

Univerzitet u Beogradu – Fakultet veterinarske medicine

20I1009 BIOHEMIJA #02

BIOLOŠKI MOLEKULI: **Ugljeni hidrati**

Priredio:

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GLAVNE GRUPE ORGANSKIH MOLEKULA

Ugljovodonici	C, H	Nepolarni	Nemaju značajne biološke uloge
Lipidi (masti)	C, H, O	Nepolarni / blago polarni	Izvor energije, gradivni molekuli, prenos signala
Ugljeni hidrati (šećeri)	C, H, O, N, S	Polarni	Izvor energije, gradivni molekuli
Nukleinske kiseline	C, H, O, N	Polarni	Čuvanje i ekspresija genetičke informacije
Proteini	C, H, O, N, S	Polarni / nepolarni	Izvršioc bioloških funkcija, gradivni molekuli, prenos signala

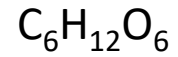
Prekursori (gradivni blokovi):
prosti organski molekuli.

Monosaharidi, glicerol, masne kiseline, purinske i pirimidinske baze, aminokiseline

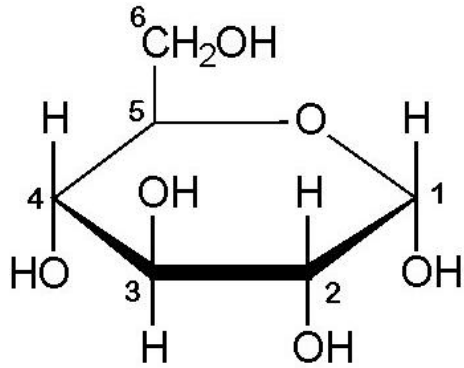
Složeni organski molekuli (biomolekuli):
polisaharidi, lipidi, nukleinske kiseline (DNK i RNK), polipeptidi i proteini polimeri prekursora.

NERASKIDIVA VEZA IZMEĐU STRUKTURE I FUNKCIJE BIOLOŠKIH MOLEKULA

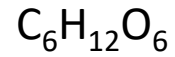
Glukoza



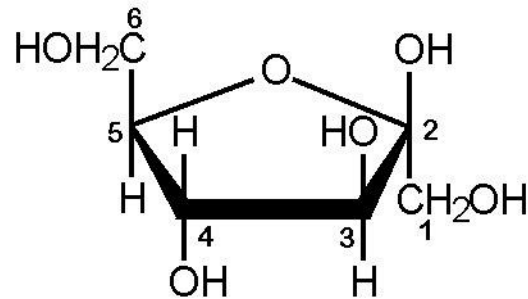
Ulazi u proces glikolize, razlaže se i oslobađa energiju



Fruktoza

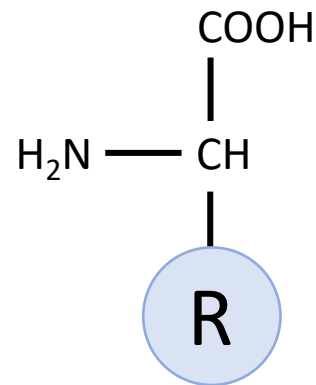


Ne ulazi direktno u proces glikolize



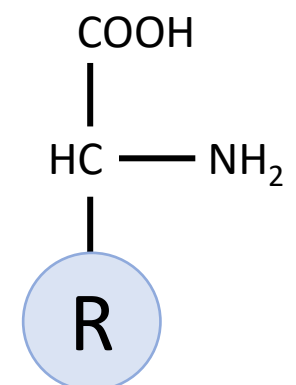
L-aminokiselina

Ugrađuje se u polipeptidni lanac proteina pomoću ribozoma



D-aminokiselina

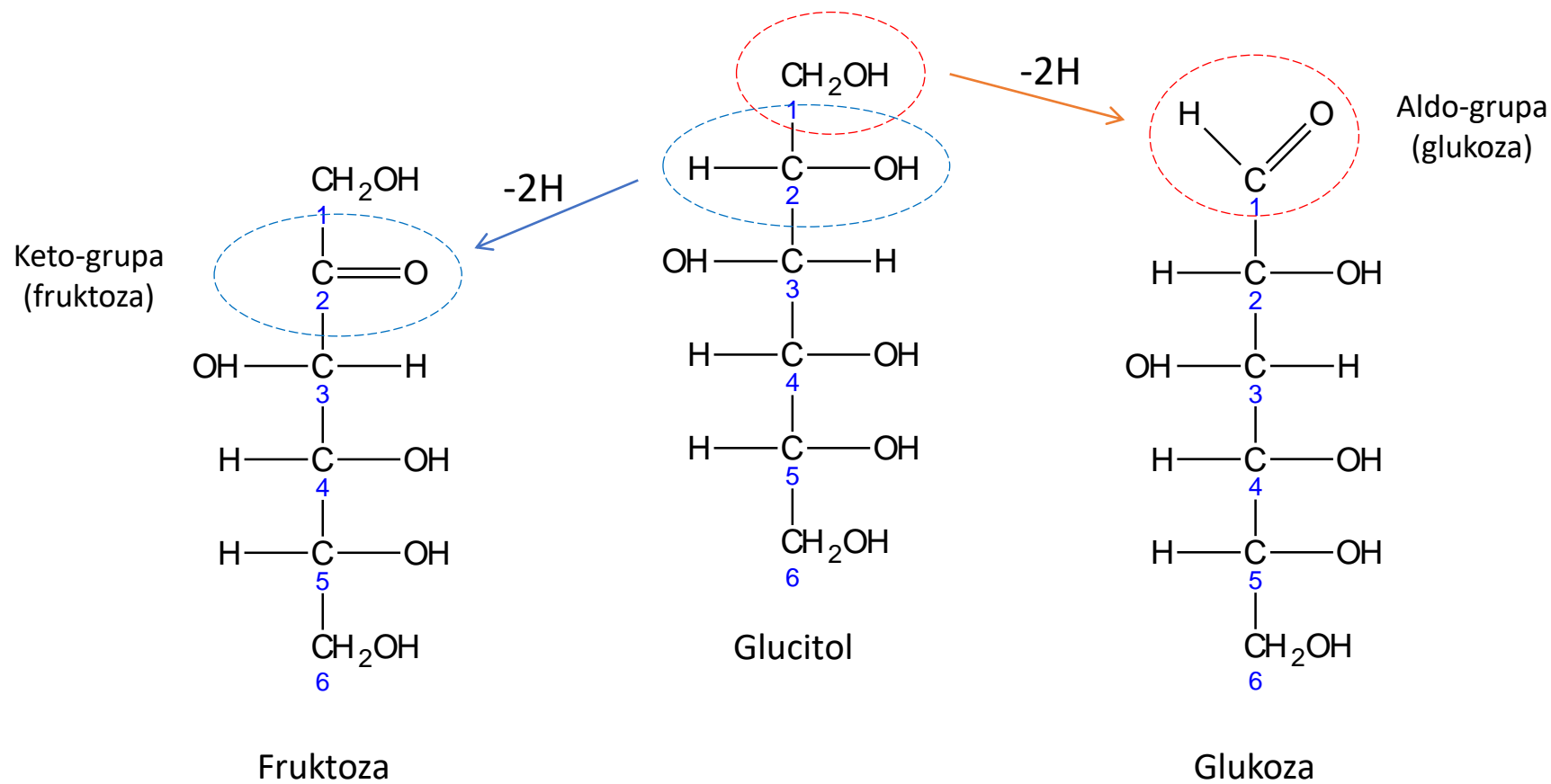
Ribozomi ne „prepoznaju“ D-aminokiseline i ne ugrađuju ih u polipeptid



