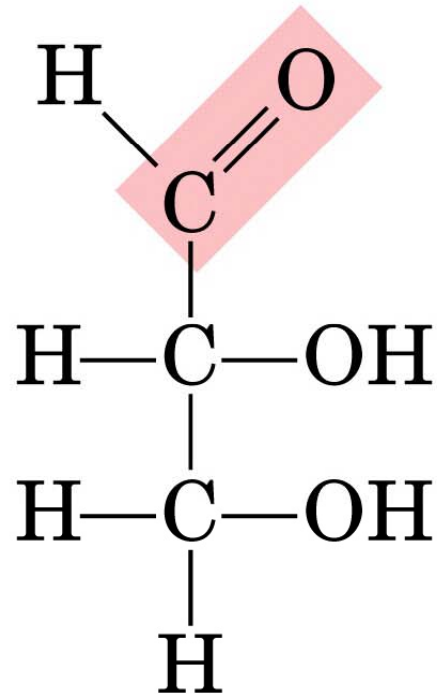
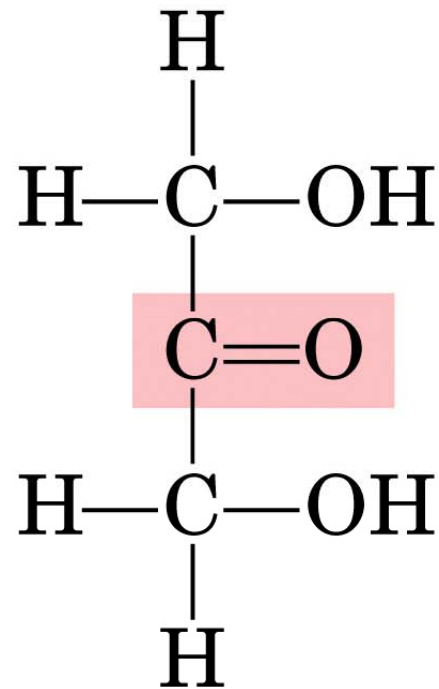


I monosaccaridi sono derivati aldeidici e chetonici di alcoli poliossidrilici a catena lineare, contenenti almeno tre atomi di carbonio

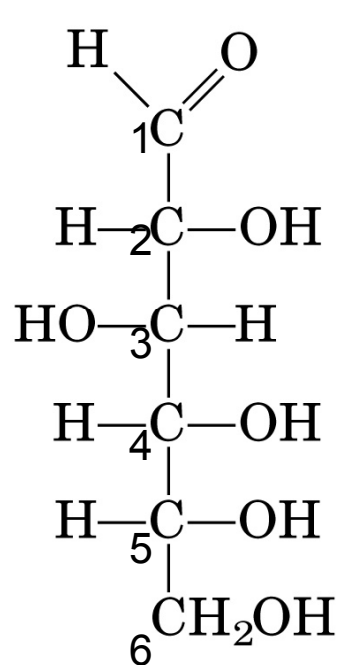


Glyceraldehyde,
an aldotriose



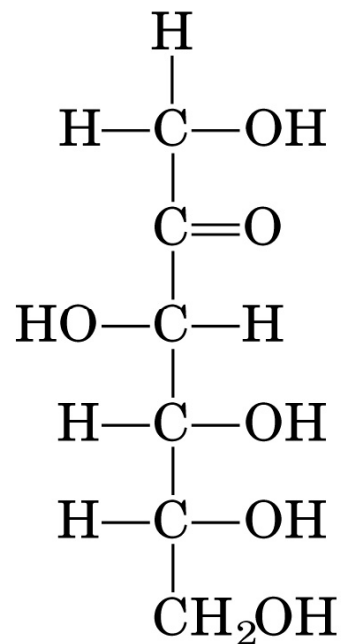
Dihydroxyacetone,
a ketotriose

(a)

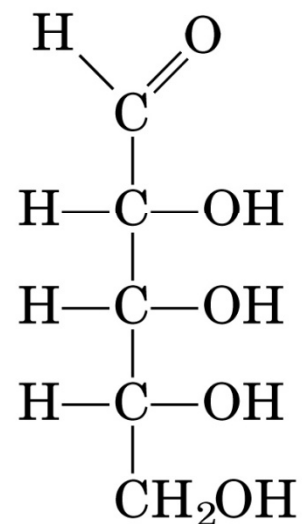


D-Glucose,
an aldohexose

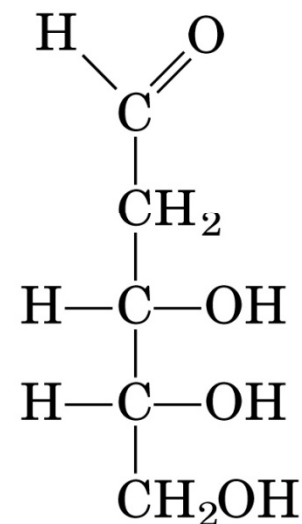
(b)



D-Fructose,
a ketohexose



D-Ribose,
an aldopentose



2-Deoxy-D-ribose,
an aldopentose

(c)

I monosaccaridi contengono uno o più atomi di carbonio asimmetrici (chirali). Per convenzione gli zuccheri della serie D hanno la stessa configurazione assoluta del centro chirale più lontano dal gruppo carbonilico della D gliceraldeide

