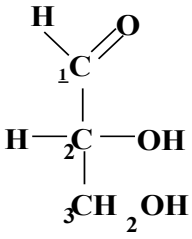
8. Sacharidy

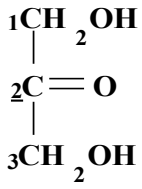
Monosacharidy

Definice monosacharidů – polyhydroxyaldehydy (ketony)

- funkční skupiny (alkoholické, karbonylové – na C1 nebo C2)
- počet uhlíků (nejvýznamnější 5 a 6)

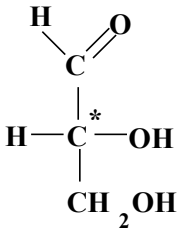


D - glyceraldehyd

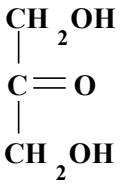


dihydroxyaceton

Základní sloučeniny monosacharidové řady aldos a ketos



D - glyceraldehyd



dihydroxyaceton

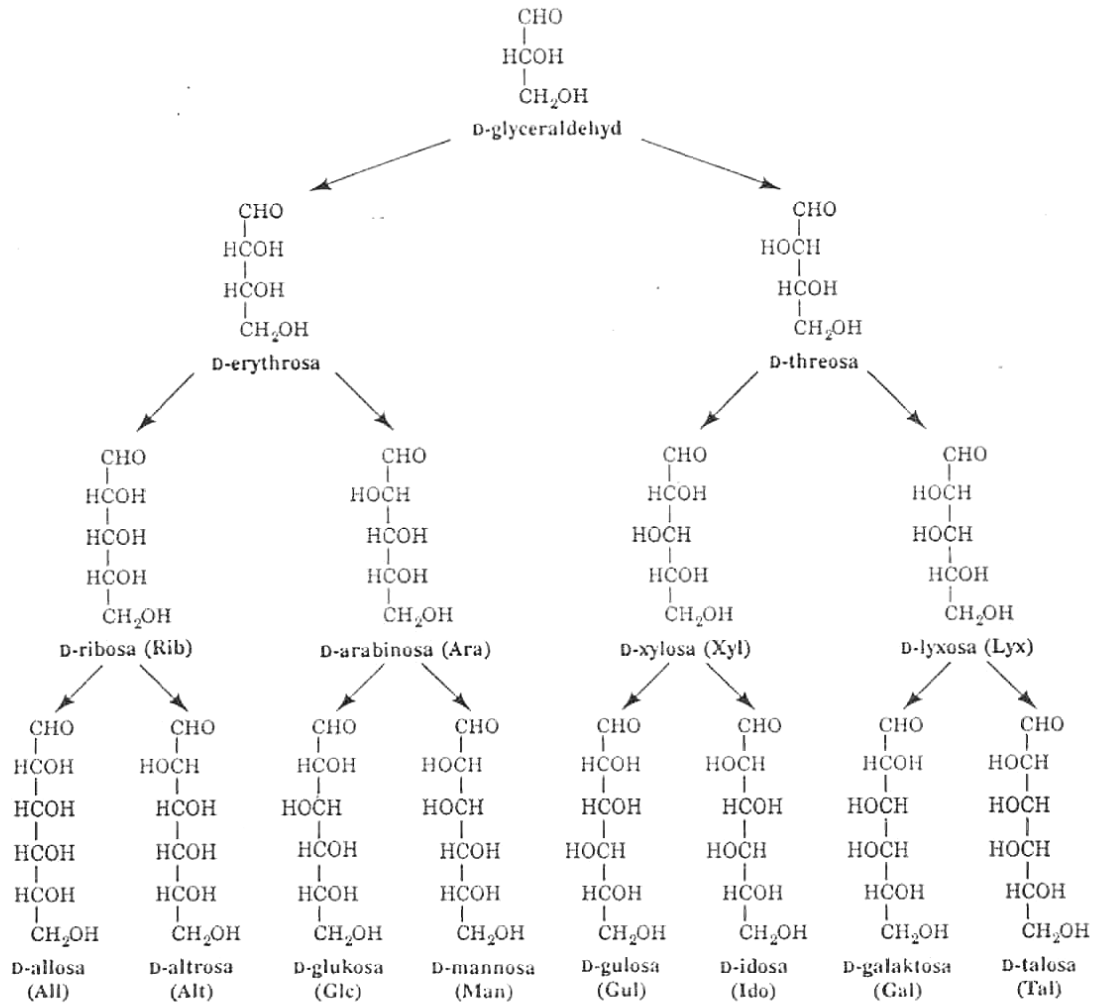
počet stereoizomerů = 2 ^{x} **(x = počet C)** *