GLAVNE OSOBINE UGLJENIH HIDRATA

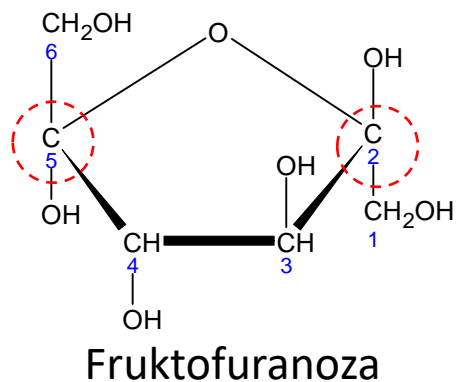
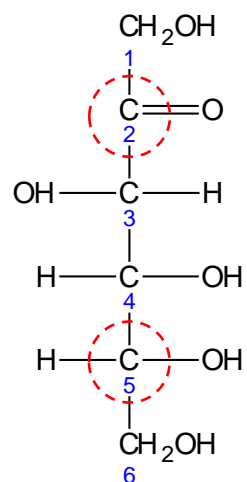
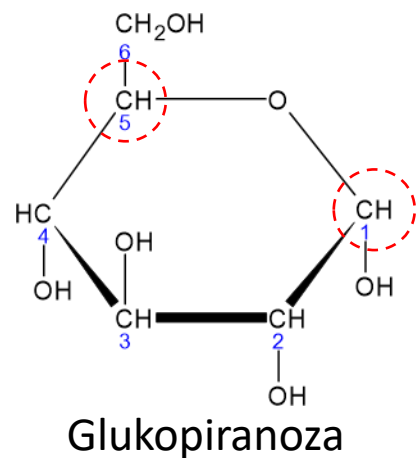
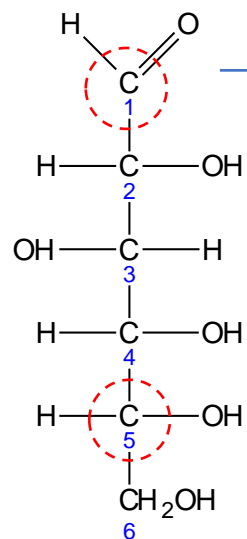
Ugljeni hidrati su primarni oksidacioni proizvodi lančastih polihidroksilnih alkohola