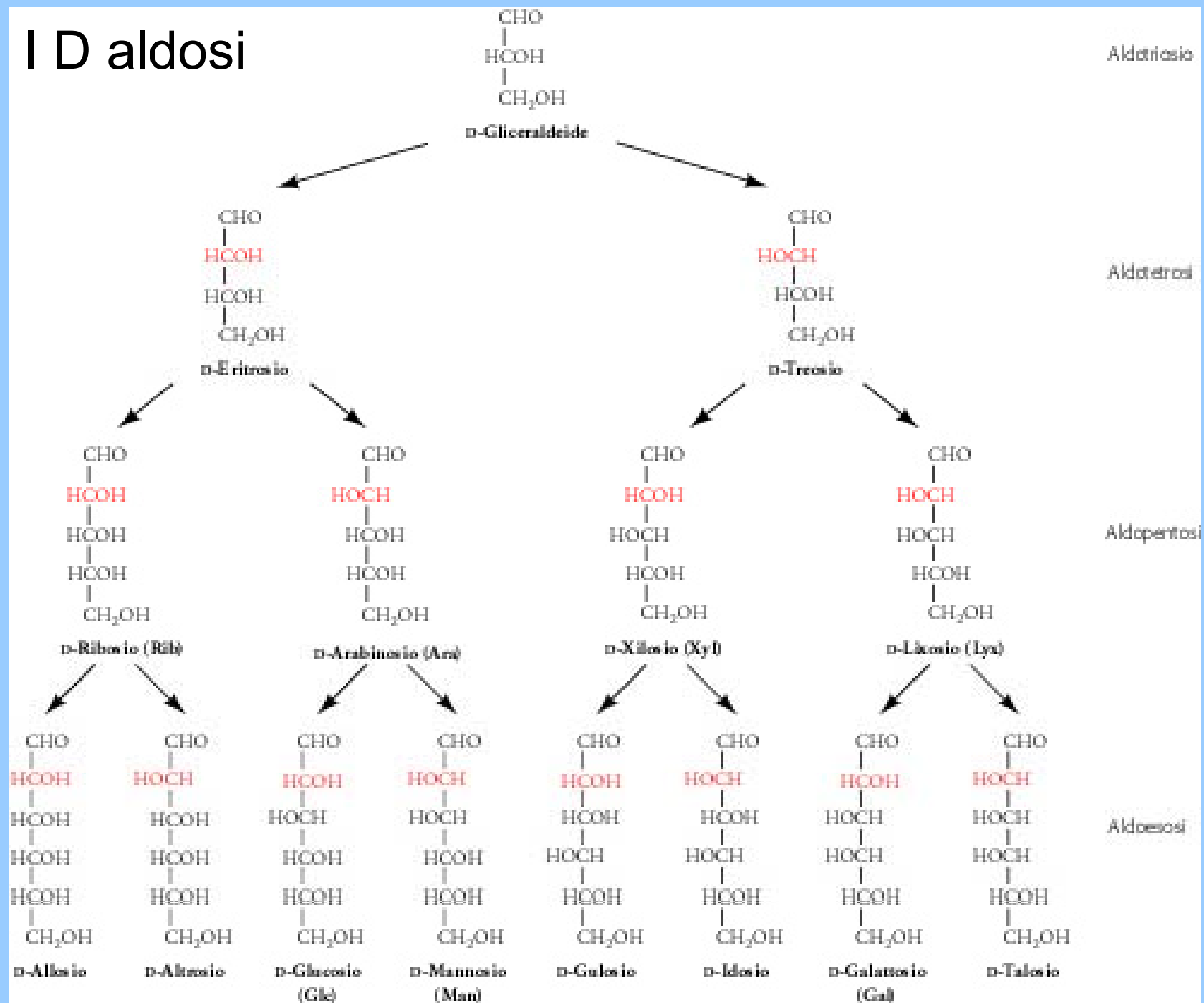


Fischer projection formulas

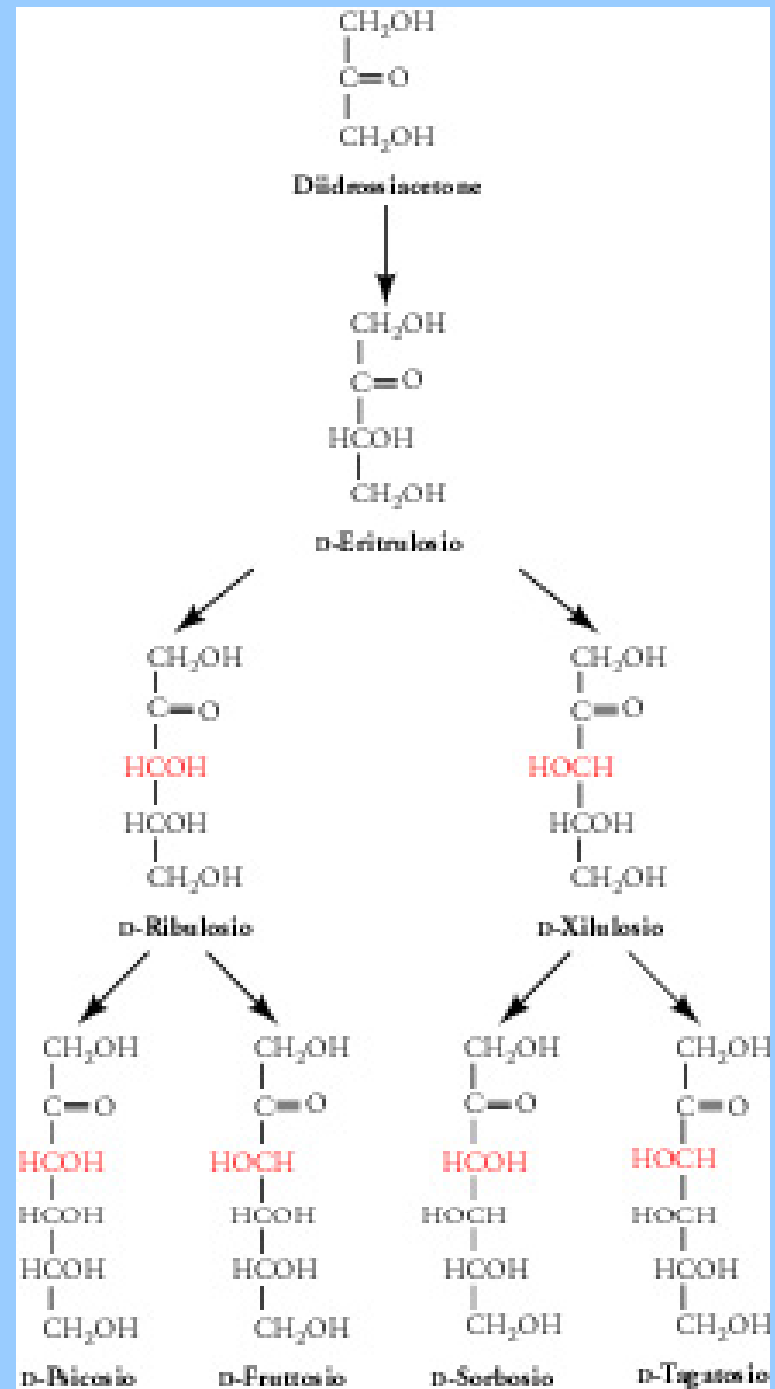


Perspective formulas

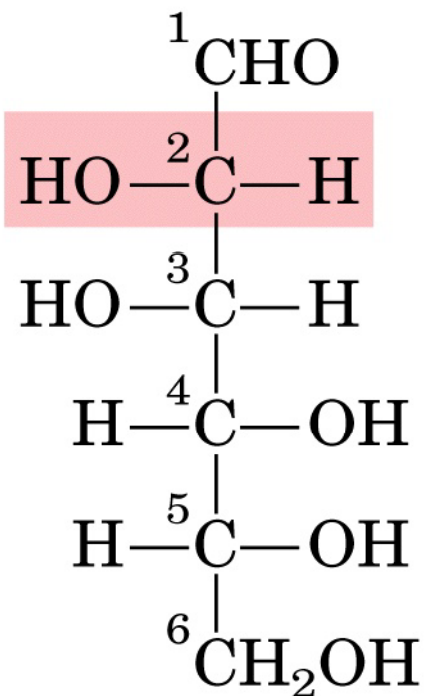
I D aldosi



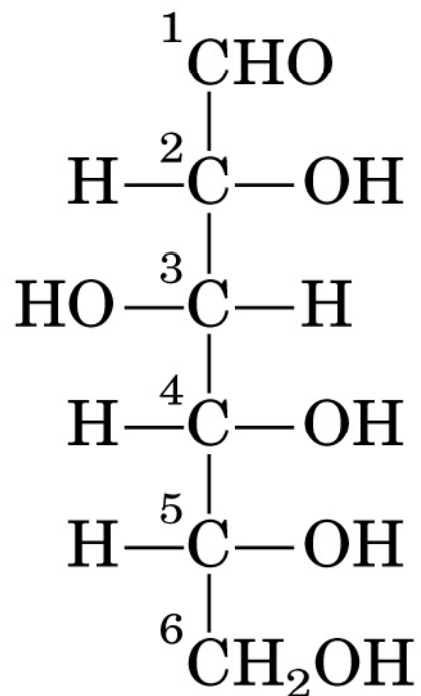
I D chetosi



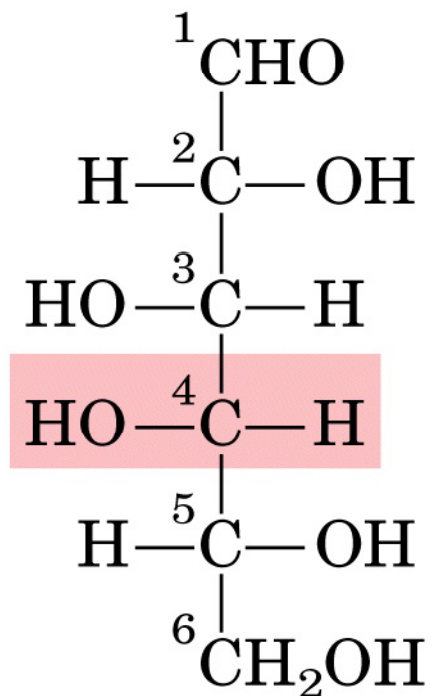
Gli epimeri



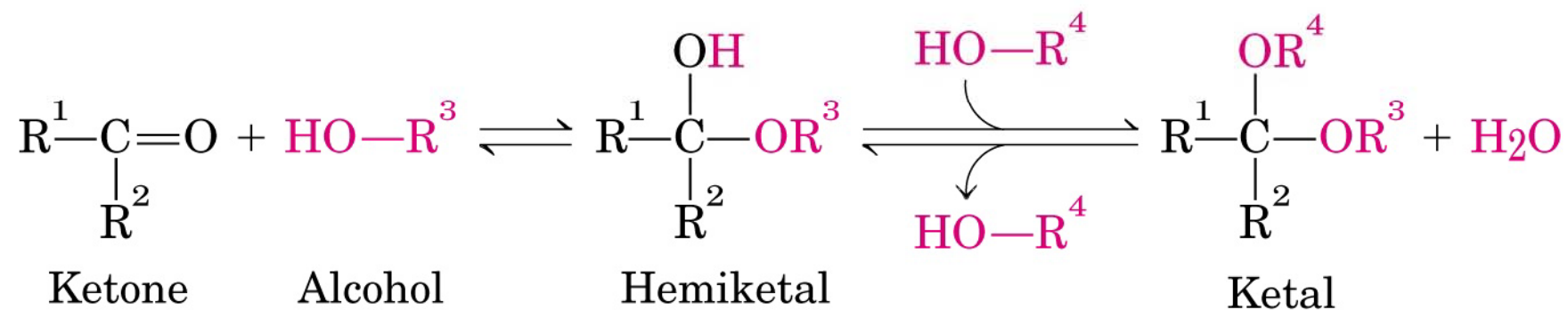
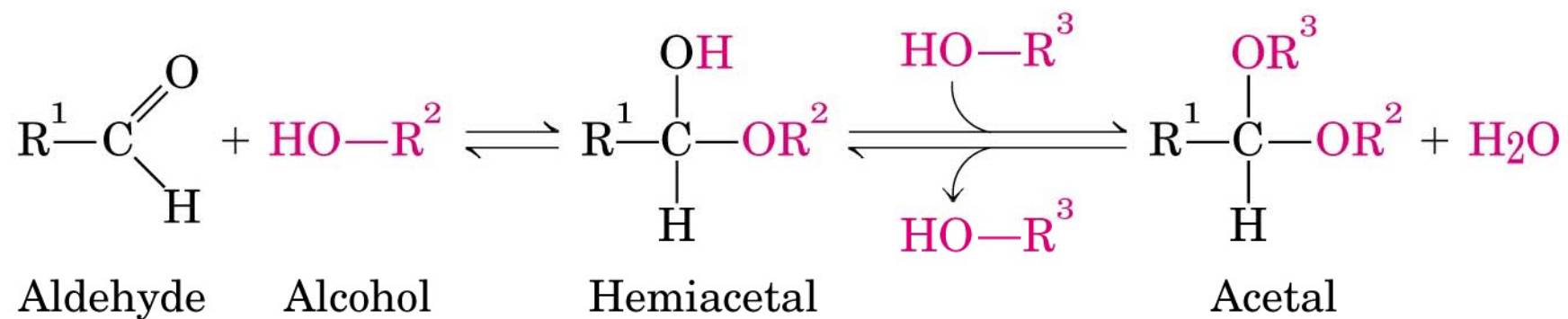
D-Mannose
(epimer at C-2)



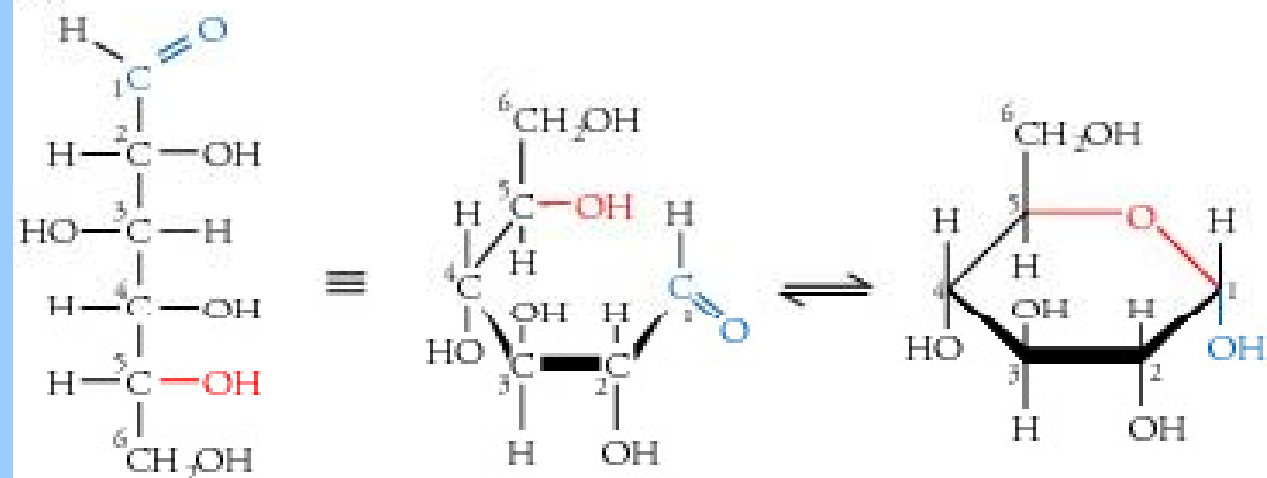
D-Glucose



D-Galactose
(epimer at C-4)

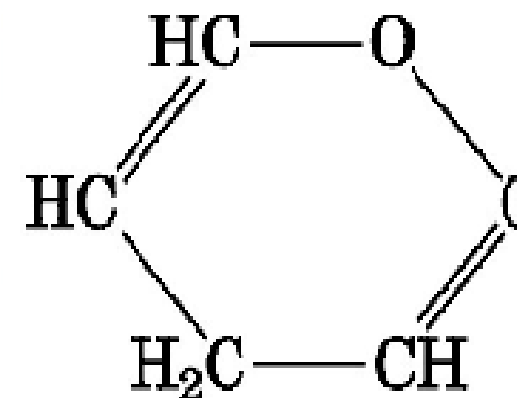


(a)



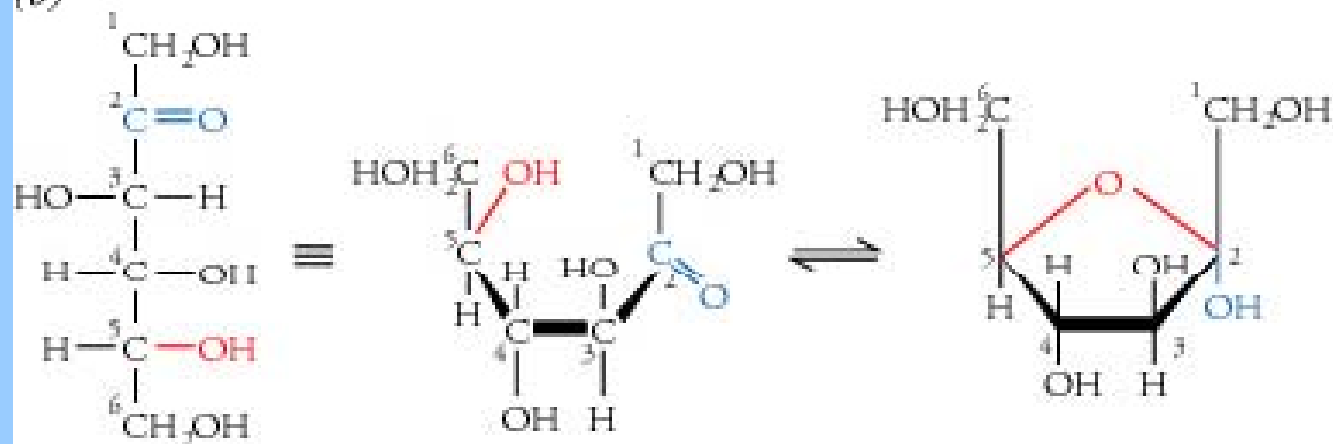
D-Glucosio
(forma lineare)

α-D-Glucopiranosio
(proiezione di Haworth)



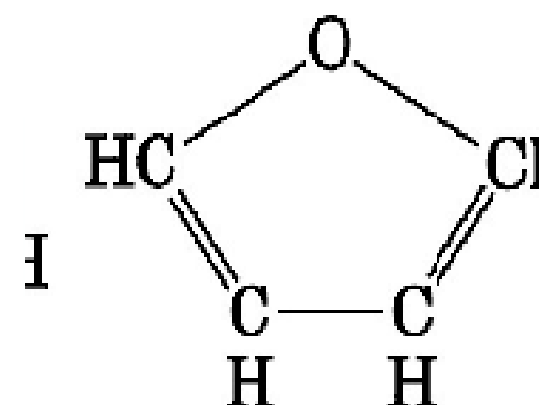
Pyran

(b)



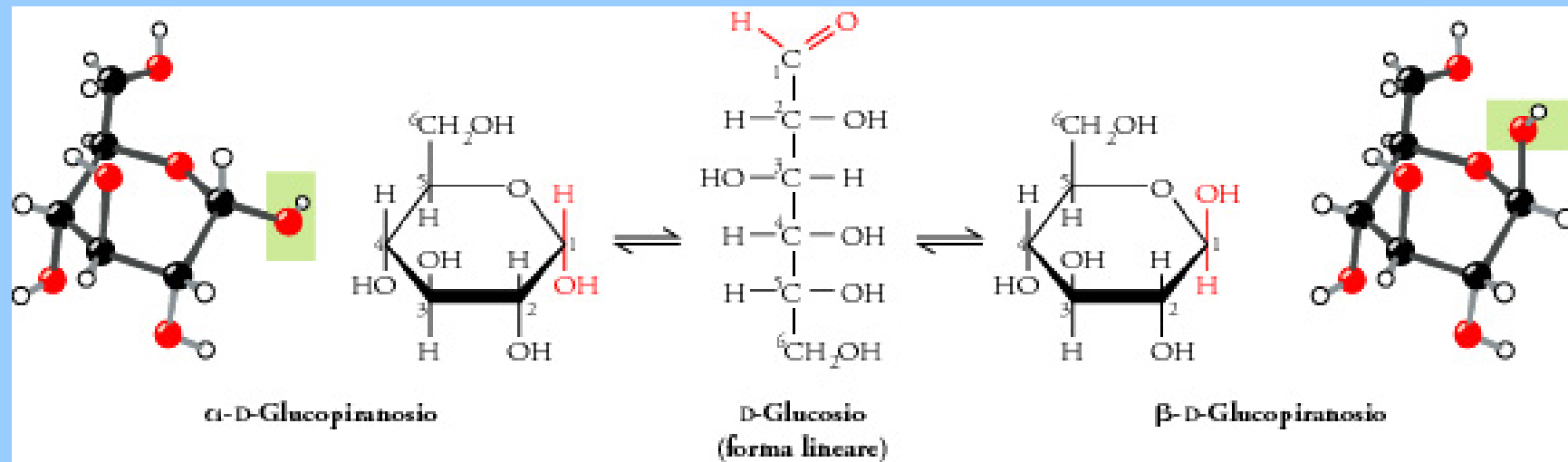
D-Fruttosio
(forma lineare)

α-D-Fruttofuranosio
(proiezione di Haworth)



Furan

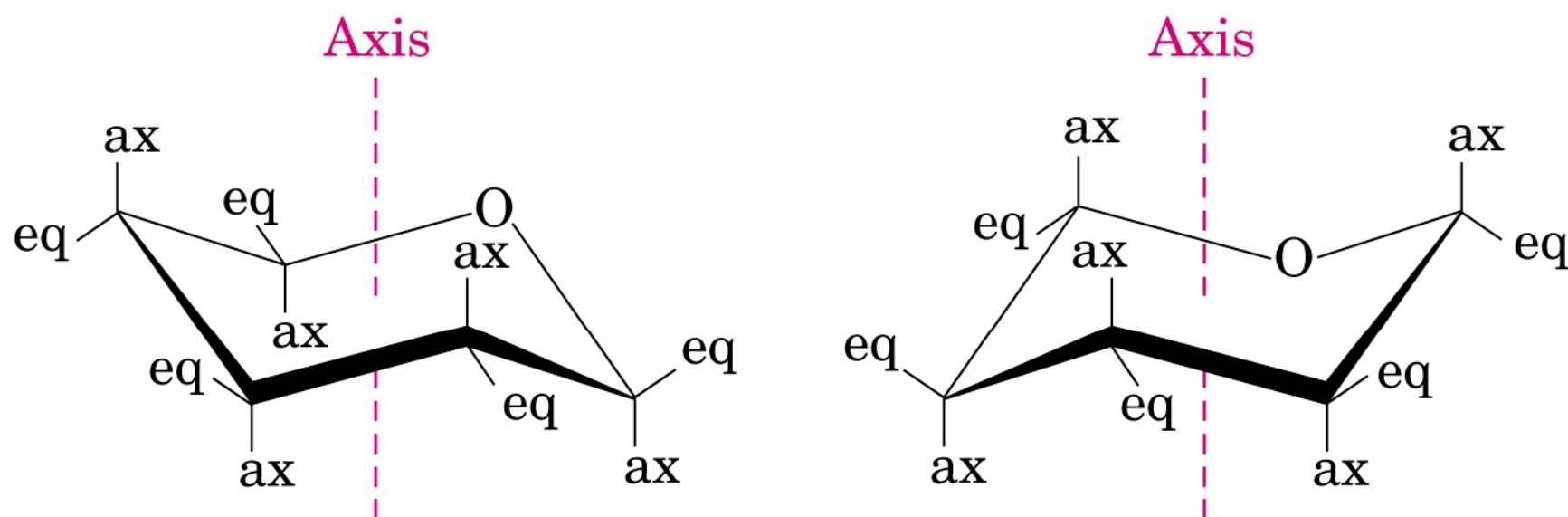
La formazione delle strutture ad anello genera un nuovo centro chirale



