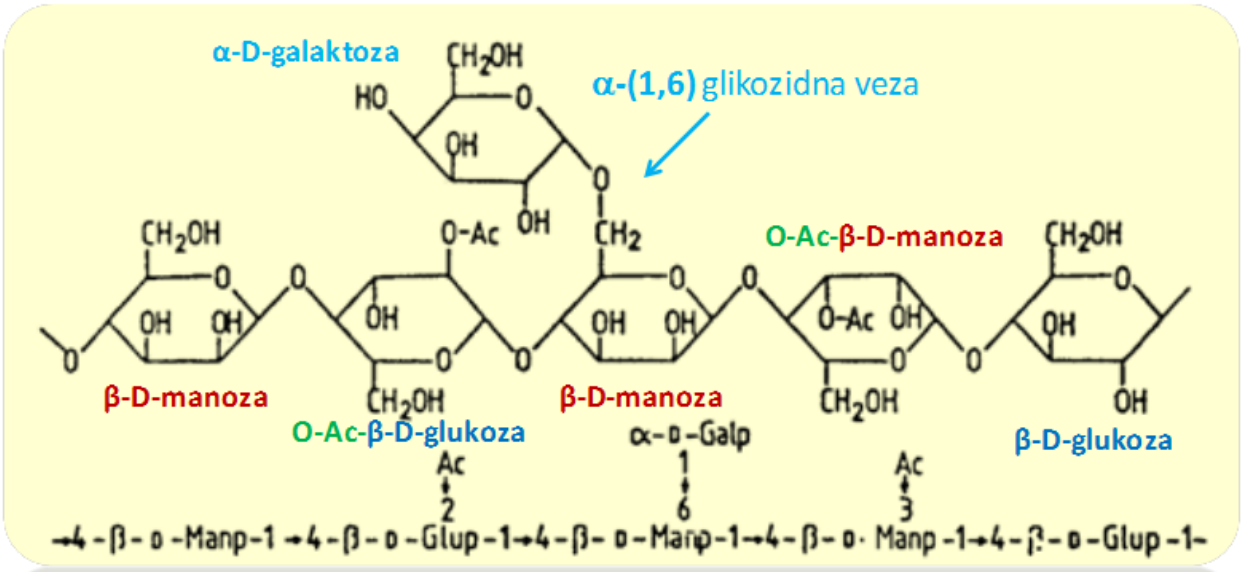
β-D-Glukoza



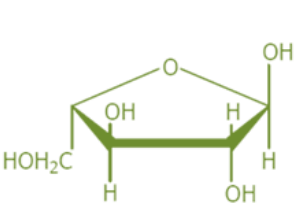
β–D-Manoza

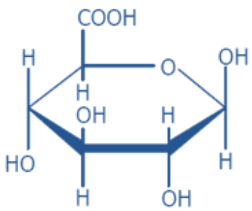


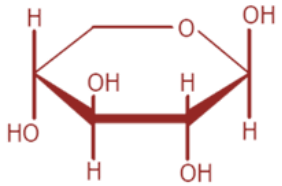
β-D-Glukoza β–D-Manoza

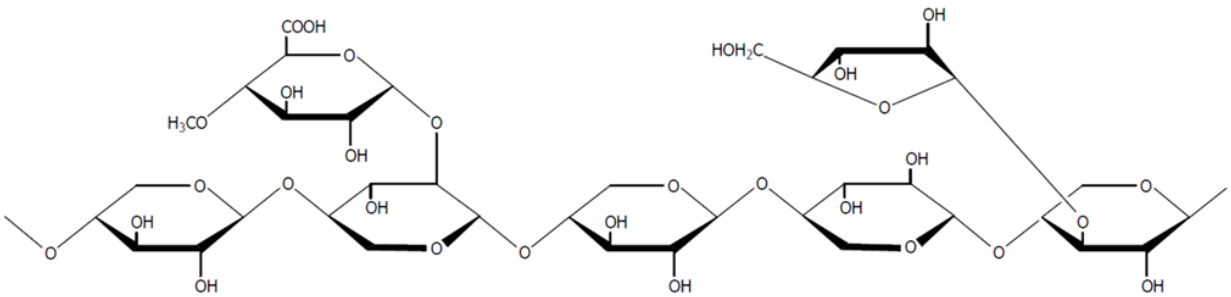


➢ **Ksilani** četinara **arabino-4-O-metilglukuronoksilan**

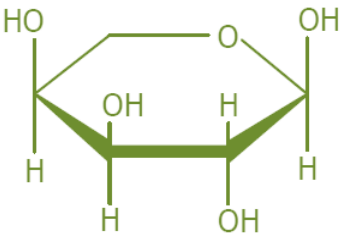

α-L-Arabinofuranoza


β-D-Glukuronska kiselina

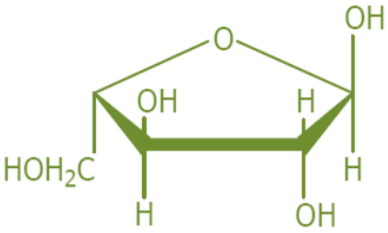

β-D-Ksiloza



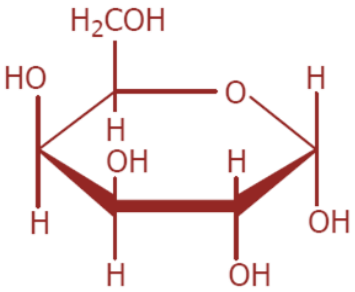
➢ **Galaktani** četinara **arabinogalaktani**



α-L-Arabinopiranoza



α-L-Arabinofuranoza



α-D-Galaktoza