Zajednički naziv za aldo i keto grupu je **karbonilna** grupa

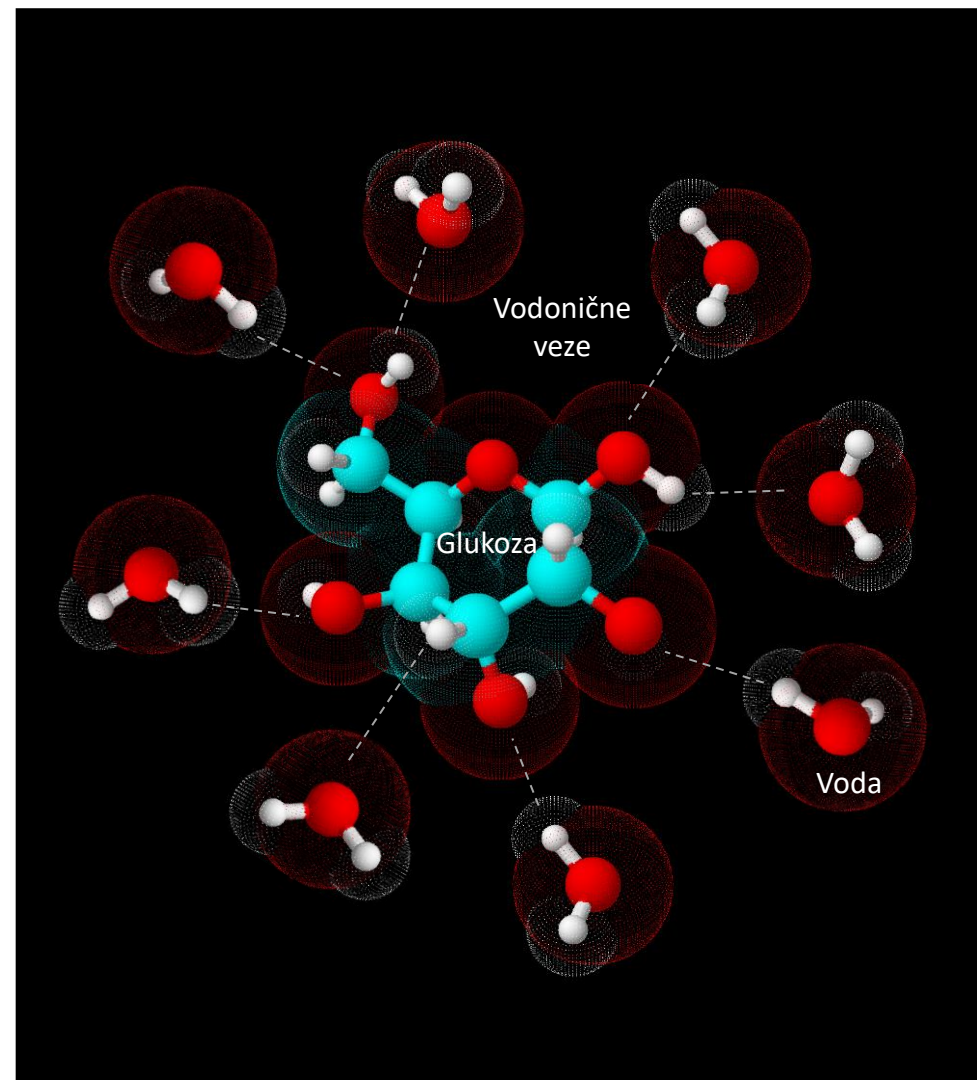


GLAVNE OSOBINE UGLJENIH HIDRATA

Reakcija nastanka poluacetalata

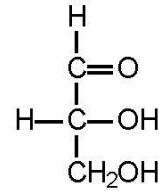


Hidrofilna priroda ugljenih hidrata

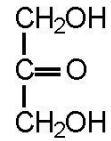


MONOSAHARIDI

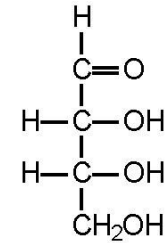
3C - Trioze



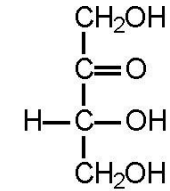
D-glicer-
aldehid



Dioksiaceton



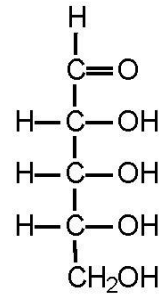
D-eritroza



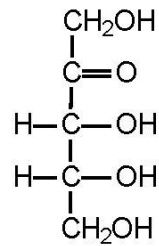
D-eritruloza

4C - Tetroze

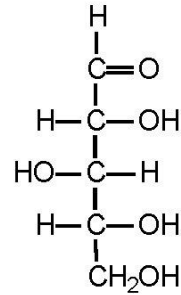
5C - Pentoze



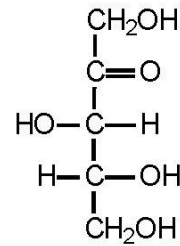