Gli isomeri che differiscono solo per la configurazione
Intorno al carbonio emiacetalico o emichetalico sono detti
anomeri,

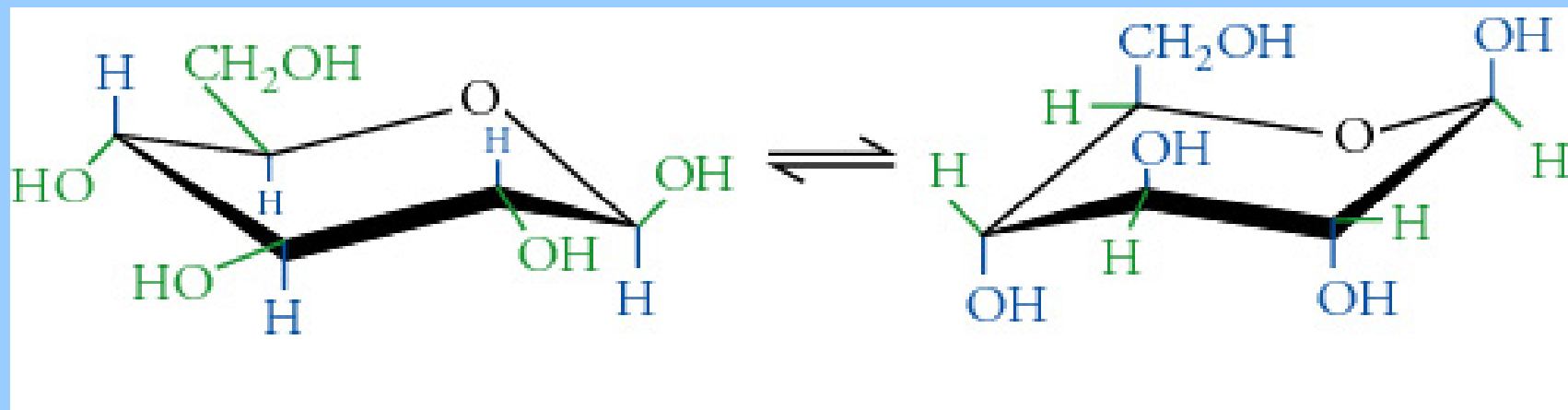
L'atomo di carbonio è detto anomero

In soluzione gli anomeri si interconvertono tra di loro
(mutarotazione)



Two possible chair forms
(a)

CONFORMAZIONI A SEDIA DEL β -D-GLUCOPIRANOSIO



Solo il glucosio può avere tutti i sostituenti diversi da H in posizione equatoriale

DERIVATI DEGLI ESOSI

Acidi aldonici

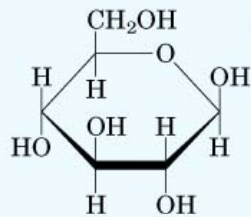
acidi uronici

alditoli

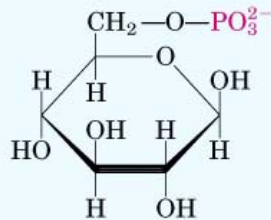
deossizuccheri

amminozuccheri

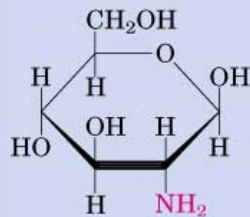
Glucose family



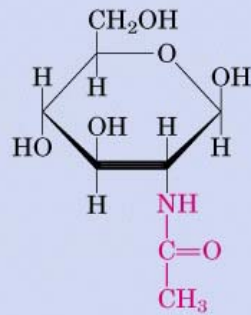
β -D-Glucose



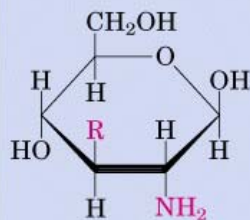
β -D-Glucose 6-phosphate



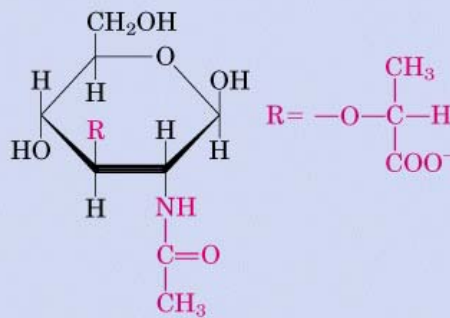
β -D-Glucosamine



N-Acetyl- β -D-glucosamine



Muramic acid



N-Acetylmuramic acid

Amino sugars

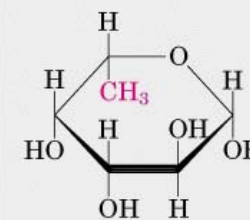


β -D-Galactosamine

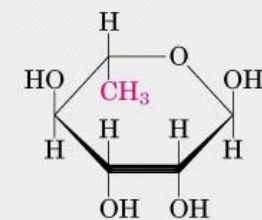


β -D-Mannosamine

Deoxy sugars

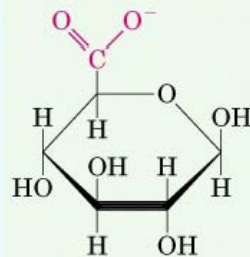


β -L-Fucose

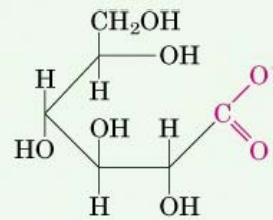


α -L-Rhamnose

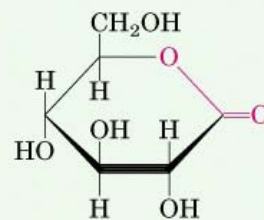
Acidic sugars



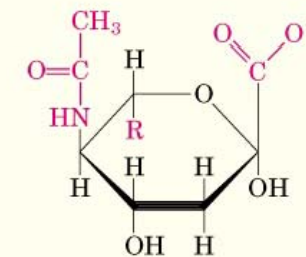
β -D-Glucuronate



D-Gluconate

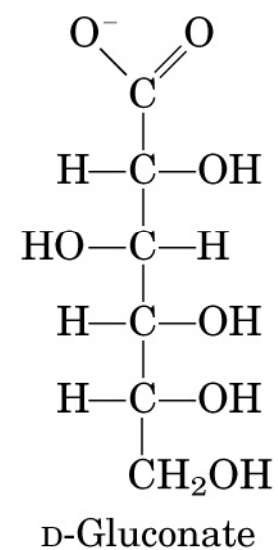
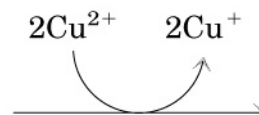
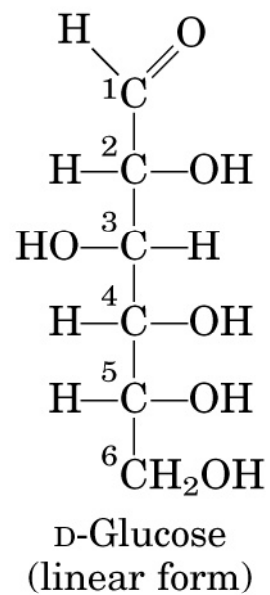
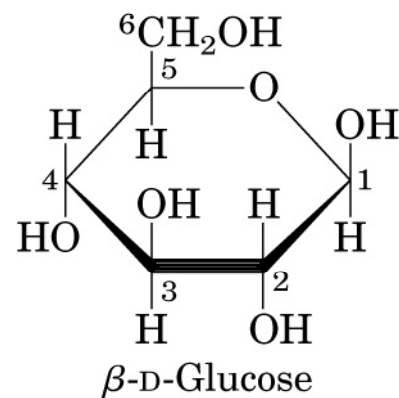


D-Glucono- δ -lactone



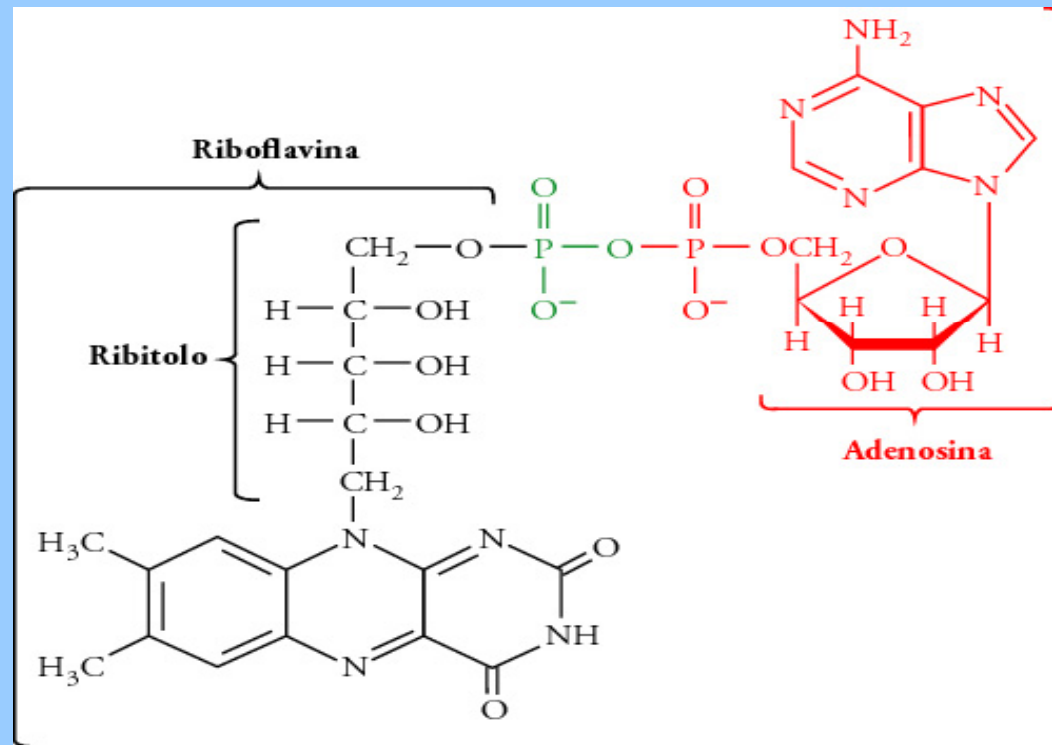
N-Acetylneuraminic acid
(sialic acid)

Acidi aldonic



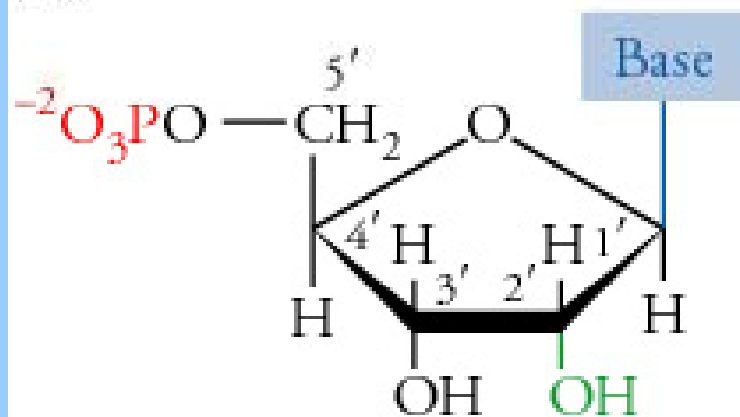
(a)

Il FAD contiene un alditolo (aldeide ridotta)



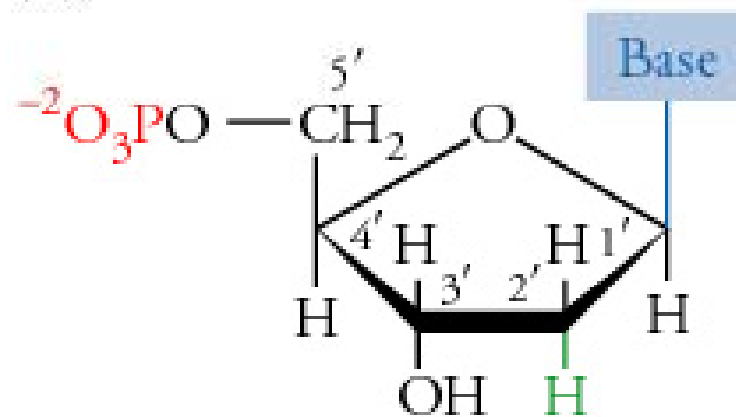
Deossizuccheri

(a)

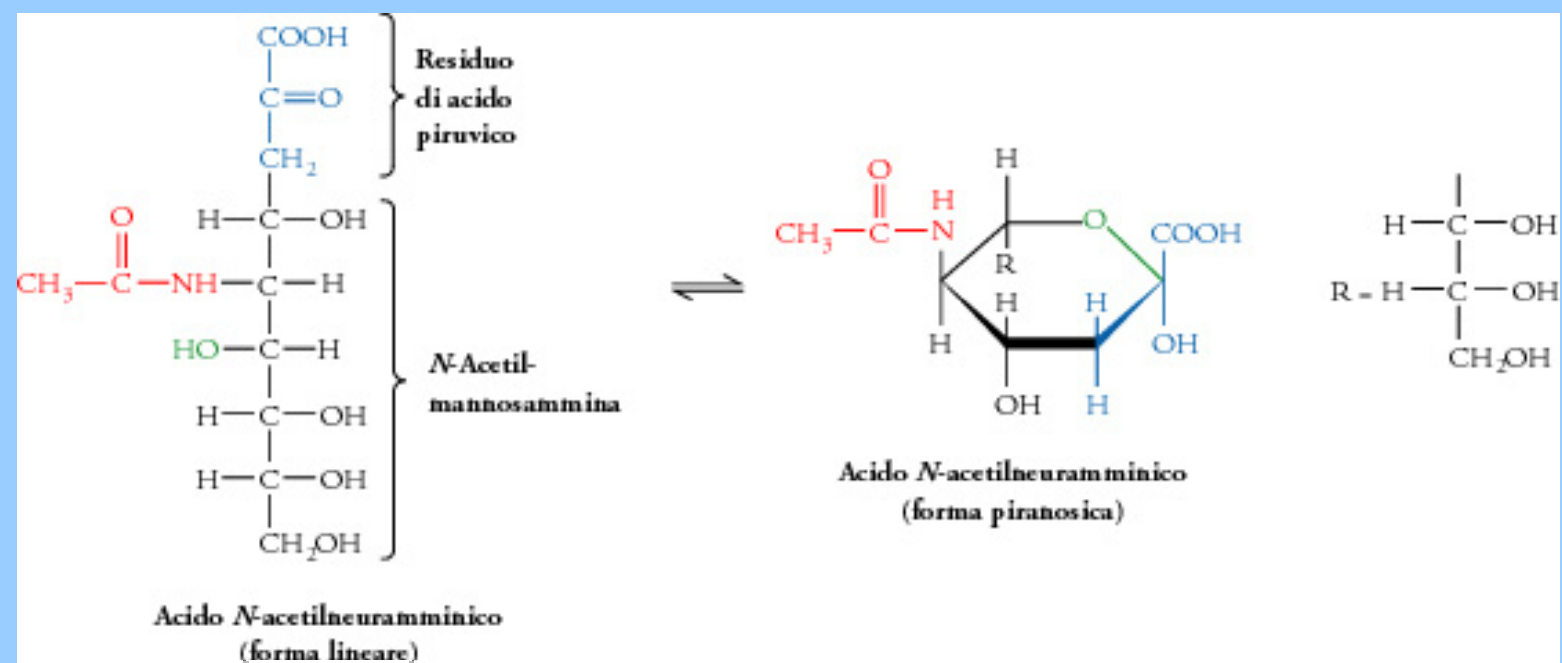


Ribonucleotidi

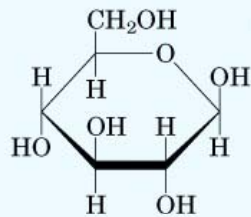
(b)