aldosy - x = n - 2 **ketosy - x = n - 3**

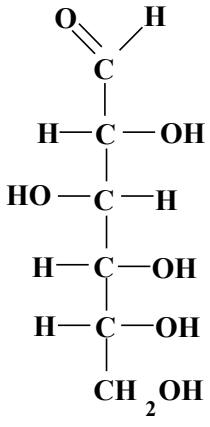
n = počet C atomů

Asymetrická centra aldos a ketos

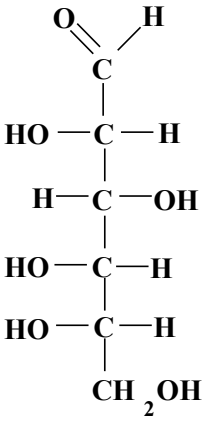
ALDOSY



Přehled D-aldos

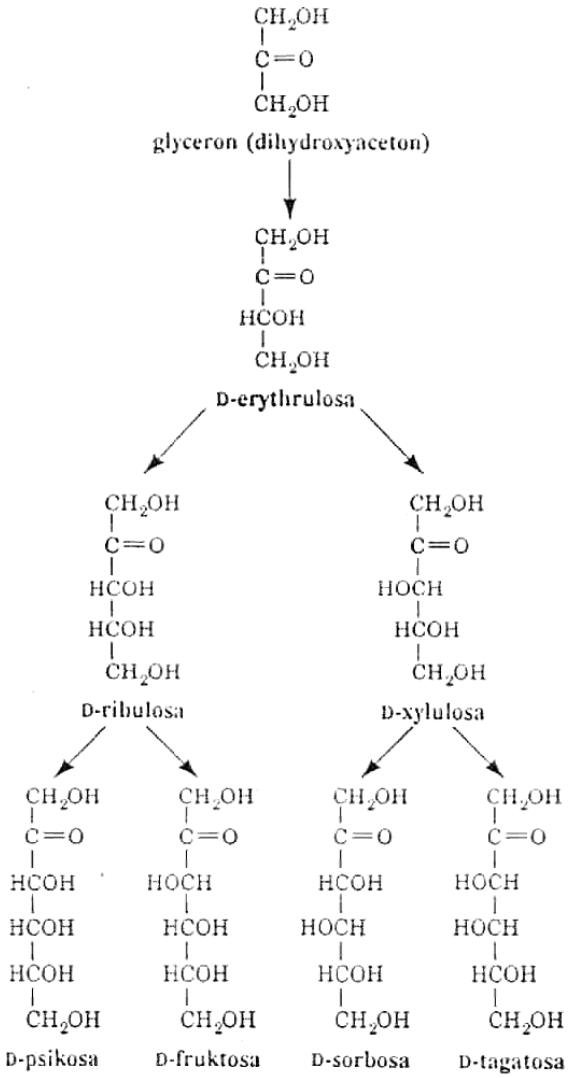


D - glukosa



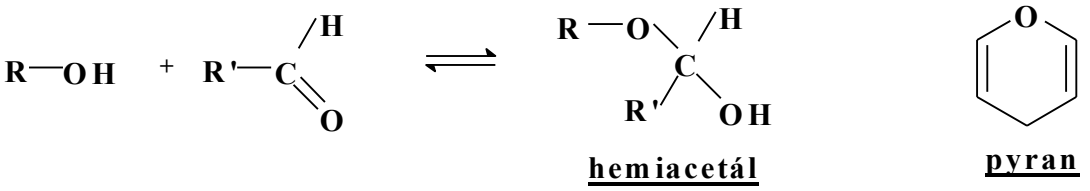
L - glukosa

KETOSY


glyceron (dihydroxyaceton)
D-erythrulosa
D-ribulosa
D-xylulosa
D-psikosa
D-fruktosa
D-sorbosa
D-tagatosa

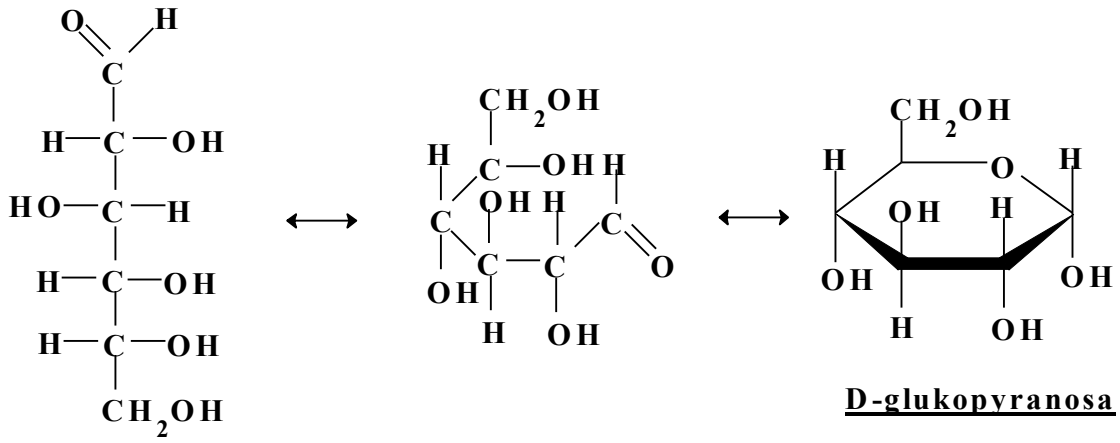
Biochemicky významné monosacharidy:

Triosy	- glyceraldehyd, dihydroxyaceton
Tetrosy	- threosa, erythrosa
Pentosy	- ribosa, deoxyribosa
Hexosy	- glukosa, manosa, galaktosa, fruktosa
Heptosa	- sedoheptulosa