D-riboza



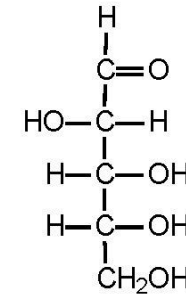
D-ribuloza



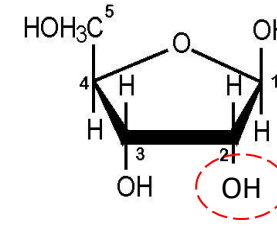
D-ksiloza



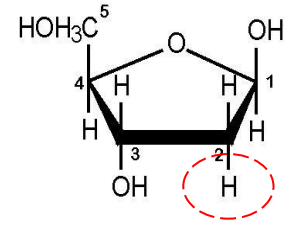
D-ksiluloza



D-arabinoza

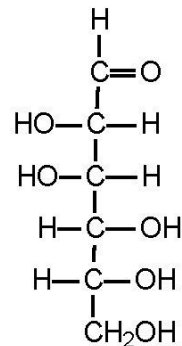


Riboza

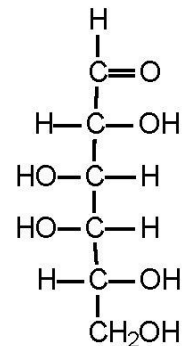


2- deoksiriboza

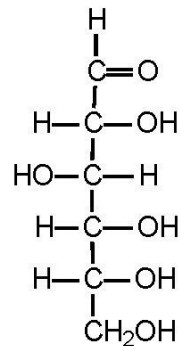
6C - Heksoze



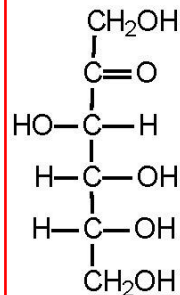
D-manoza



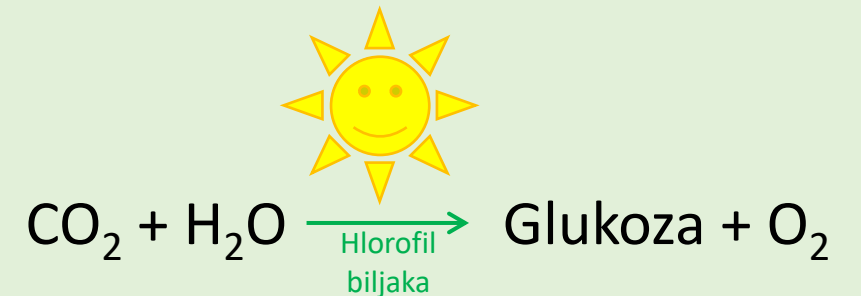
D-galaktoza



D-glukoza



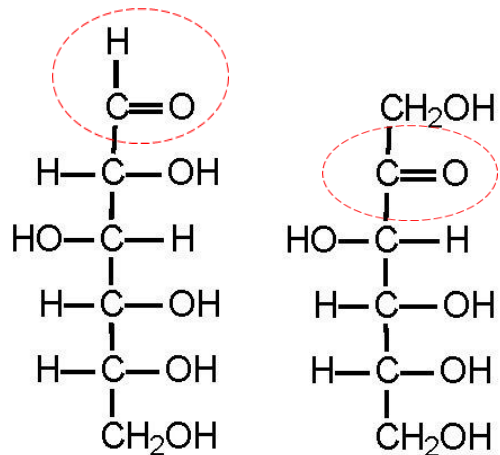
D-fruktoza



Centralna uloga glukoze u biosferi

TIPOVI IZOMERIJA MONOSAHARIDA

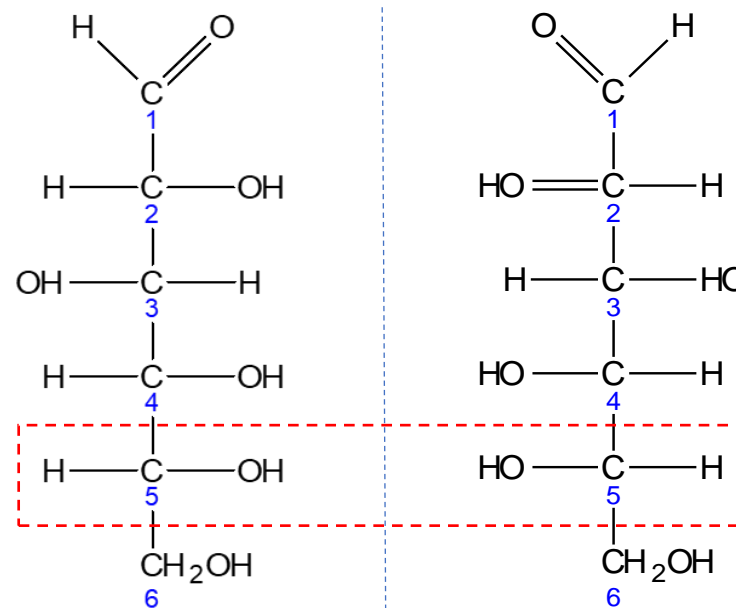