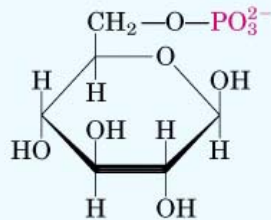
Deossiribonucleotidi



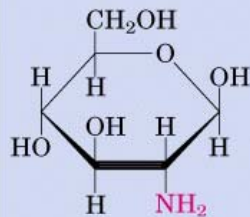
Glucose family



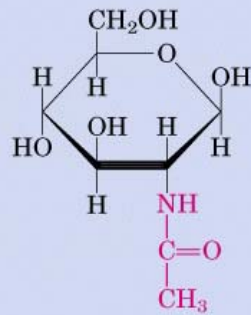
β -D-Glucose



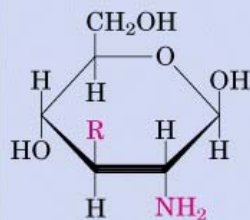
β -D-Glucose 6-phosphate



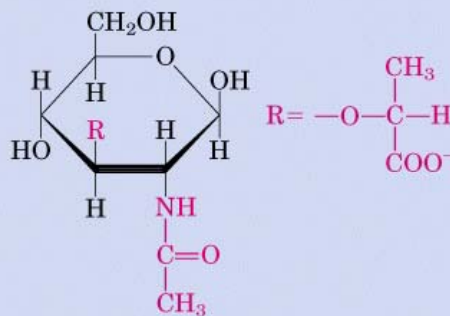
β -D-Glucosamine



N-Acetyl- β -D-glucosamine



Muramic acid



N-Acetylmuramic acid

Amino sugars

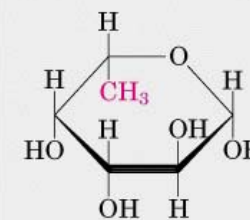


β -D-Galactosamine

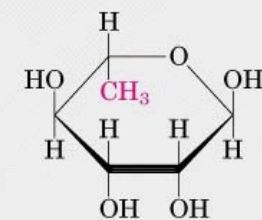


β -D-Mannosamine

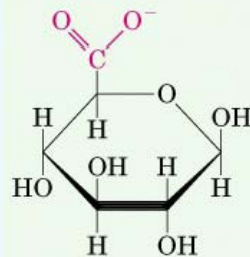
Deoxy sugars



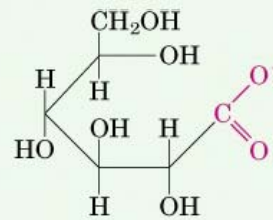
β -L-Fucose



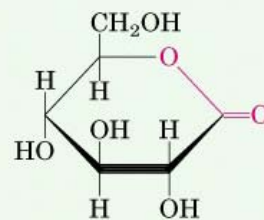
α -L-Rhamnose



β -D-Glucuronate

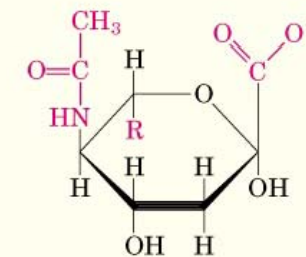


D-Gluconate



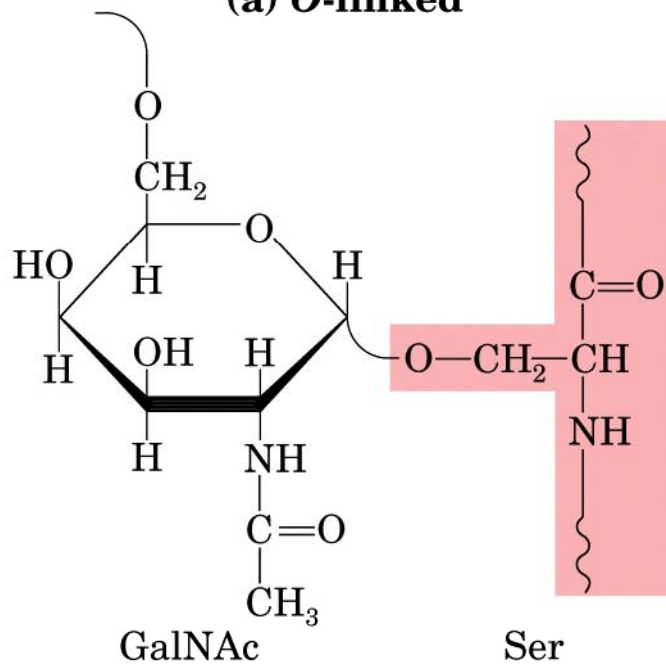
D-Glucono- δ -lactone

Acidic sugars

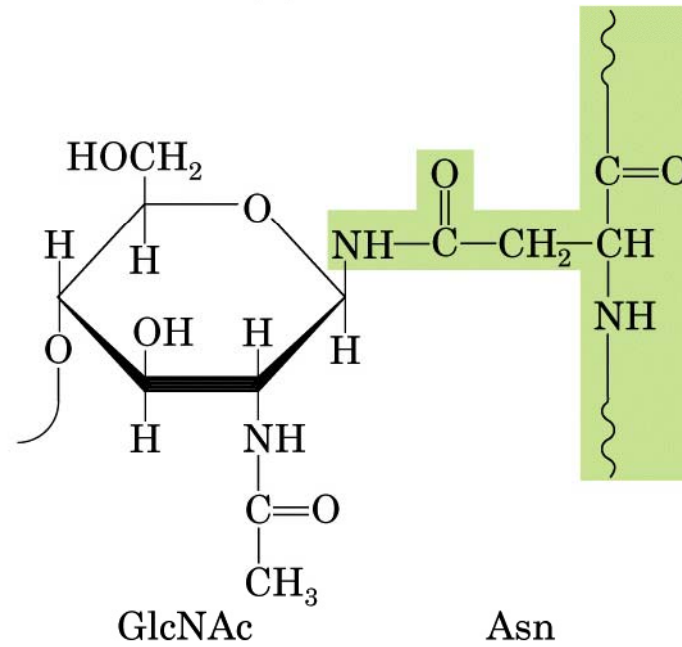


N-Acetylneuraminic acid
(sialic acid)

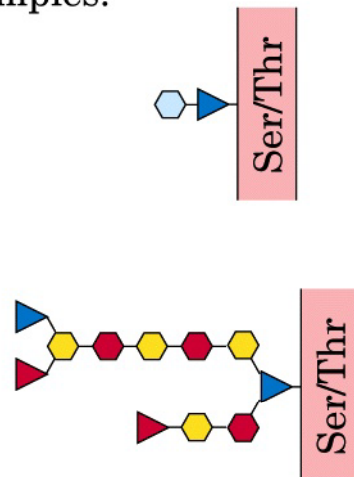
(a) O-linked



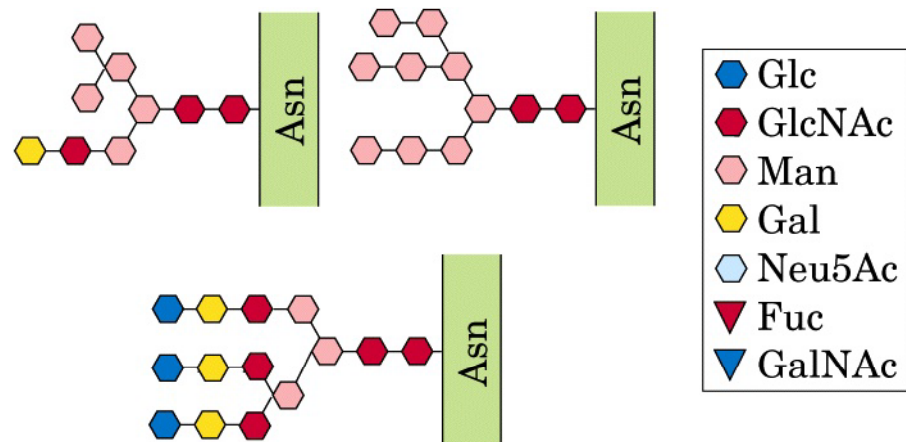
(b) N-linked



Examples:



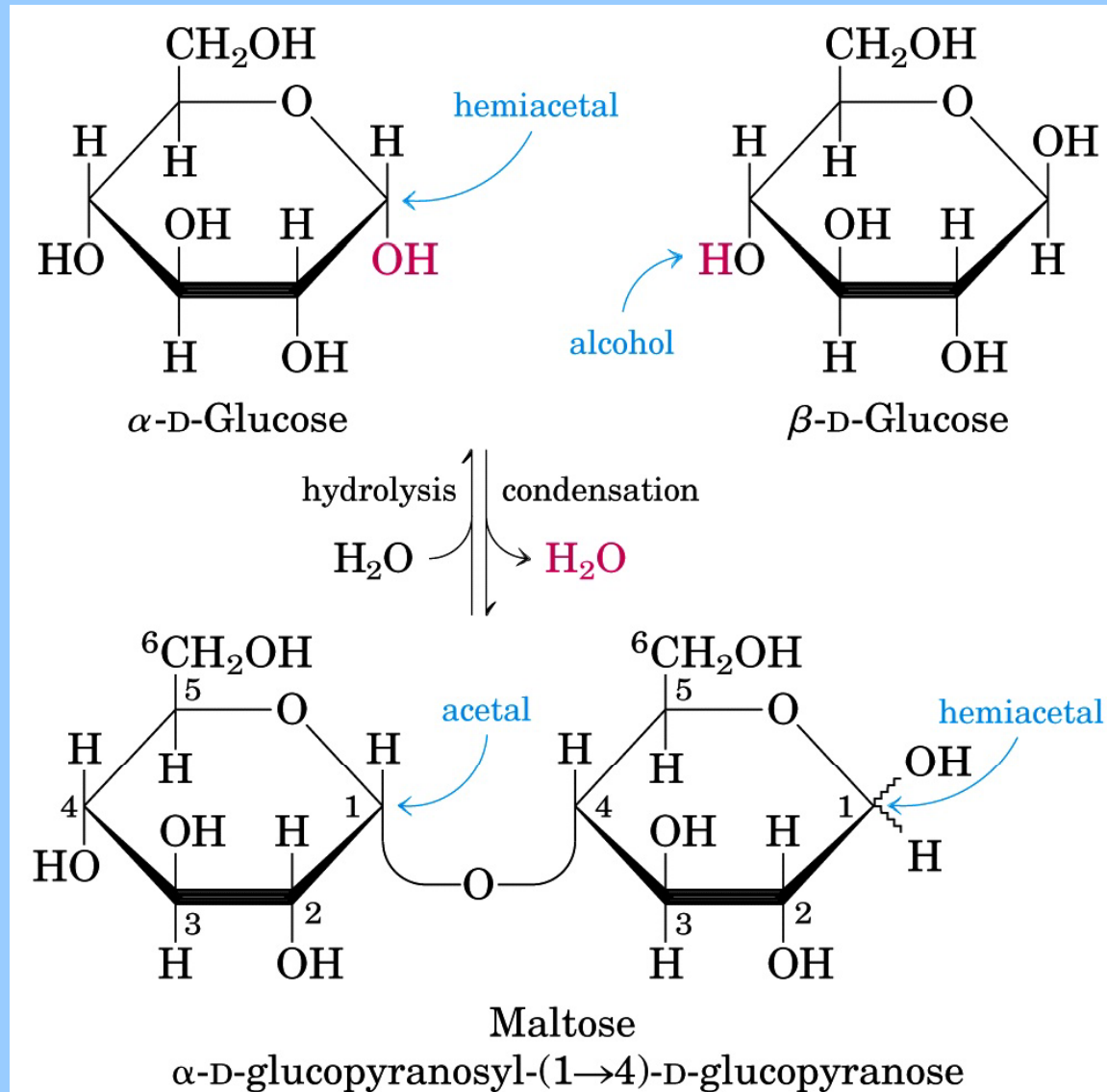
Examples:

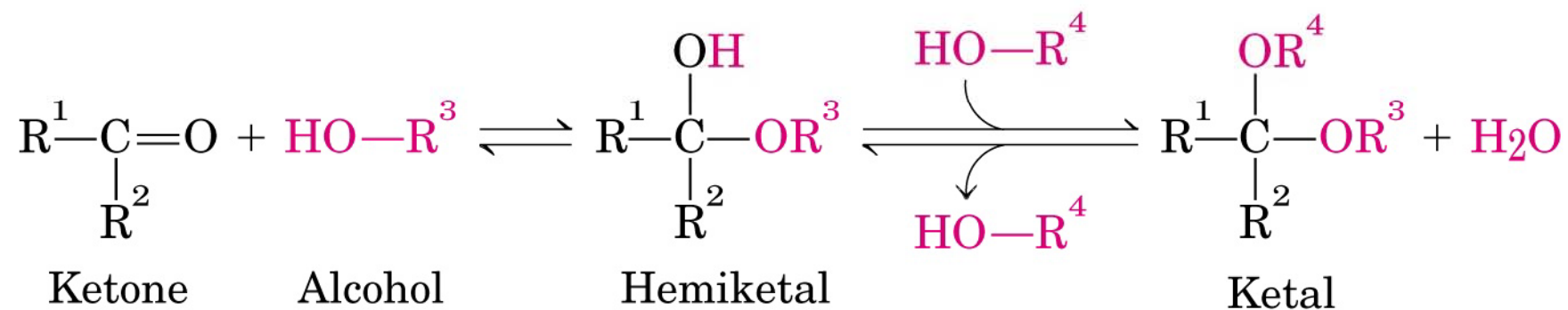
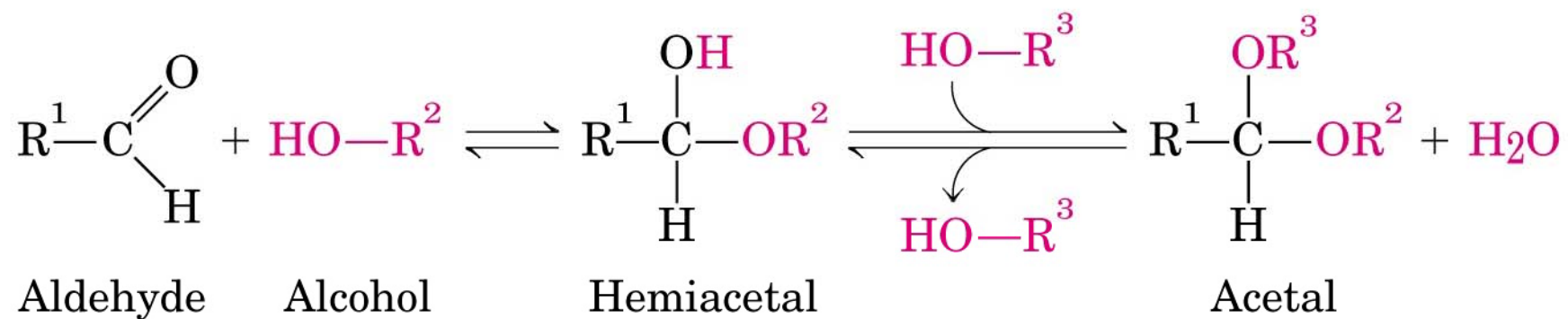


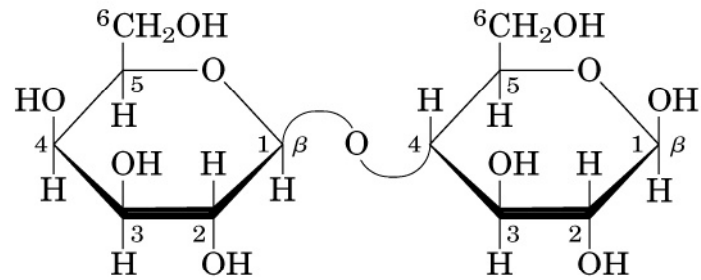
- Glc
- GlcNAc
- Man
- Gal
- Neu5Ac
- Fuc
- GalNAc

Formazione di un legame glicosidico

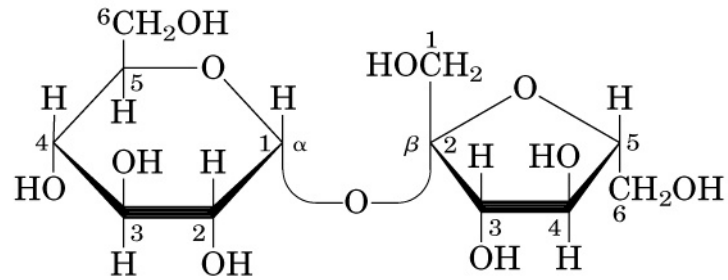
Il legame O-glicosidico si forma quando un gruppo ossidrilico di uno zucchero reagisce con il carbonio anomerico di un altro zucchero



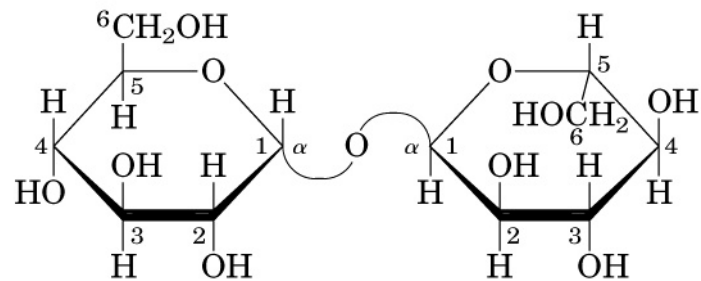




Lactose (β form)
 β -D-galactopyranosyl-(1 $\rightarrow$ 4)- β -D-glucopyranose
 Gal(β 1 $\rightarrow$ 4)Glc



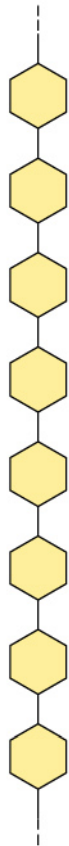
Sucrose
 β -D-fructofuranosyl α -D-glucopyranoside
 Fru(β 2 $\leftrightarrow$ 1 α)Glc



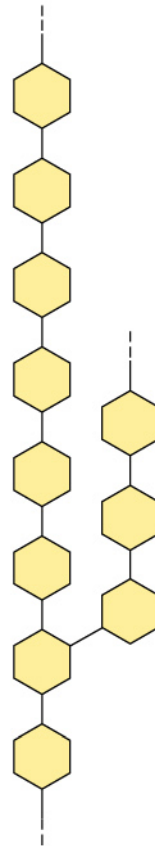
Trehalose
 α -D-glucopyranosyl α -D-glucopyranoside
 Glc(α 1 $\leftrightarrow$ 1 α)Glc

Homopolysaccharides

Unbranched



Branched



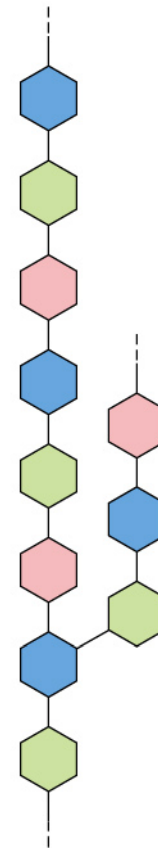
Massa indefinita

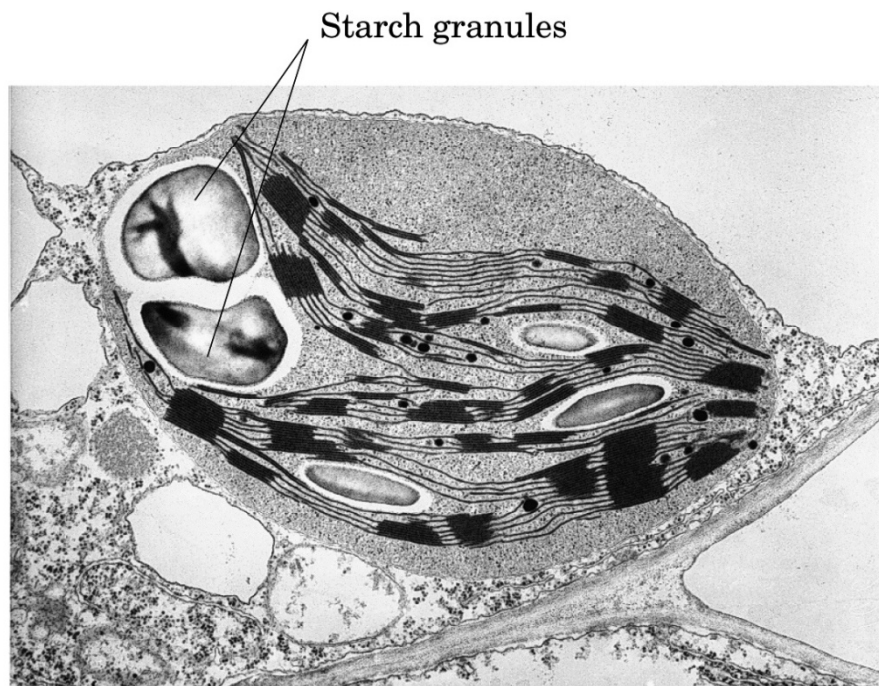
Heteropolysaccharides

Two monomer
types,
unbranched

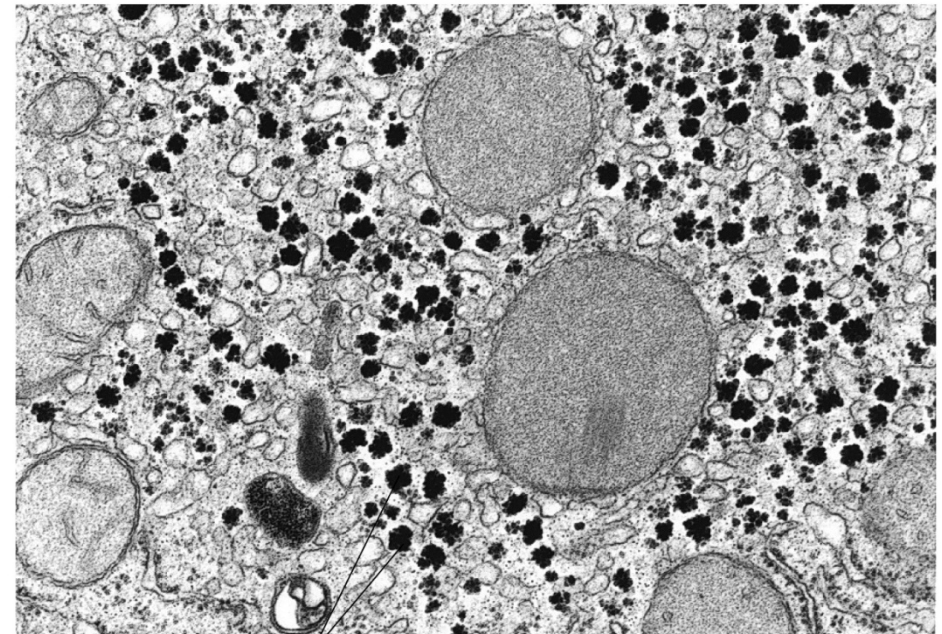


Multiple
monomer types,
branched





(a)



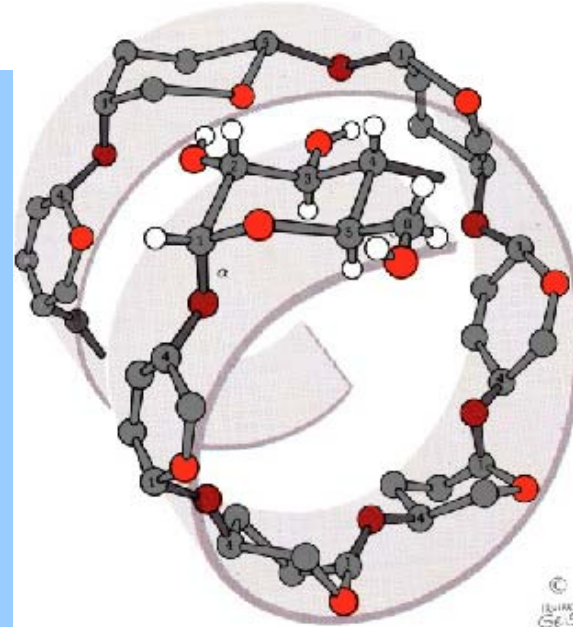
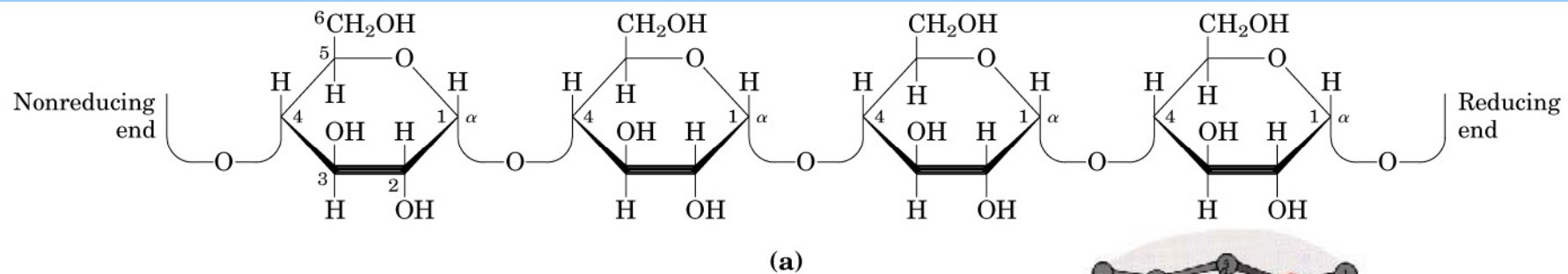
Glycogen granules

(b)