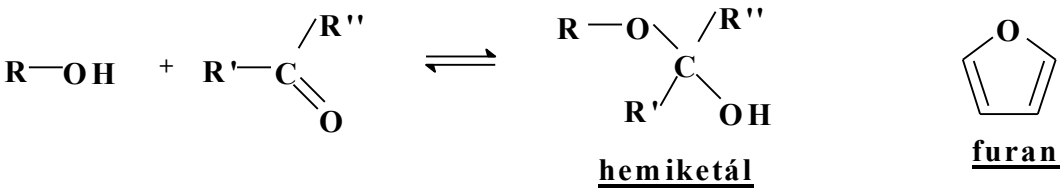


hemiacetál **pyran**

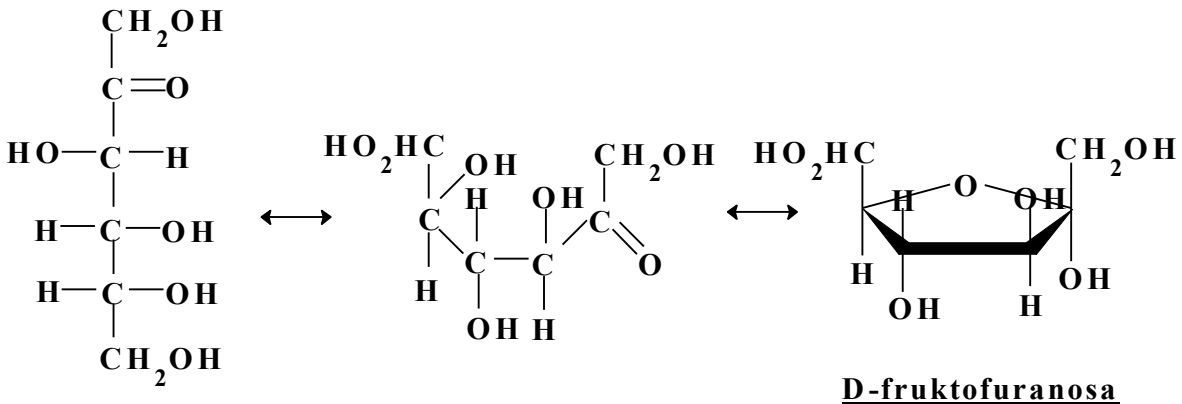
Fischerovy vzorce *Haworthovy vzorce*



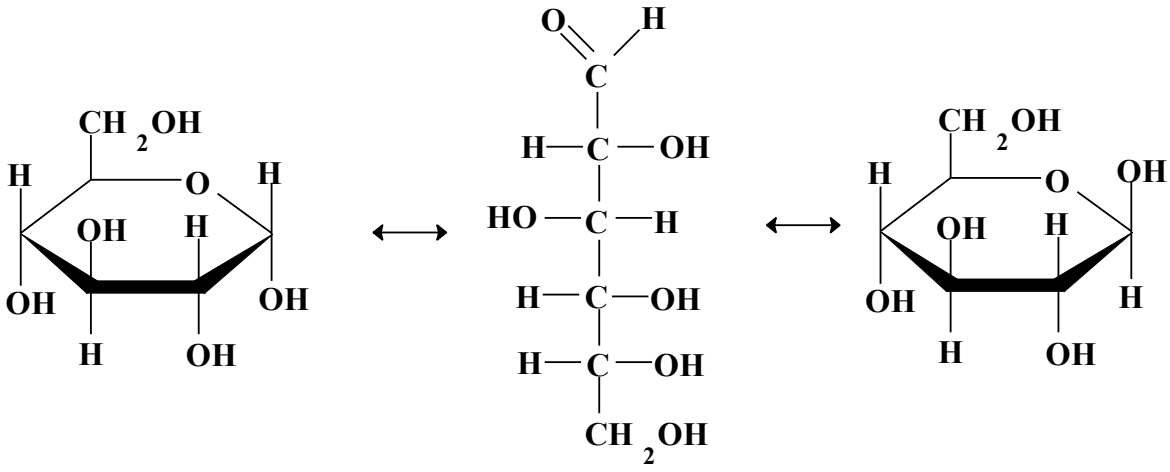
D-glukopyranosa



hemiketál **furan**



D-fruktofuranosa

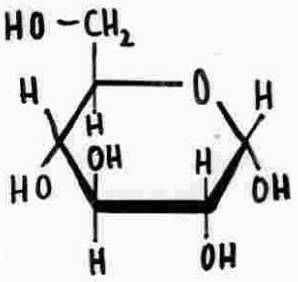


α–anomer (63 %) ⟷ MUTAROTACE ⟷ β–anomer (36 %)

vaničková **židličková**

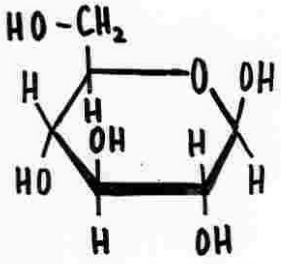
KONFORMACE

Rovnovážné formy glukosy



+

$[\alpha]_D$ + 52,5°

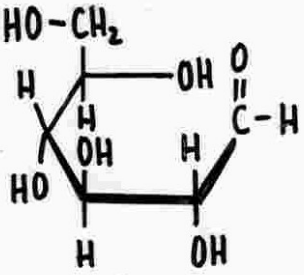


36% α-D-glukopyranosa

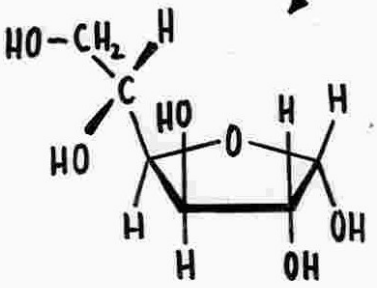
$[\alpha]_D$ + 112°

β-D-glukopyranosa 64%

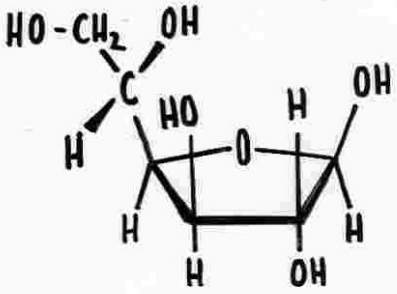
$[\alpha]_D$ + 22,5°



aldehydová forma < 0.1%



<1% α-D-glukofuranosa

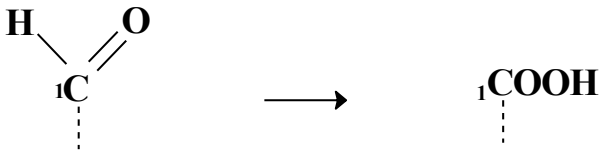


β-D-glukofuranosa < 1%

Deriváty monosacharidů

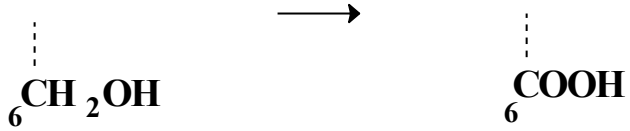
Oxidace :

A. Mírná ⇒ **aldehydická skupina → karboxylovou skupinu**



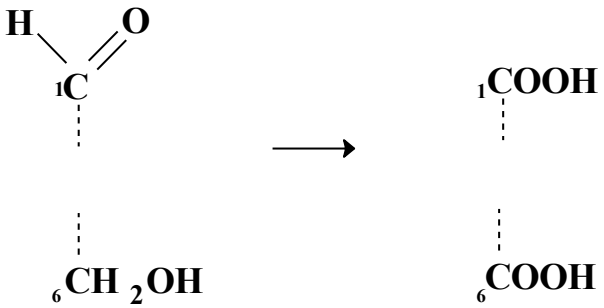
ALDONOVÉ KYSELINY - glukosa → k. glukonová

B. Specifická ⇒ **primární OH skupina → karboxylovou skupinu**



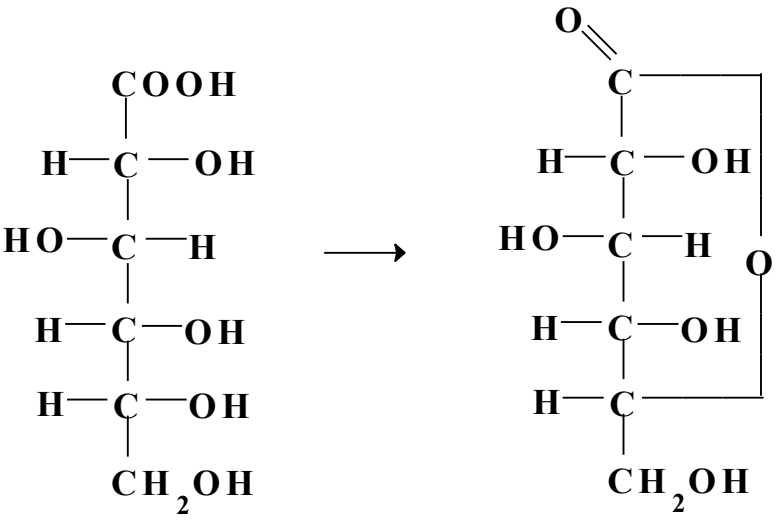
URONOVÉ KYSELINY - glukosa → k. glukuronová