Aldo – keto izomerija



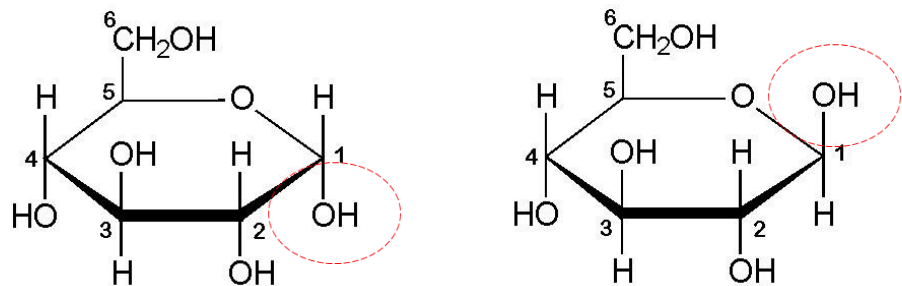
Glukoza

Fruktoza

Desna – leva (D / L) izomerija



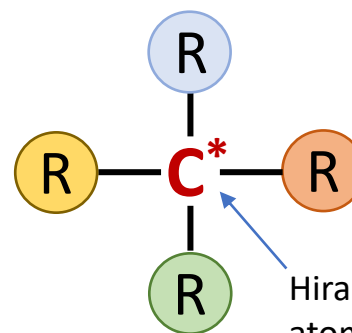
Alfa – beta izomerija



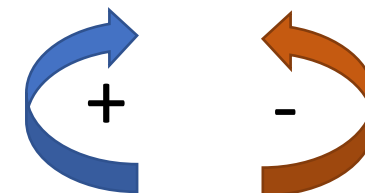
α -D-glukopiranoza

β -D-glukopiranoza

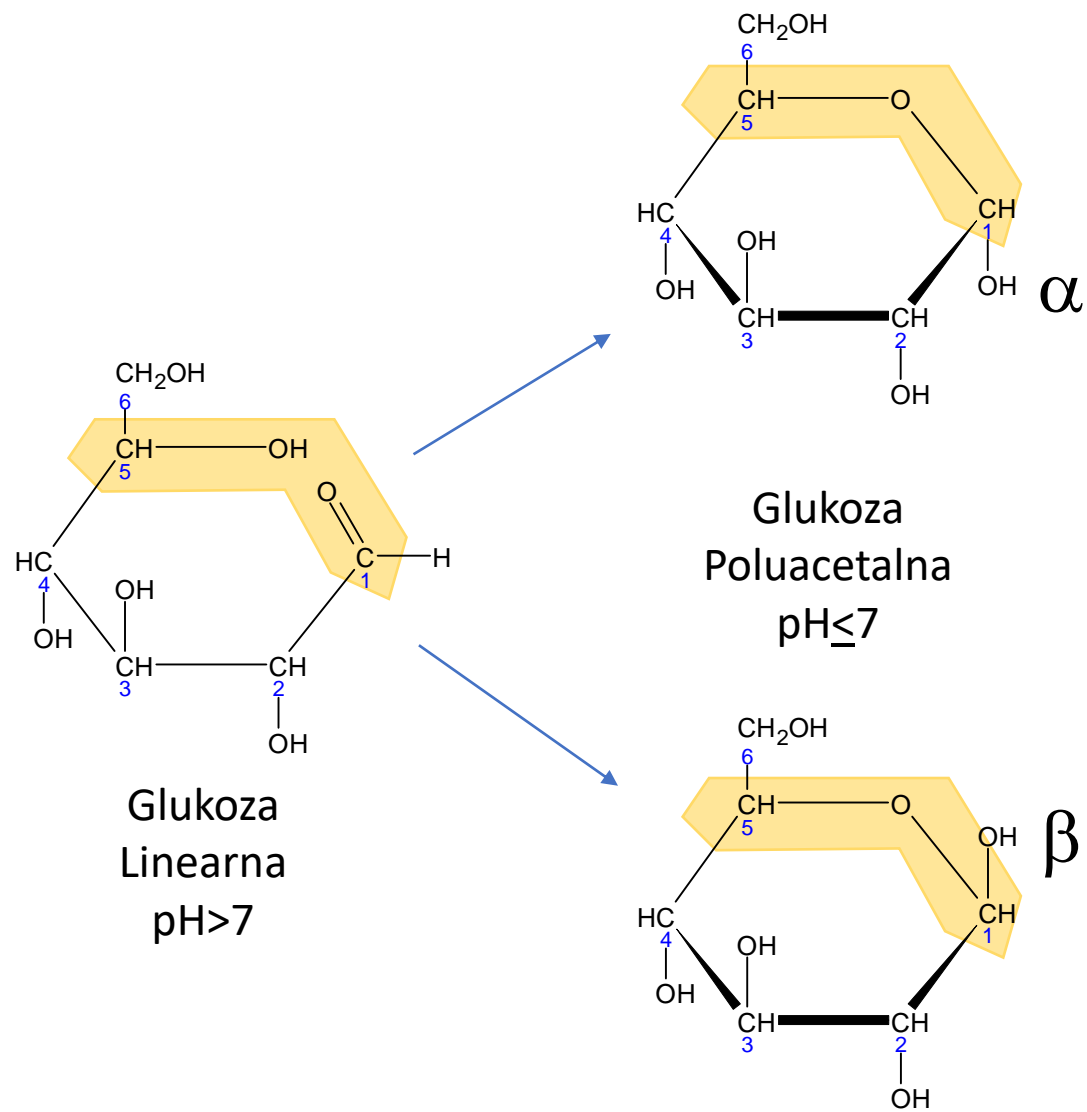
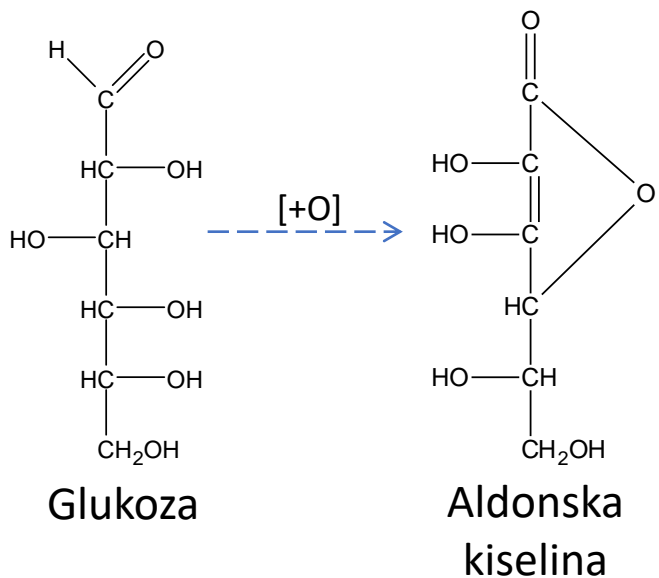
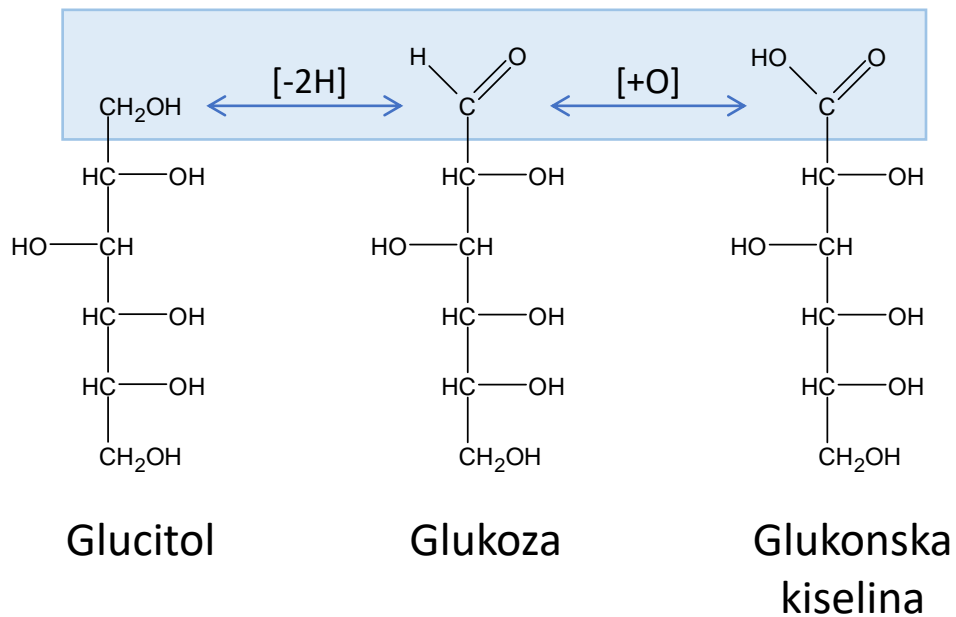
Optička (+ / -) izomerija



Optički aktivna jedinjenja rotiraju ravan polarizovane svetlosti propuštene kroz njihov rastvor

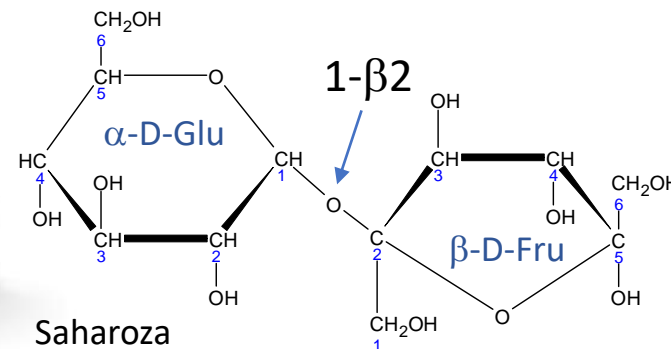
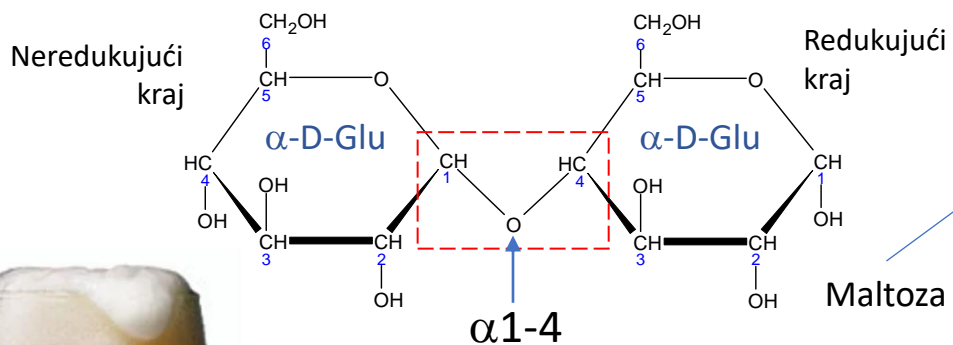
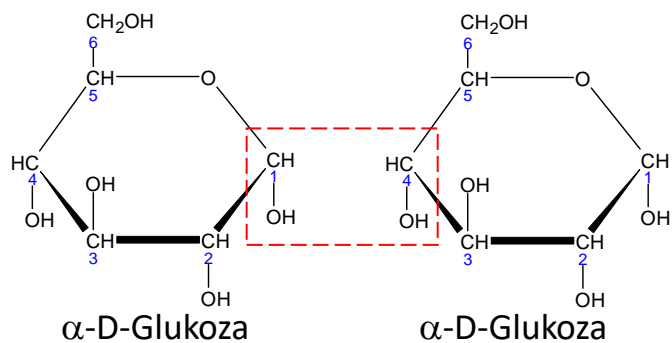