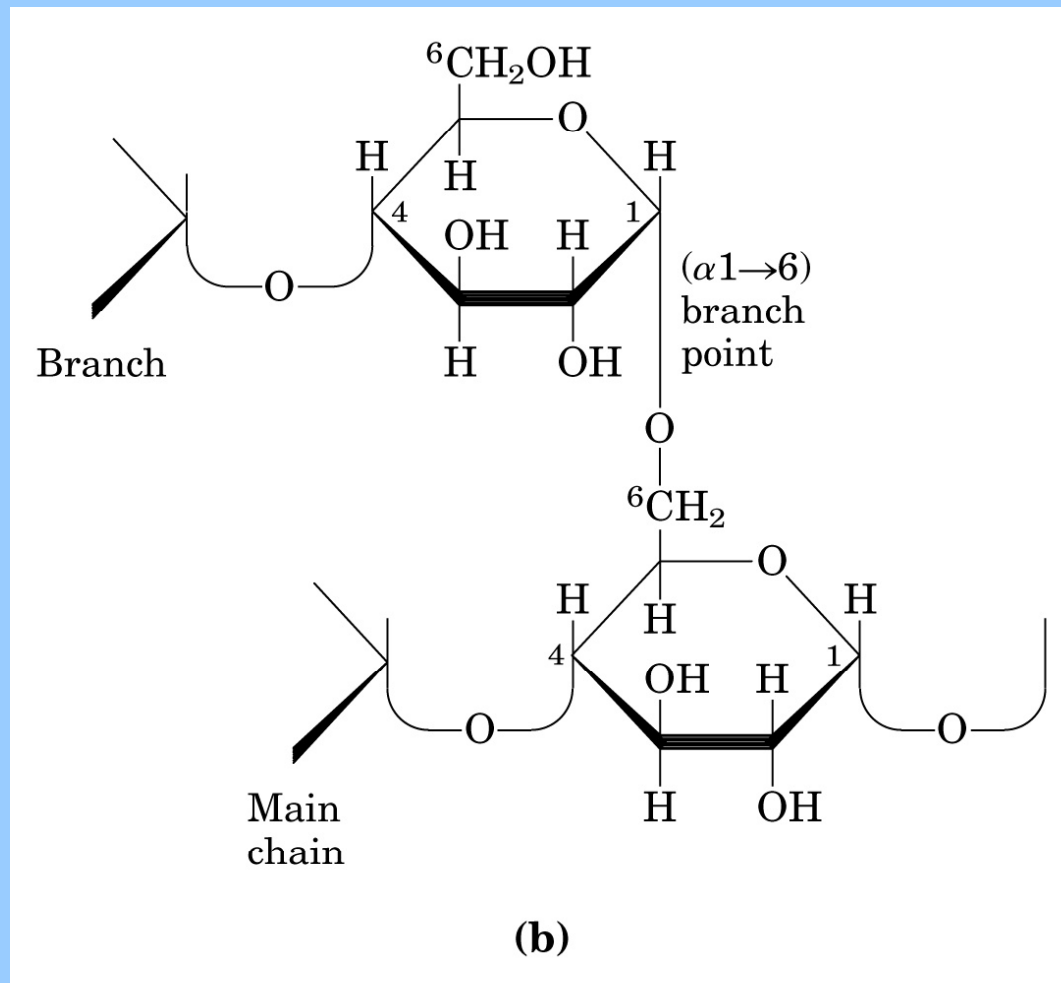
Polisaccaridi di riserva: Amido

L'amido è una miscela di due polisaccaridi, l'amilosio e l'amilopectina

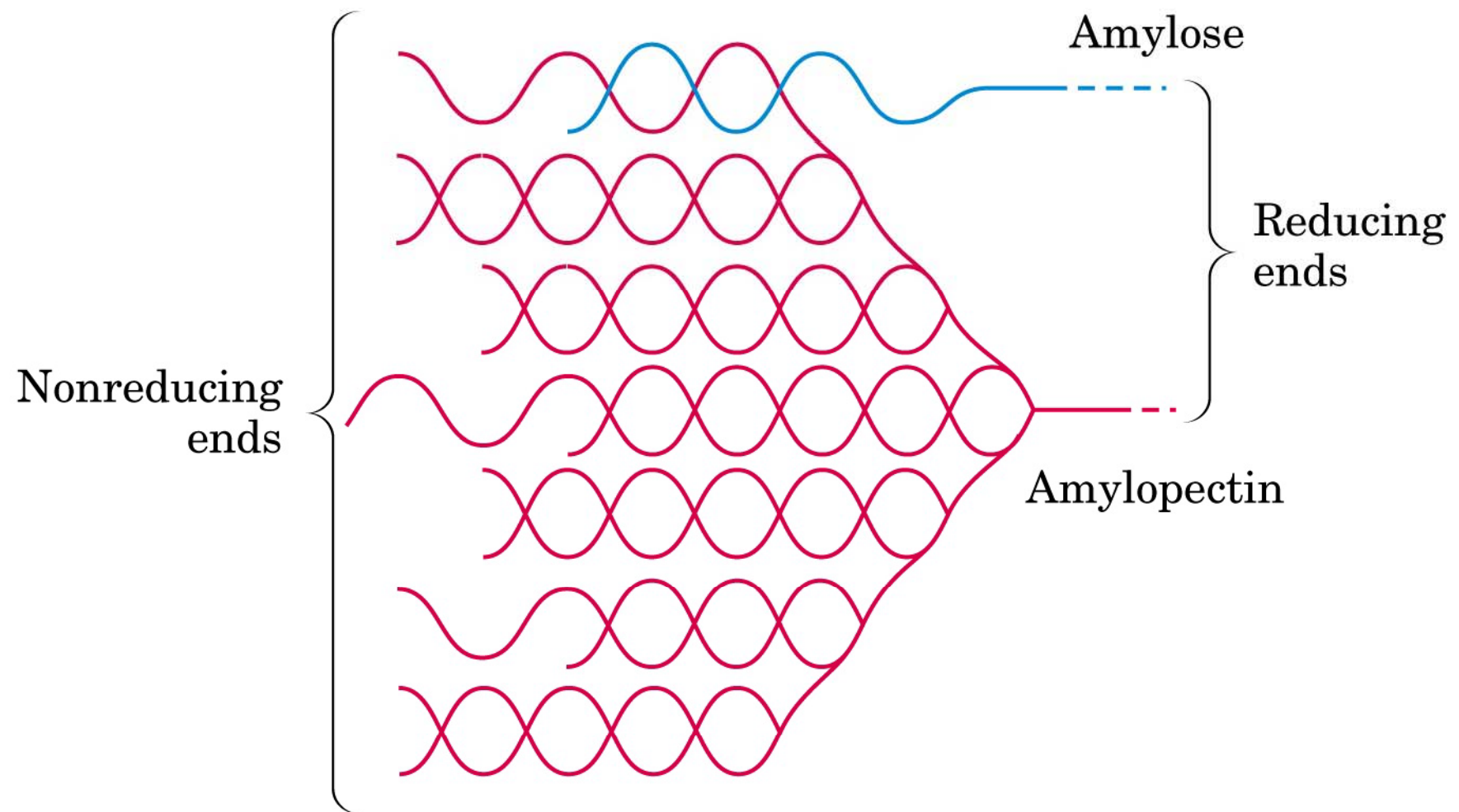
L'amilosio non è ramificato. Glucosio con legame ($\alpha 1 \rightarrow 4$)



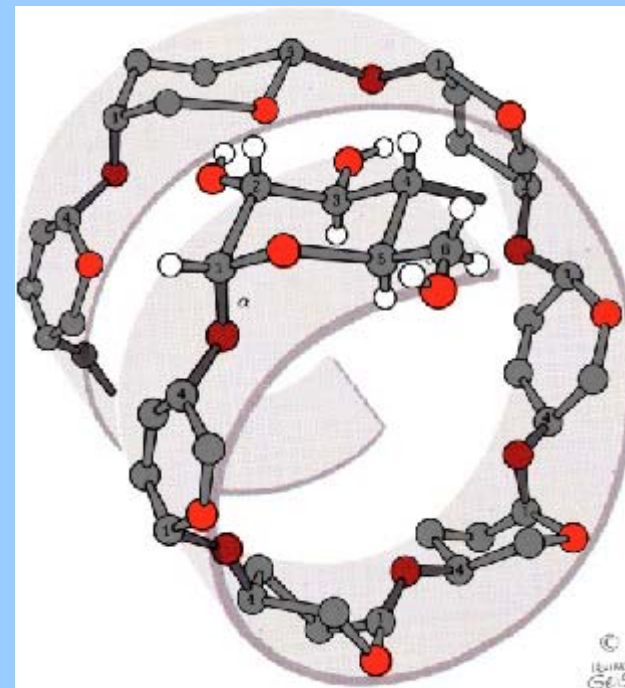
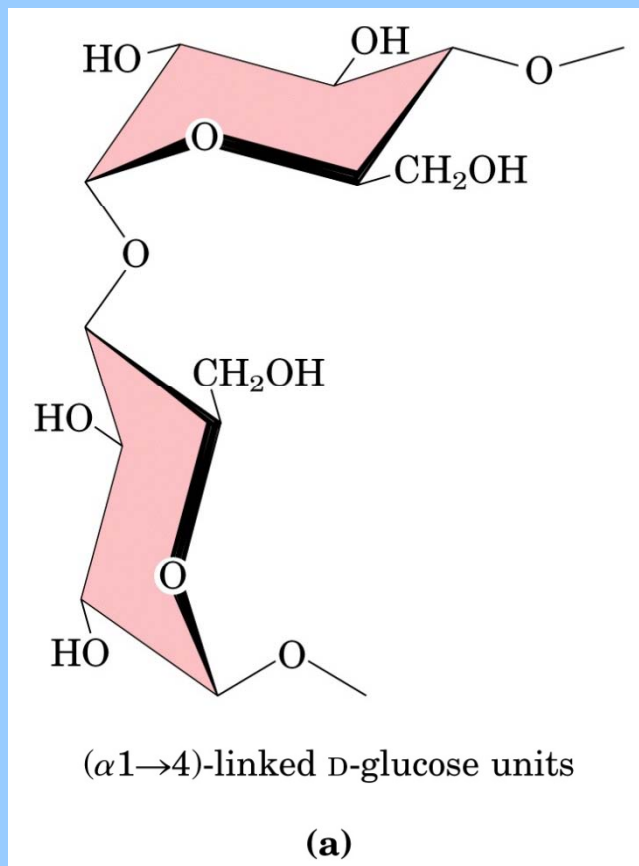
L'amilopeptina è ramificata (ogni 24-30 residui),
con legami ($\alpha 1 \rightarrow 6$)



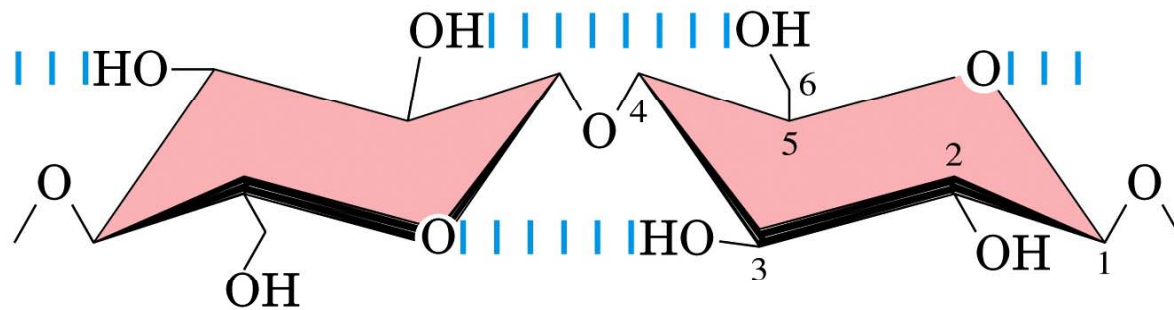
Il glicogeno è simile ma piu' ramificato (ogni 8-12 residui)



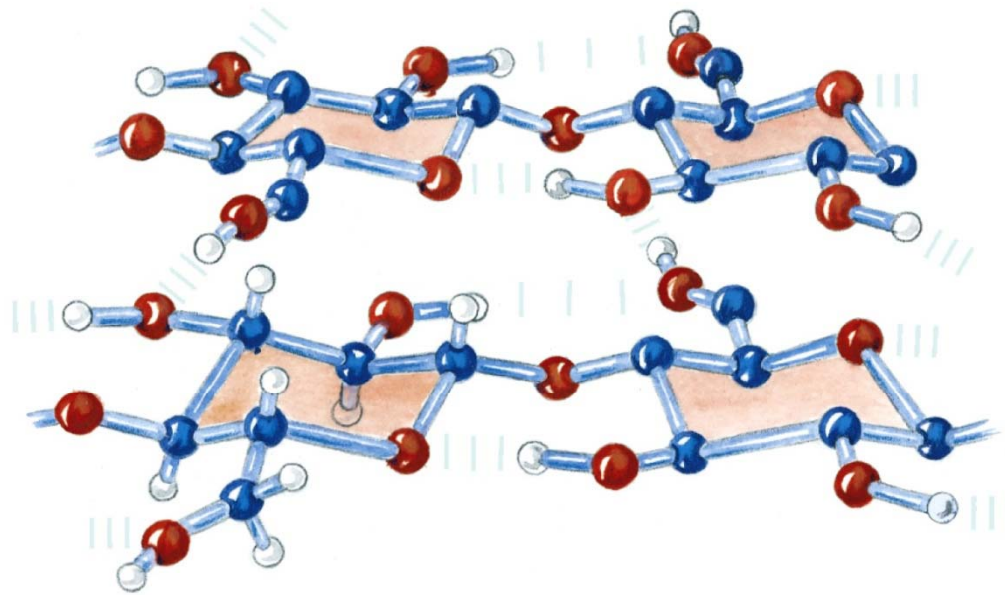
(c)



La cellulosa (legami $\beta 1 \rightarrow 4$)

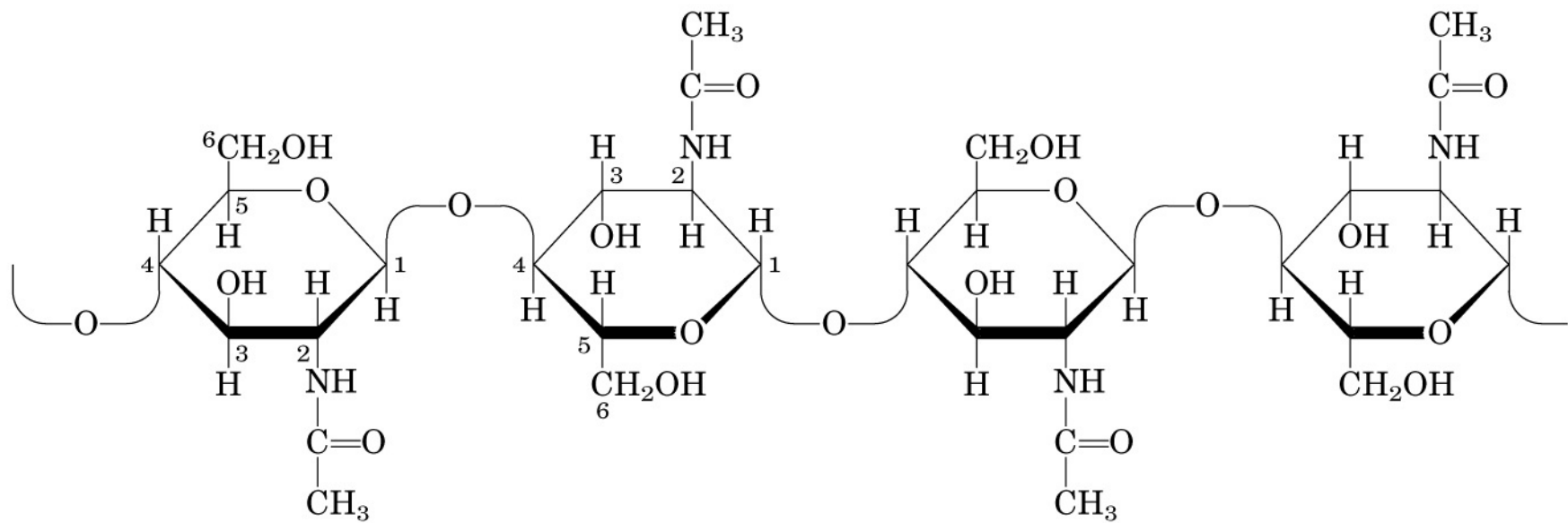


($\beta 1 \rightarrow 4$)-linked D-glucose units

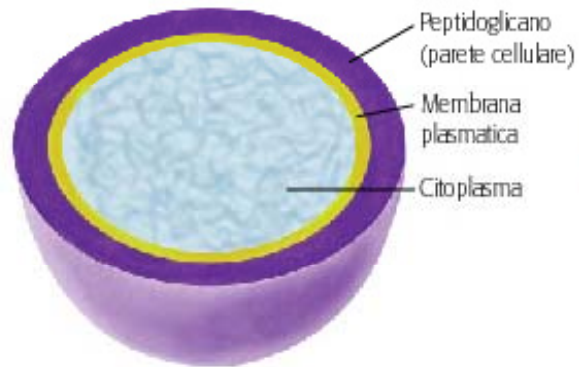


(b)