C. Silná ⇒ **aldehydická skupina + primární OH skupina**

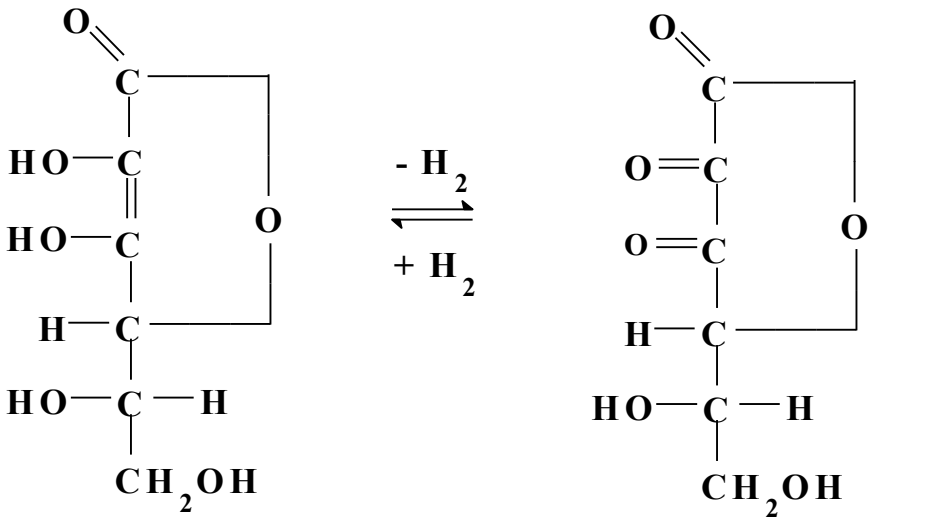


ALDAROVÉ KYSELINY - glukosa → k. glukarová

Tvorba laktonů u aldonových a uronových kyselin



k.glukonová **D-glukonolakton**

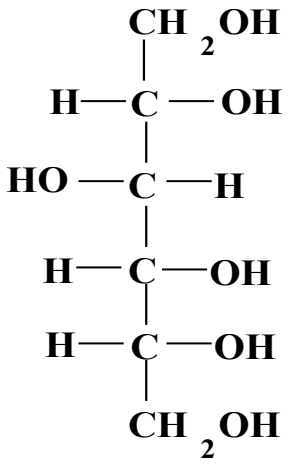


k.askorbová **k.dehydroaskorbová**

Redukce :

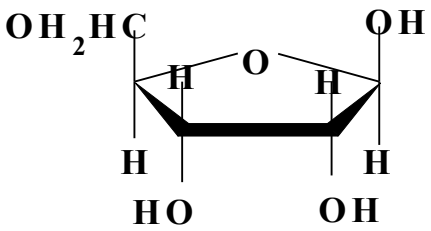
mírná ⇒ **karbonylová skupina → hydroxy skupinu**

POLYHYDROXYALKOHOLY - ALDITOLY -itol

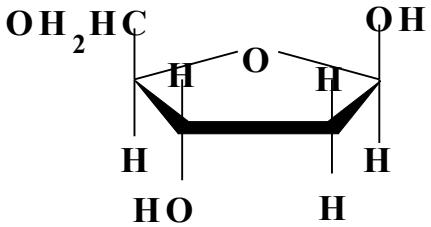


GLUCITOL - SORBITOL

Deoxycukry - OH skupina nahrazena H

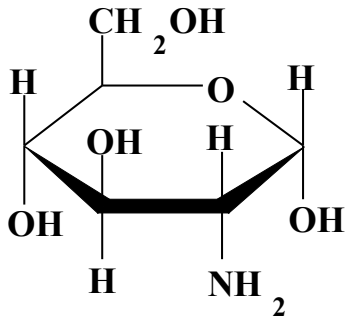


RIBOSA

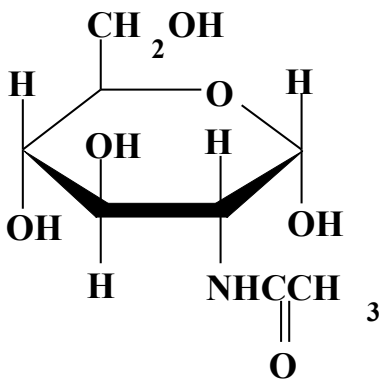


DEOXYRIBOSA

Aminocukry - OH skupina nahrazena NH_2 skupinou

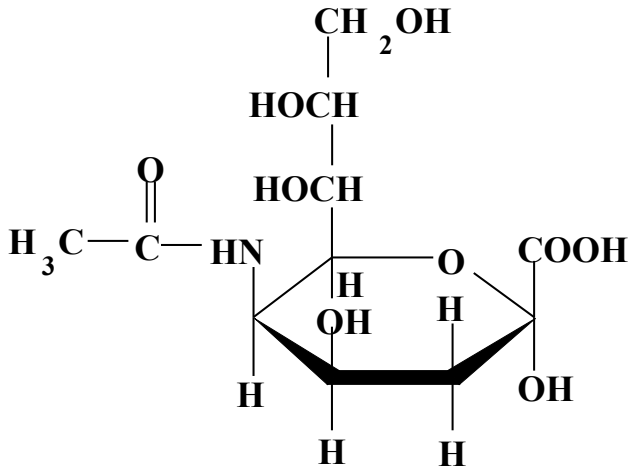


GLUKOSAMIN



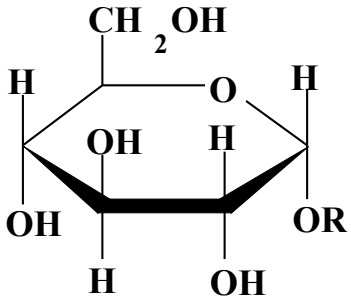
N-ACETYLGLUKOSAMIN

<u>Sialové kyselina</u> - kondenzace N-acetylmanosaminu + pyruvátu



<u>K. SIALOVÁ</u>

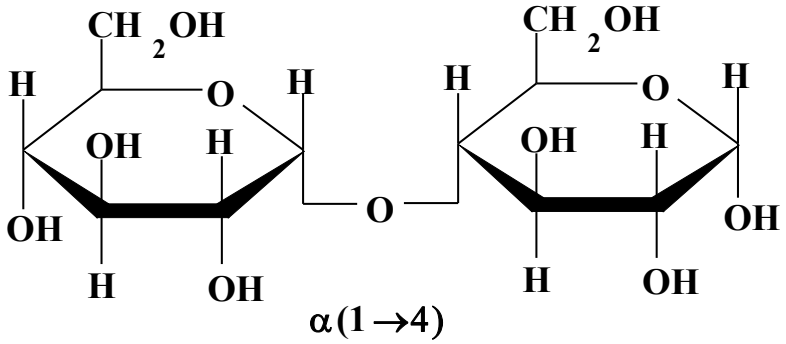
Glykosidy :