REAKCIJE MONOSAHARIDA

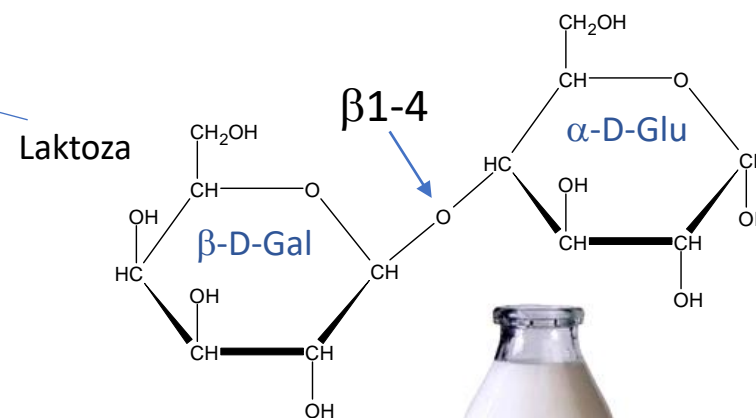
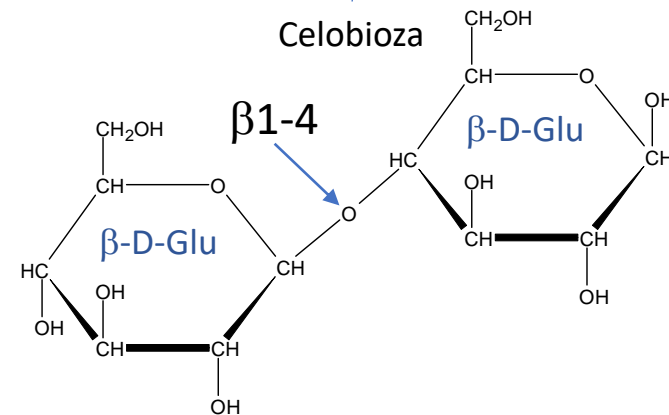


POLISAHARIDI

Glikozidna veza



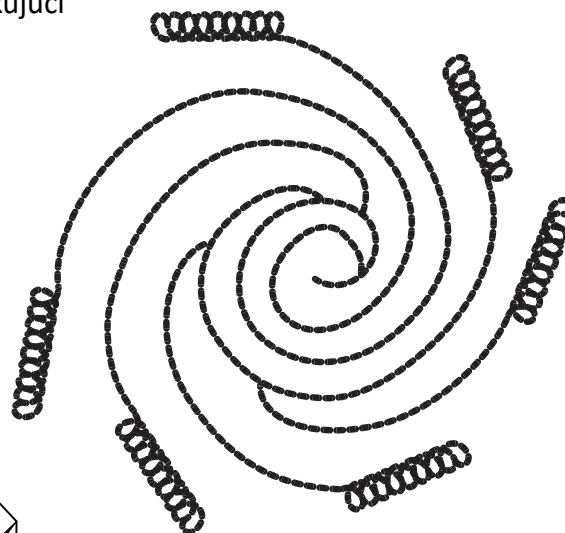
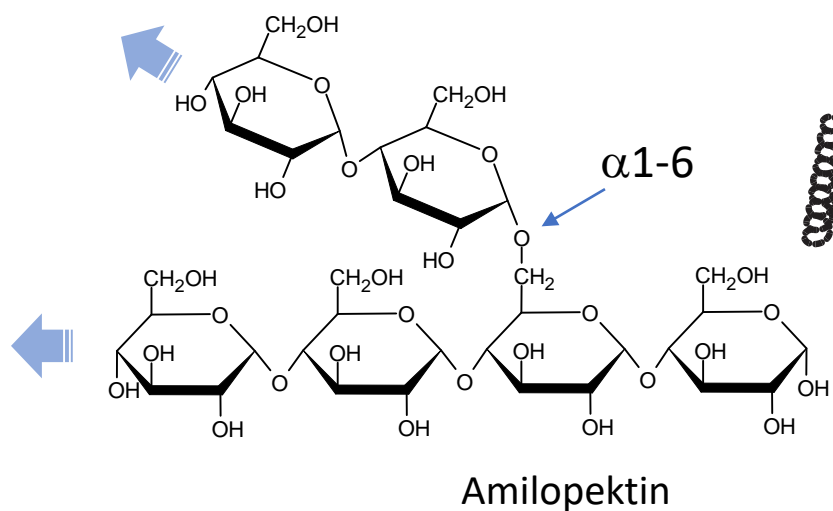
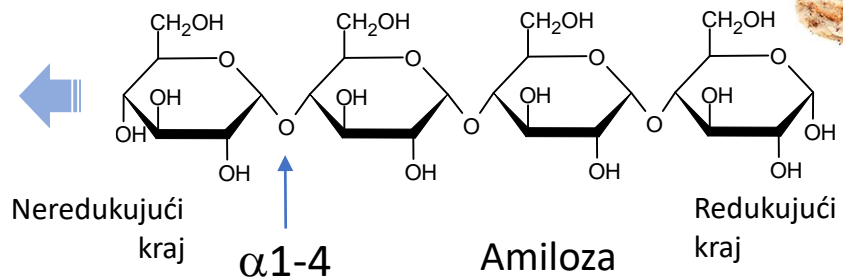
Disaharidi