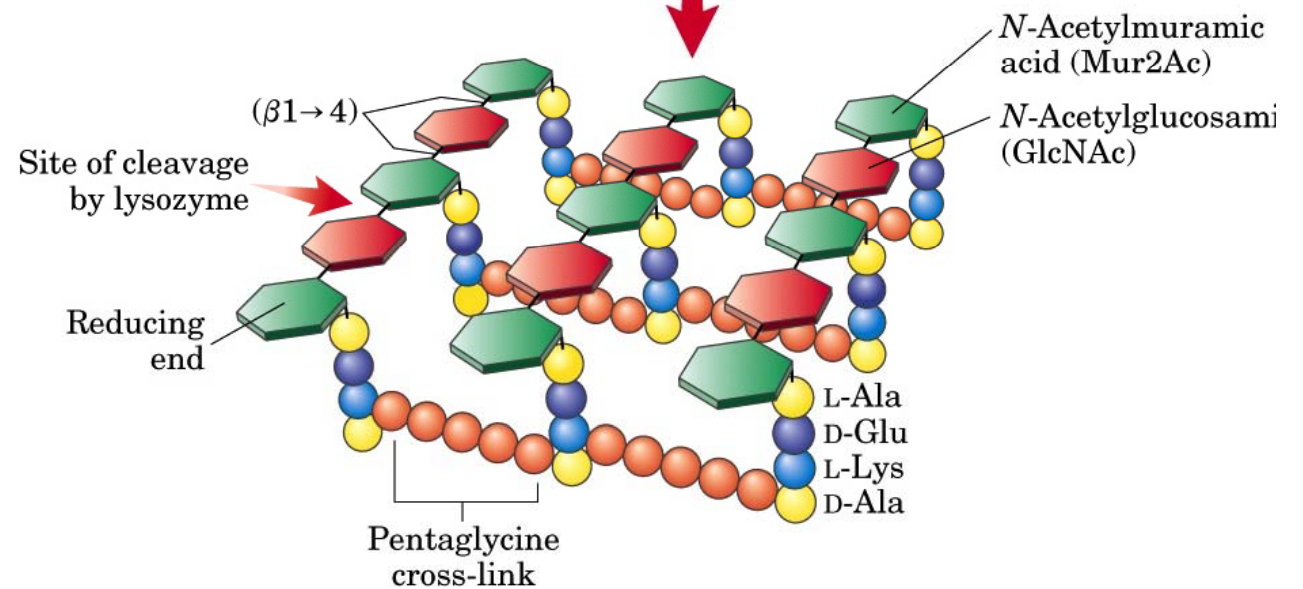
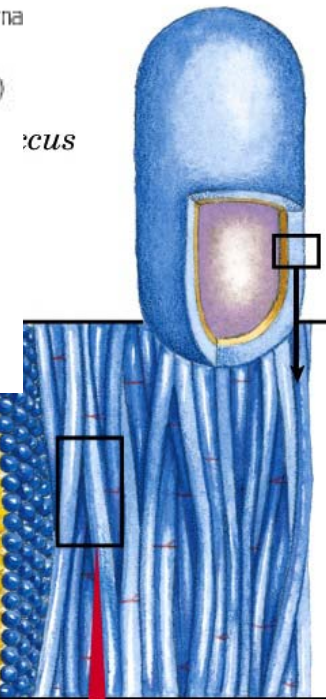
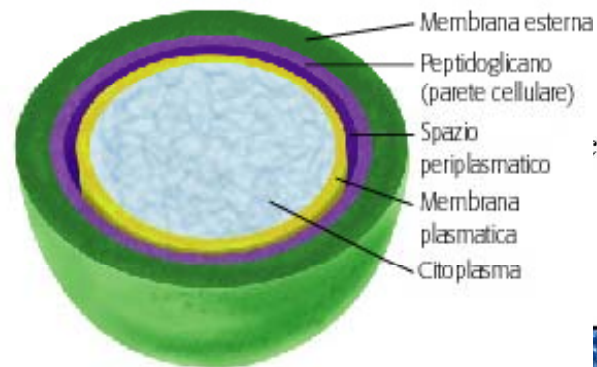
La chitina



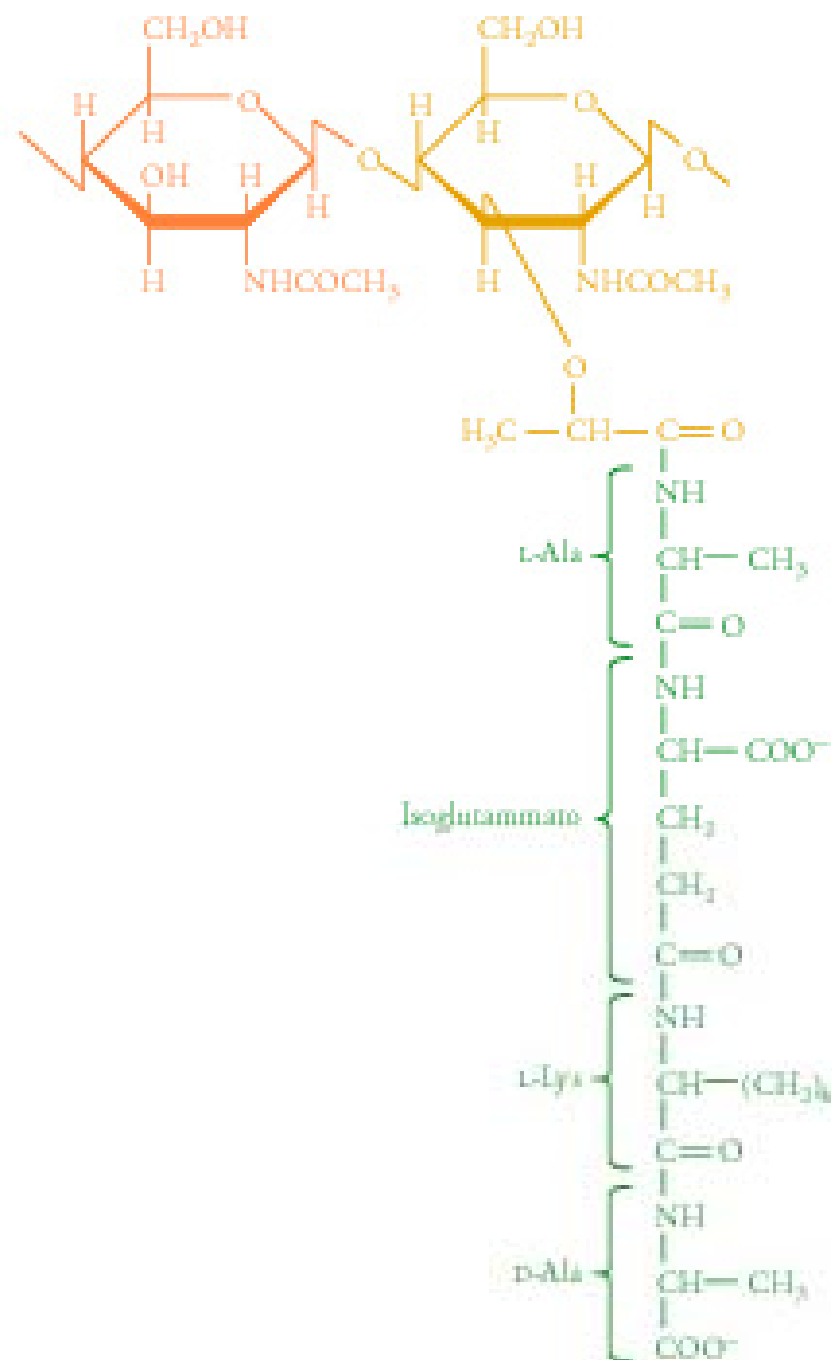
(a) Batteri gram-positivi



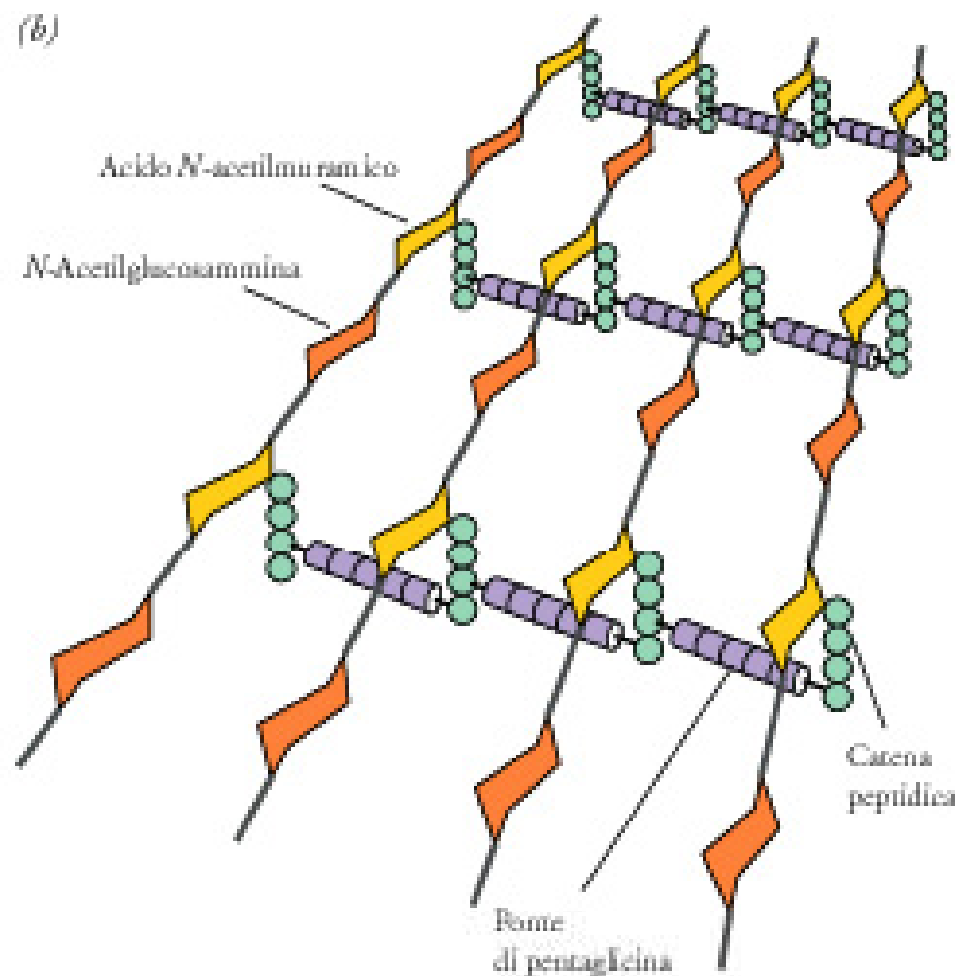
(b) Batteri gram-negativi



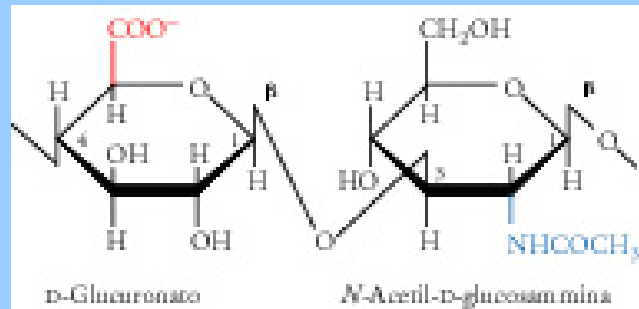
(a) *N*-Acetilglucosammina Acido *N*-acetilmuramico



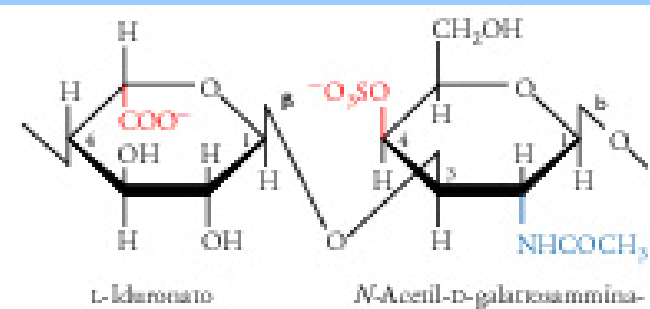
(b)



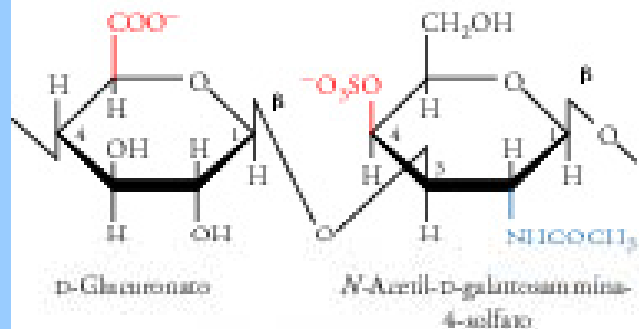
Glicosoamminoglicani (componenti matrice extracellulare)