O-glukosid

glykosidická vazba - OR, SR, NR - specificky štěpí glykosidasy

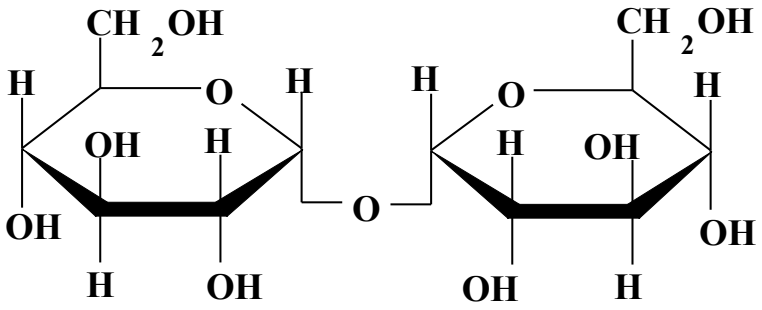
Homoglykosidy – sacharid + sacharid - di-, tri-,…, oligo-, polysacharidy
Heteroglykosidy – sacharid + aglykon



$\alpha(1 \rightarrow 4)$

MALTOSA

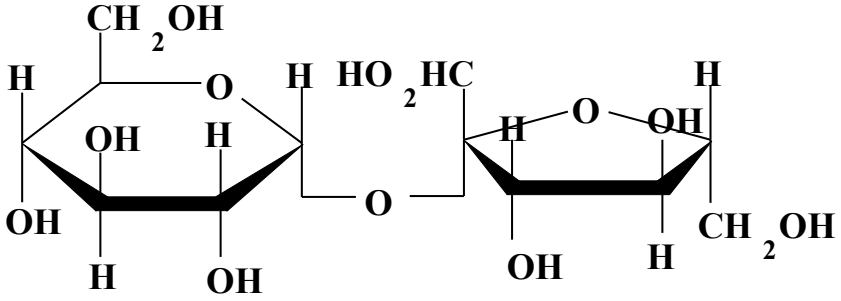
O - α -D - glukopyranosyl (1→4) - α -D – glukopyranosa



$\alpha 1 \rightarrow \alpha 1$

TREHALOSA

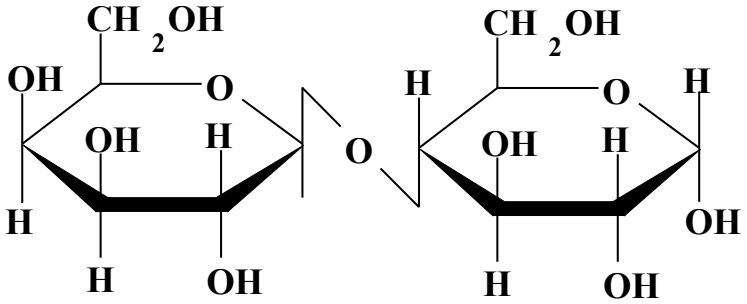
O - α -D - glukopyranosyl (1→1) - α -D – glukopyranosid



$\alpha 1 \rightarrow \beta 2$

SACHAROSA

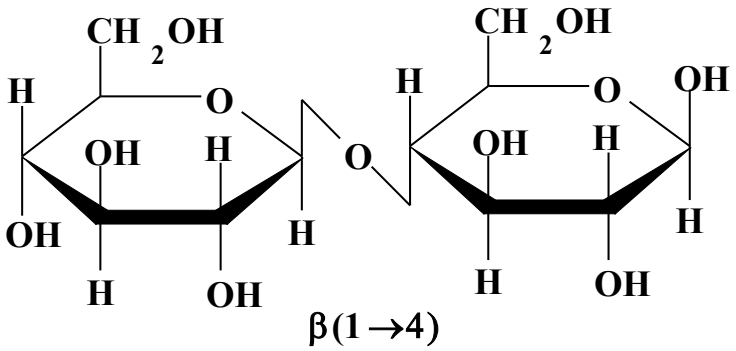
O - α -D - glukopyranosyl (1→2) - β - D – fruktofuranosid



$\beta (1 \rightarrow 4)$

LAKTOSA

O - β -D - galaktopyranosyl (1→4) - β -D – glukopyranosa



CELLOBIOSA

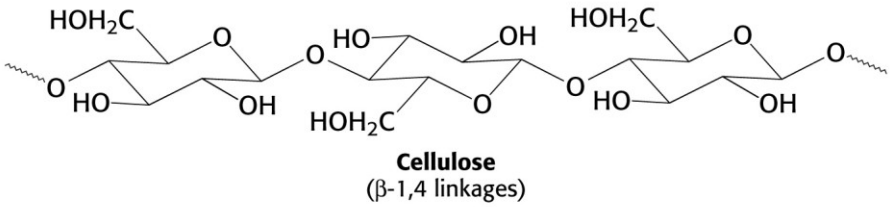
O - β -D - glukopyranosyl (1→4) - β -D - glukopyranosa