POLISAHARIDI

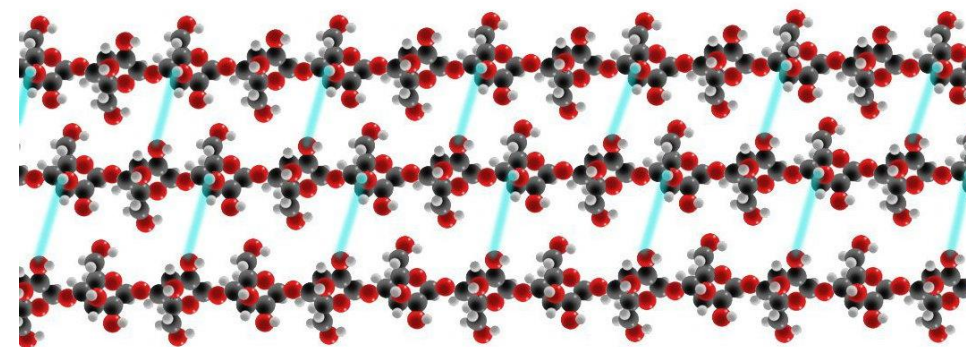
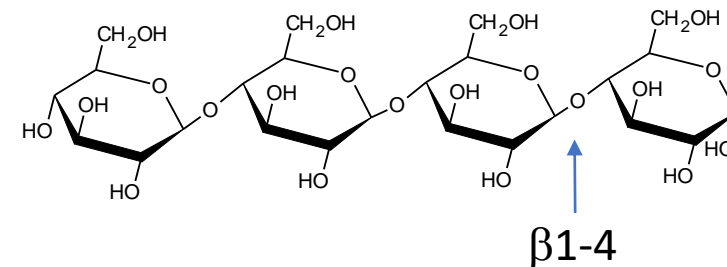
Skrob

- rezervni polisaharid biljaka
- monomerna jedinica: α -D-glukoza
- glikozidne veze: α 1-4, α 1-6
- broj glikozidnih jedinica: 10^2 do 10^5
- grananje na 20 - 24 glikozidnih ostataka



Celuloza

- gradivni polisaharid biljaka
- monomerna jedinica: β -D-glukoza
- glikozidne veze: β 1-4
- broj glikozidnih jedinica: 10^2 do 10^4

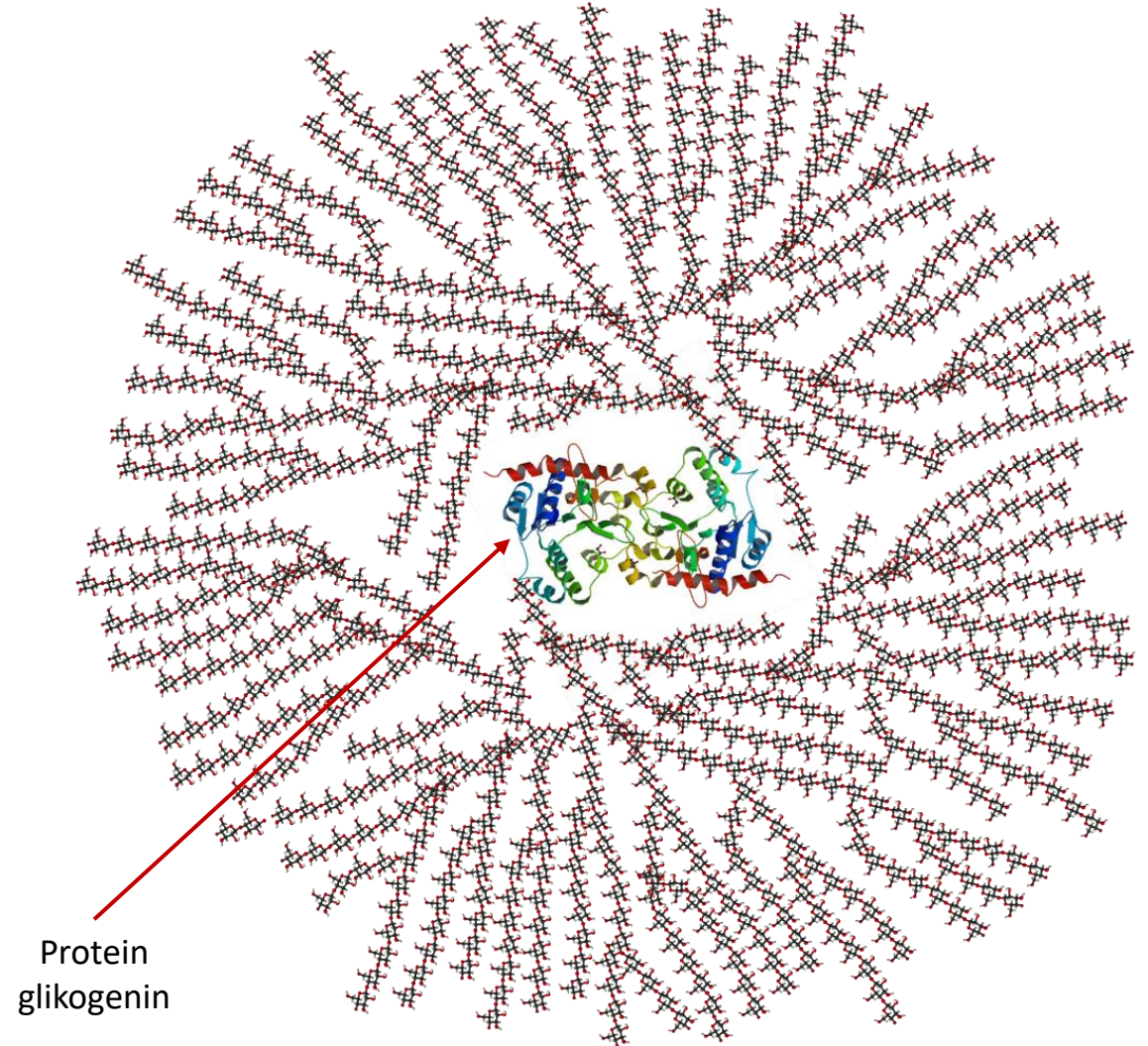
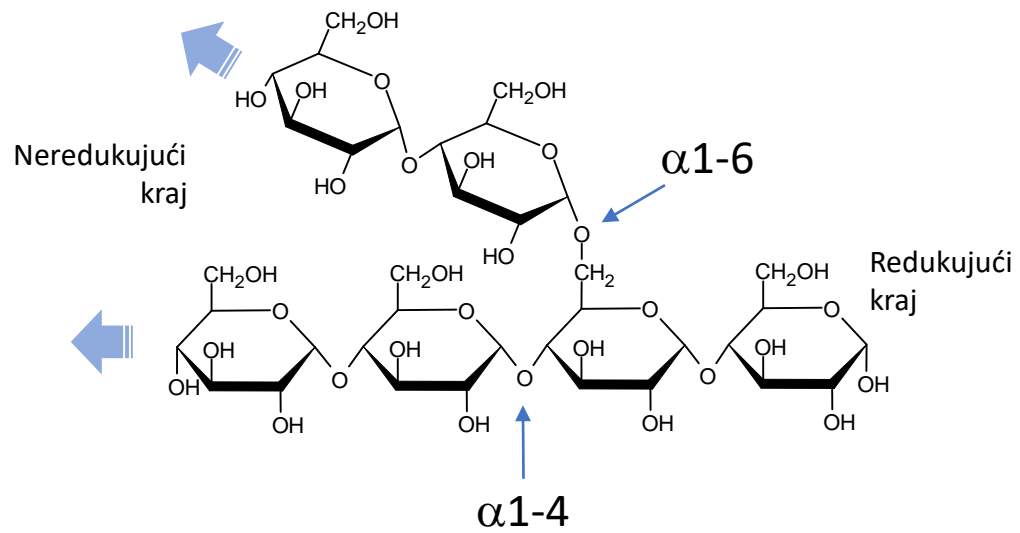