Polysacharidy

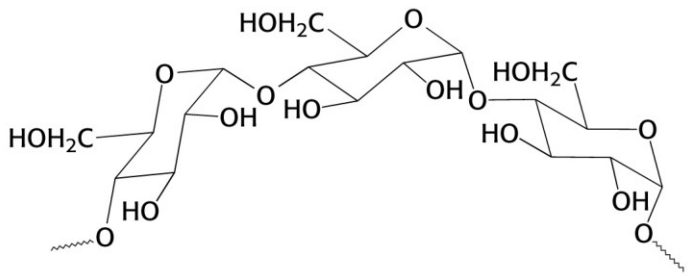
Jednoduché x složené

Zásobní x strukturní

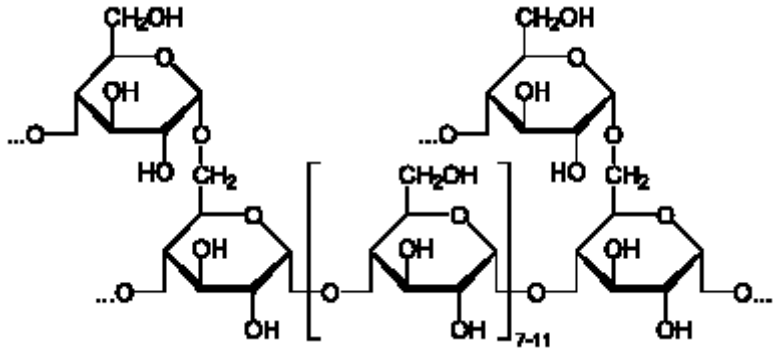
Jednoduché – (poly)glukany

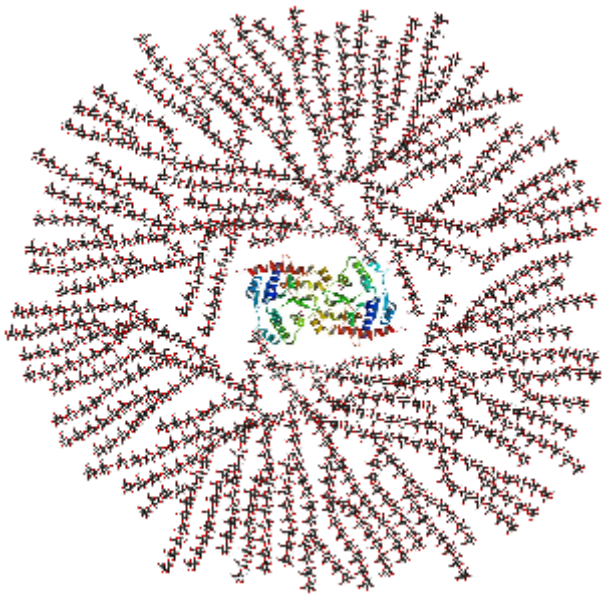


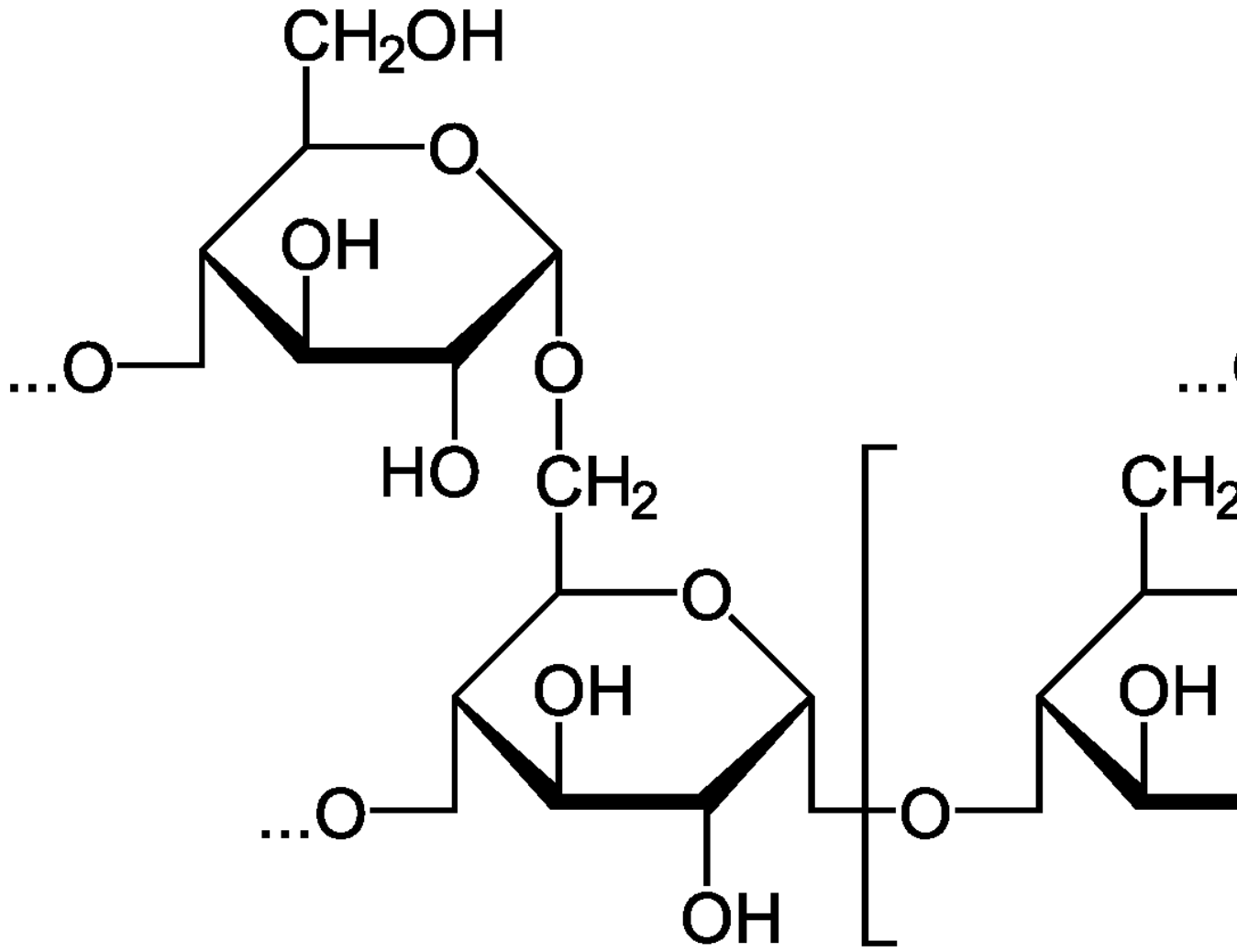
Cellulose
(β-1,4 linkages)



Starch and Glycogen
(α-1,4 linkages)

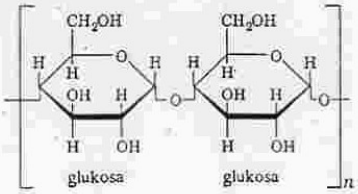

CH2OH
O
OH
HO
CH2
...O
O
OH
OH
O
CH2OH
O
OH
OH
7-11
O
CH2OH
O
OH
HO
CH2
...O
O
OH
OH
O...



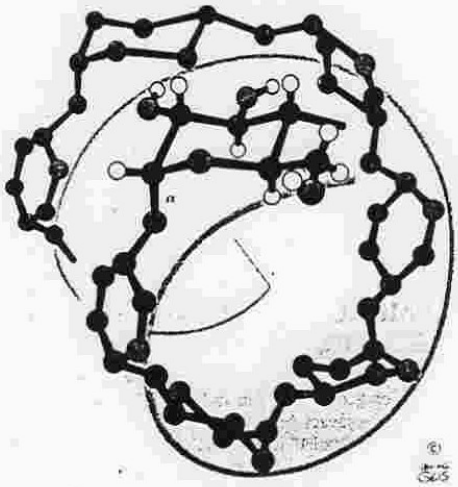

CH2OH
O
OH
...O
O
HO
CH2
O
OH
...O
O
OH
CH2
OH

AMYLOSA

(a)

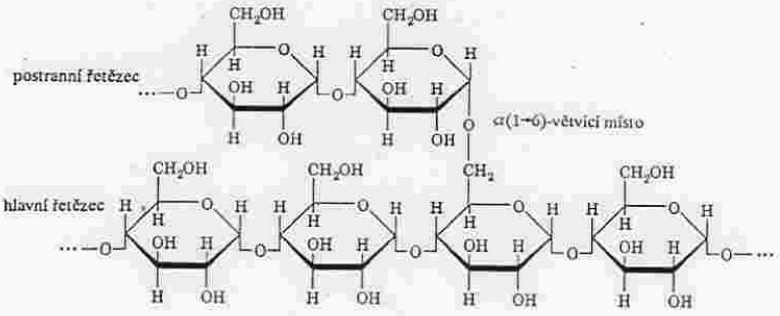


(b)

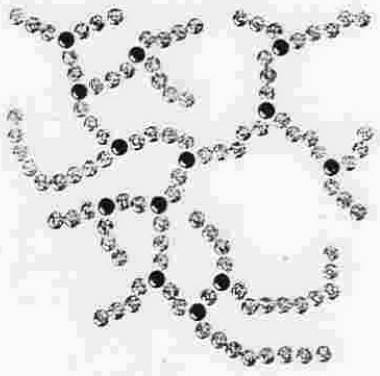


AMYLOPEKTIN

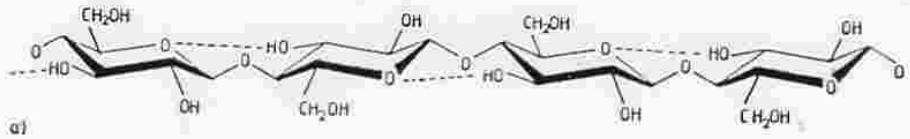
(a)

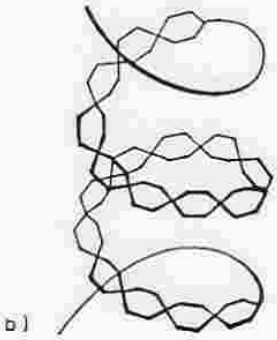


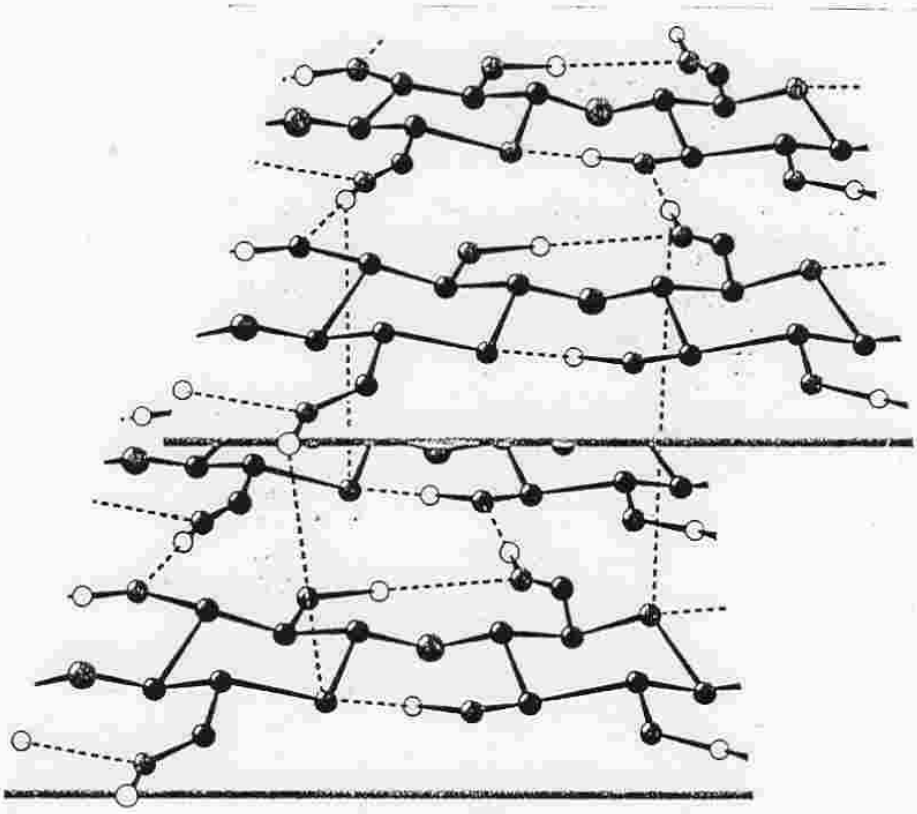
(b)



Celulosa

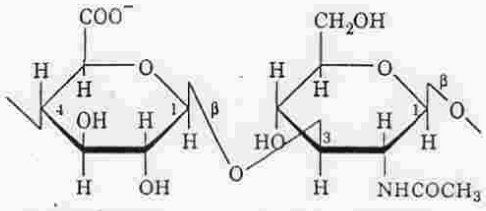






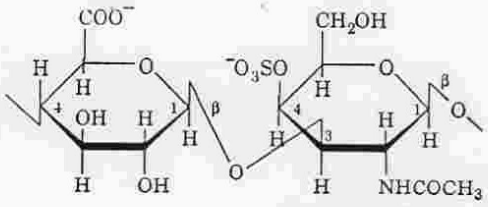
CELULOSA

HETEROPOLYSACHARIDY - glykosaminoglykany



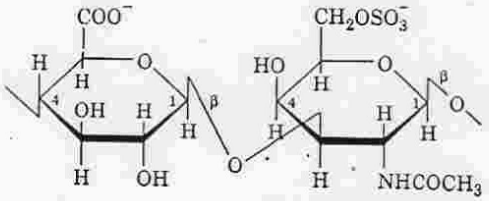
D-glukuronurát N-acetyl-D-glukosamin

hyaluronát



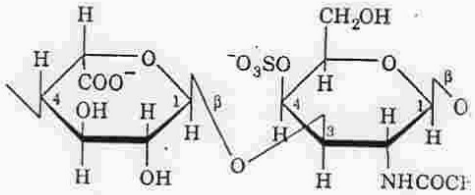
D-glukuronurát N-acetyl-D-galaktosamin-4-sulfát