Lanci celuloze povezani bočnim vodoničnim vezama (CeresVesta, Wikipedia)

POLISAHARIDI

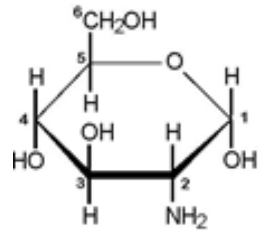
Glikogen

- rezervni polisaharid životinja
- monomerna jedinica: α -D-glukoza
- glikozidne veze: α 1-4, α 1-6
- broj glikozidnih jedinica: $\sim 3 \times 10^5$
- grananje na 10 – 14 glukozidnih ostataka

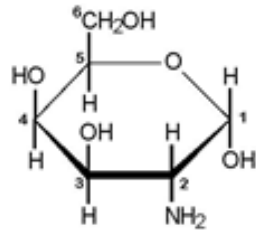


Molekul glikogena
(Mikael Häggström, Wikipedia)

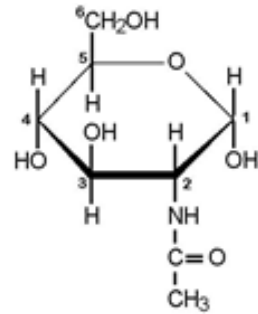
DERIVATI UGLJENIH HIDRATA



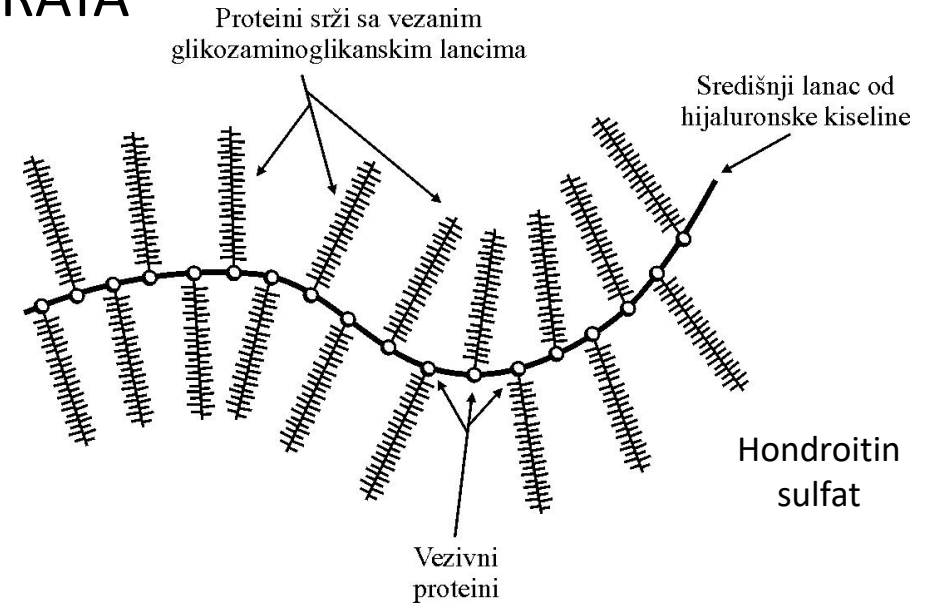
α -D-glukozamin



D-galaktozamin



N-acetilglukozamin



Važni glikozaminoglikani

Glikozamino-glukan	Uronska kiselina	Amino-šećer	Heksoza	Sulfonovani ostatak	Veza sa proteinom	Rasprostranjen u tkivima
Hondroitin sulfat	GlcA	GalNAc	-	GalNAc	Xyl-Ser	Hrskavica, kost, kornea
Dermatin sulfat	IdoA GlcA	GalNAc	-	GalNAc IdoA	Xyl-Ser	Široko rasprostranjeni (npr. koža, krvni sudovi)
Heparin sulfat	GlcA	GlcN	-	GlcN	Xyl-Ser	Fibroblasti kože, zid aorte
Heparin	IdoA GlcA	GlcN GlcNAc	-	GlcN IdoA	Gal-Gal-Xyl-Ser	Mastociti
Hijaluronska kiselina	GlcA	GlcNAc	-	-	-	Sinovija, aqua vitreus, rastresito v. tkivo
Keratin sulfat	-	GlcNAc	Gal	GlcNAc Gal	GlcNAc Asn	Kornea