choňdroitin-4-sulfát



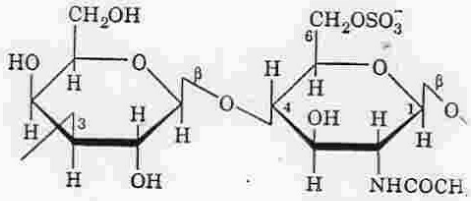
D-glukuronurát N-acetyl-D-galaktosamin-6-sulfát

chondroitin-6-sulfát



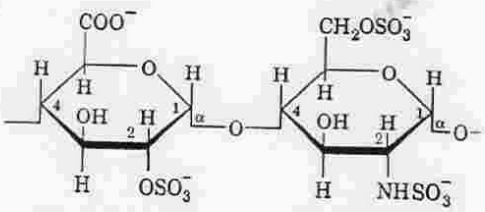
L-iduronát N-acetyl-D-glukosamin-4-sulfát

dermatansulfát



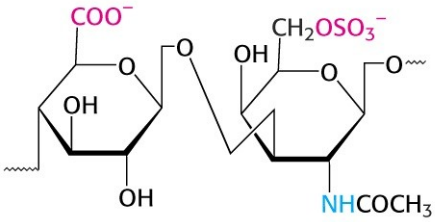
D-galaktosa N-acetyl-D-glukosamin-6-sulfát

keratansulfát

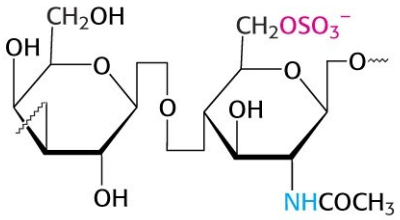


D-glukurono-2-sulfát N-sulfo-D-glukosamin-6-sulfát

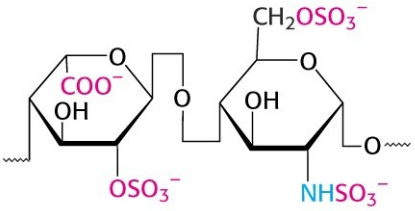
heparin



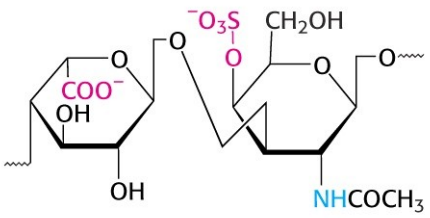
Chondroitin 6-sulfate



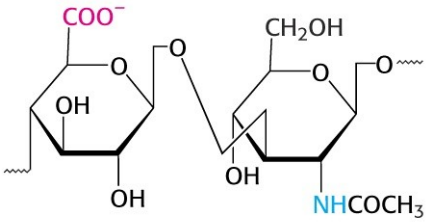
Keratan sulfate



Heparin

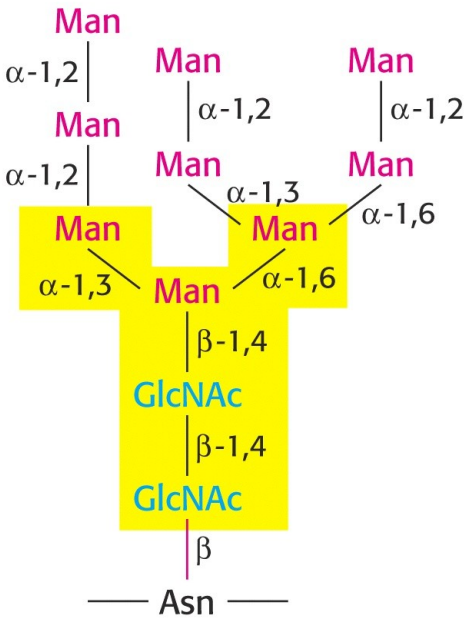


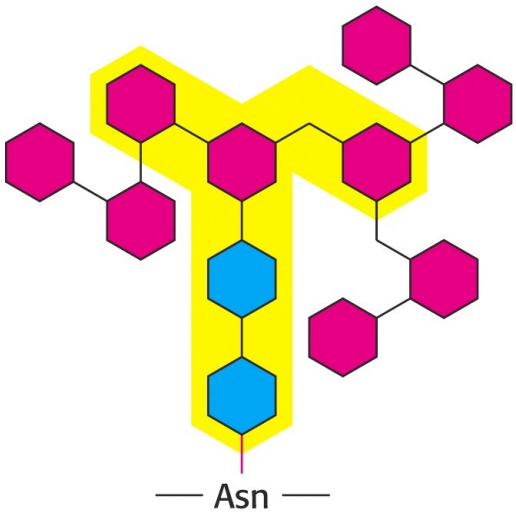
Dermatan sulfate

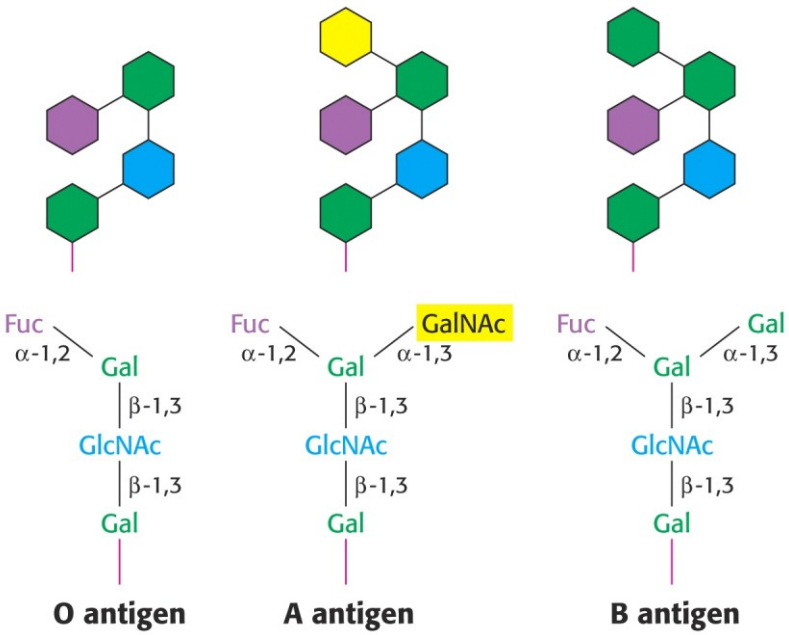


Hyaluronate

(A)






Fuc
α-1,2
Gal
β-1,3
GlcNAc
β-1,3
Gal
O antigen
Fuc
α-1,2
Gal
GalNAc
α-1,3
β-1,3
GlcNAc
β-1,3
Gal
A antigen
Fuc
α-1,2
Gal
Gal
α-1,3
β-1,3
GlcNAc
β-1,3
Gal
B antigen