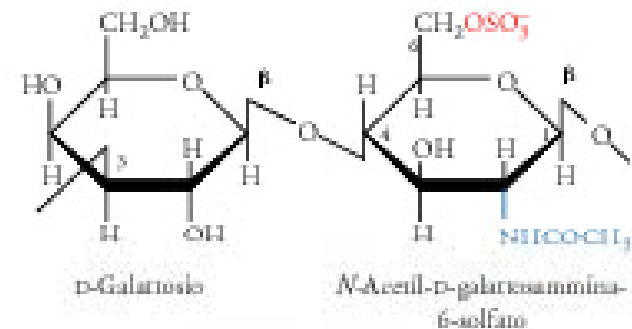
Heparanato



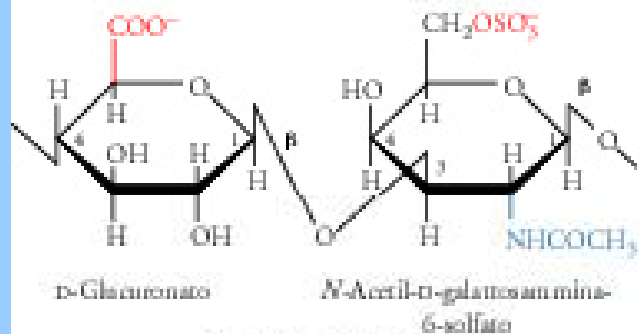
Dermatan solfato



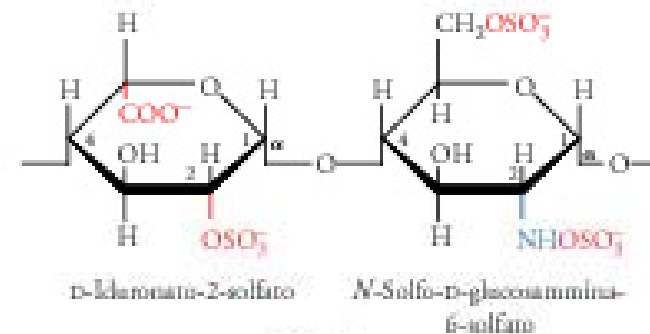
Condroitin-4-solfato



Cheratan solfato



Condroitin-6-solfato



Eparina

table 9–2

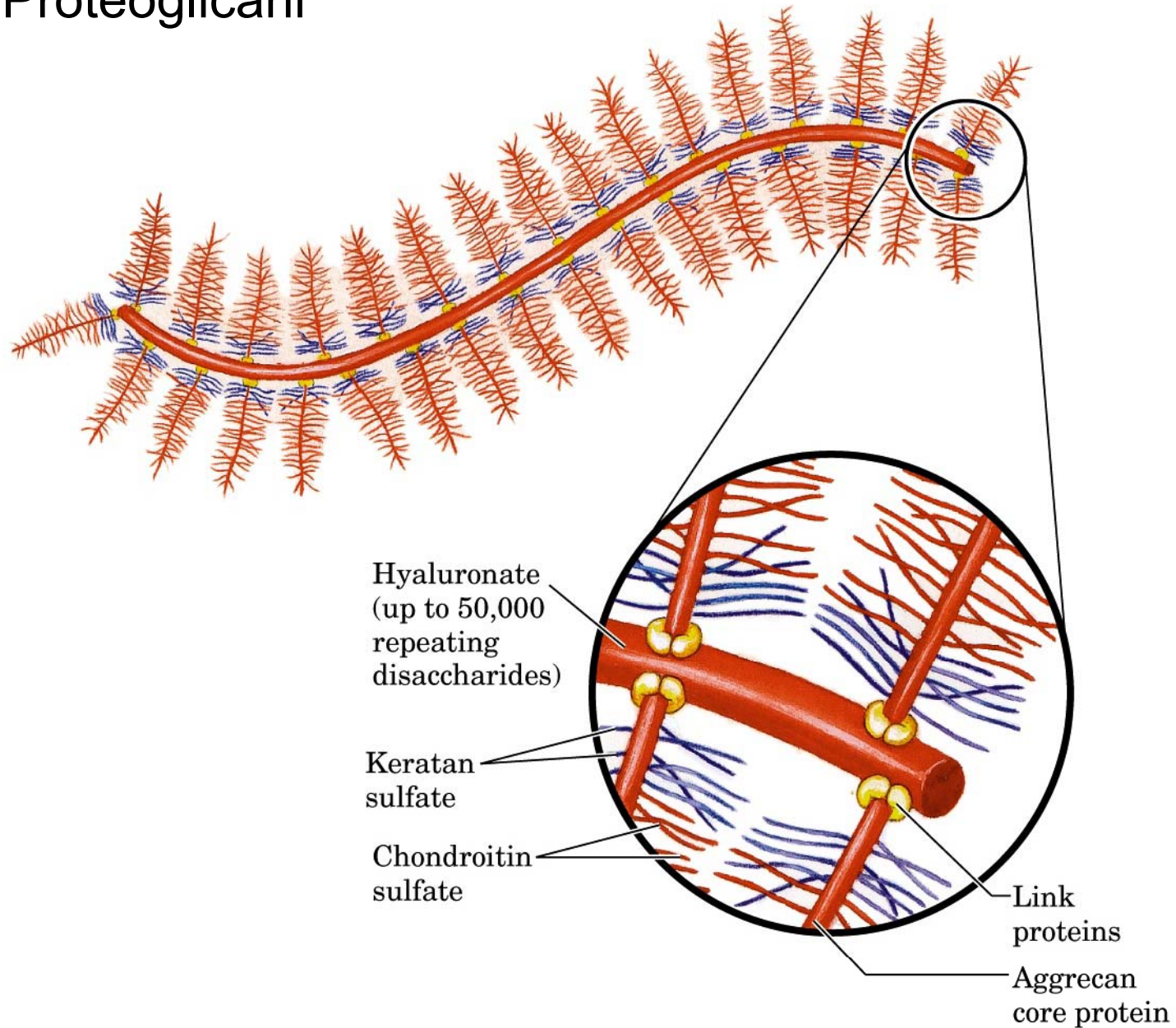
Structures and Roles of Some Polysaccharides

Polymer	Type*	Repeating unit†	Size (number of monosaccharide units)	Roles
Starch				Energy storage: in plants
Amylose	Homo-	(α 1→4)Glc, linear	50–5,000	
Amylopectin	Homo-	(α 1→4)Glc, with (α 1→6)Glc branches every 24 to 30 residues	Up to 10^6	
Glycogen	Homo-	(α 1→4)Glc, with (α 1→6)Glc branches every 8 to 12 residues	Up to 50,000	Energy storage: in bacteria and animal cells
Cellulose	Homo-	(β 1→4)Glc	Up to 15,000	Structural: in plants, gives rigidity and strength to cell walls
Chitin	Homo-	(β 1→4)GlcNAc	Very large	Structural: in insects, spiders, crustaceans, gives rigidity and strength to exoskeletons
Peptidoglycan	Hetero-; peptides attached	4)Mur2Ac(β 1→4) GlcNAc(β 1	Very large	Structural: in bacteria, gives rigidity and strength to cell envelope
Hyaluronate (a glycosaminoglycan)	Hetero-; acidic	4)GlcA(β 1→3) GlcNAc(β 1	Up to 100,000	Structural: in vertebrates, extracellular matrix of skin and connective tissue; viscosity and lubrication in joints

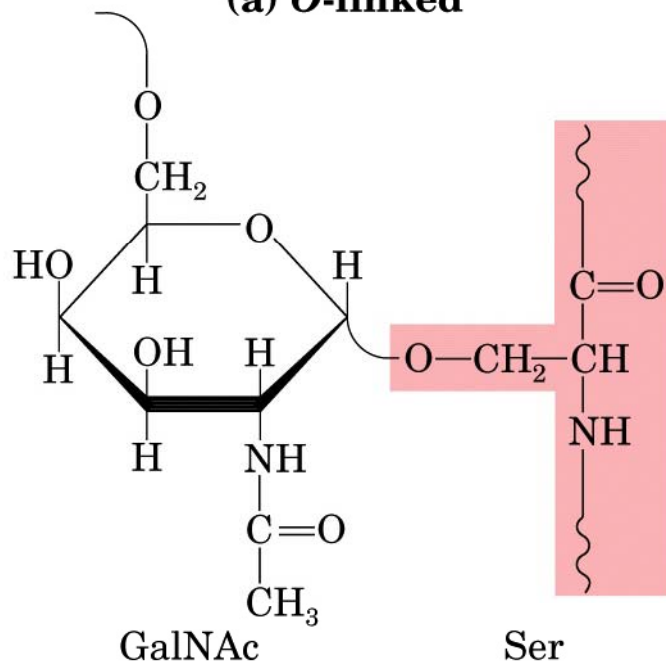
* Each polymer is classified as a homopolysaccharide (homo-) or heteropolysaccharide (hetero-).

†The abbreviated names for the peptidoglycan and hyaluronate repeating units indicate that the polymer contains repeats of this disaccharide unit, with the GlcNAc of one disaccharide unit linked β (1→4) to the first residue of the next disaccharide unit.

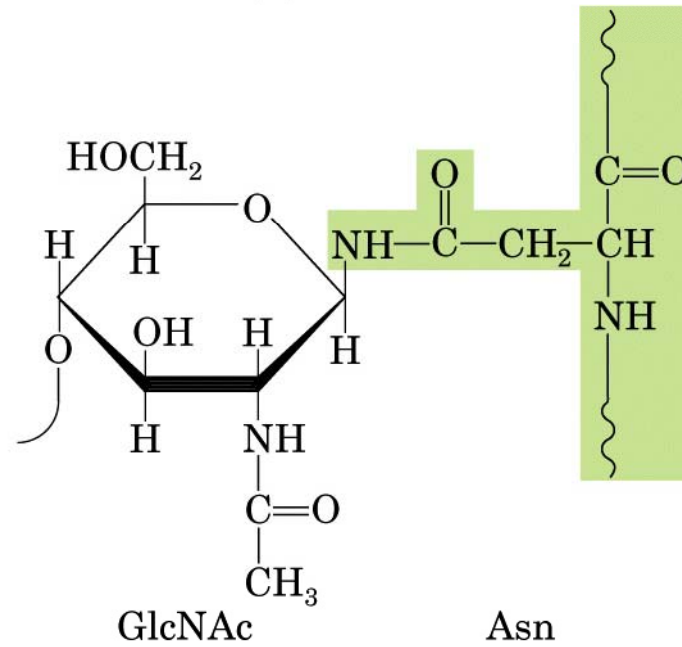
Proteoglicani



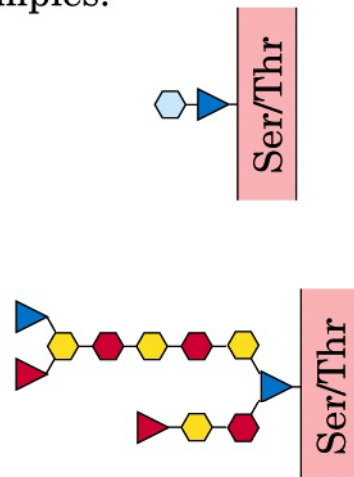
(a) O-linked



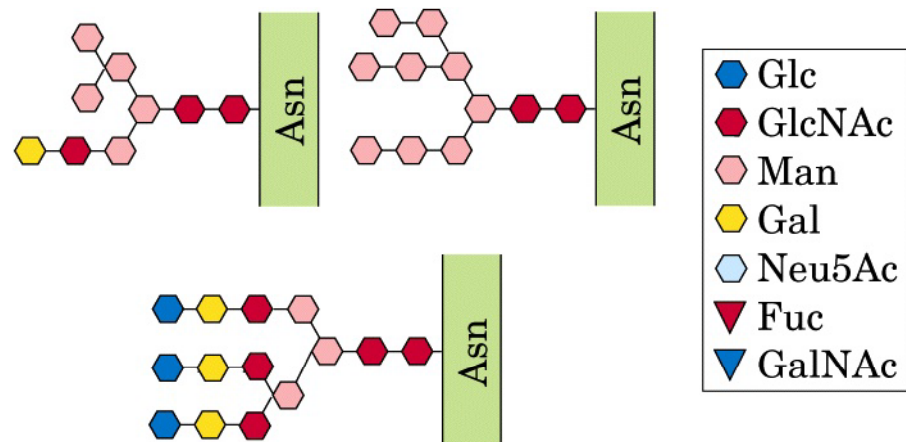
(b) N-linked



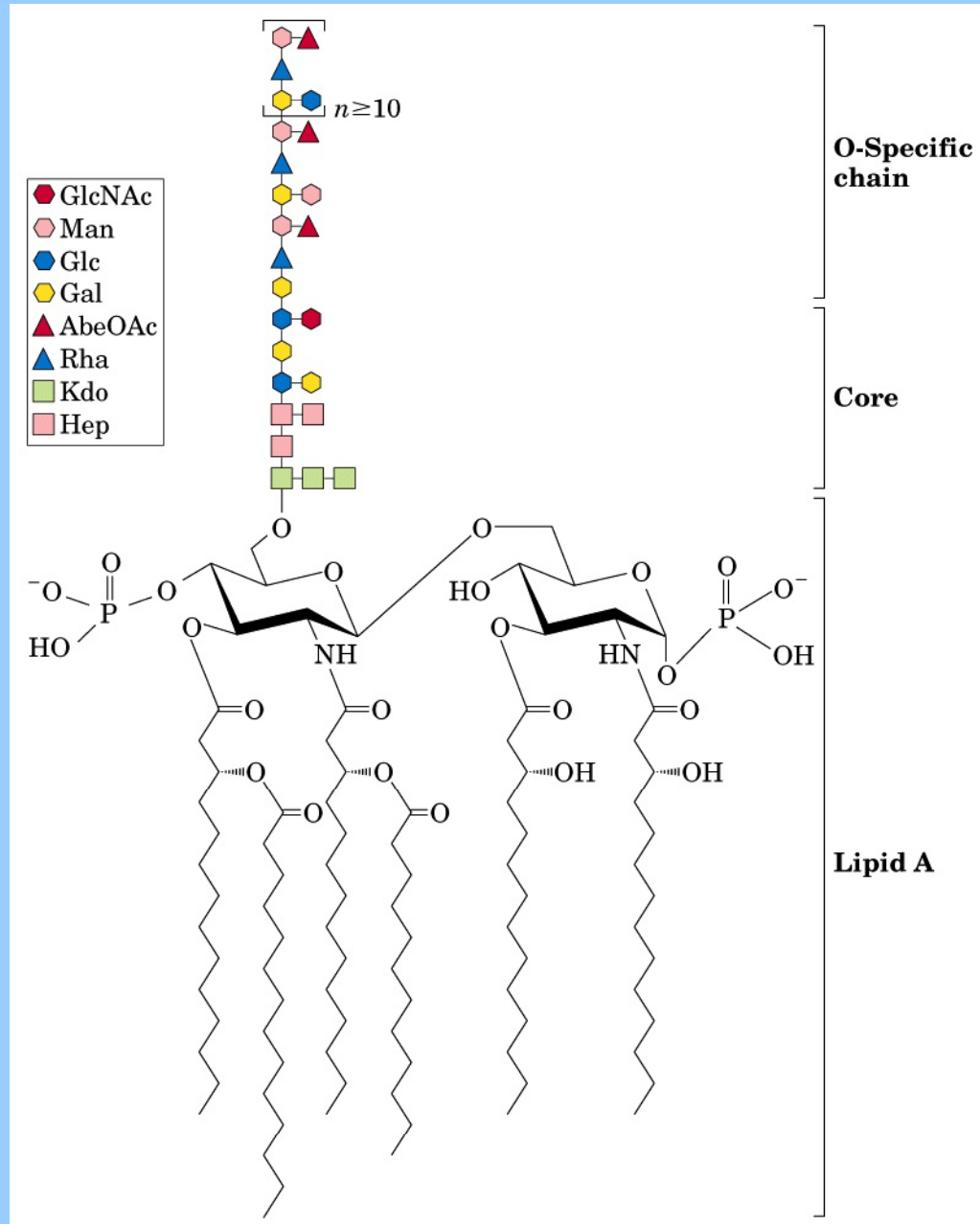
Examples:

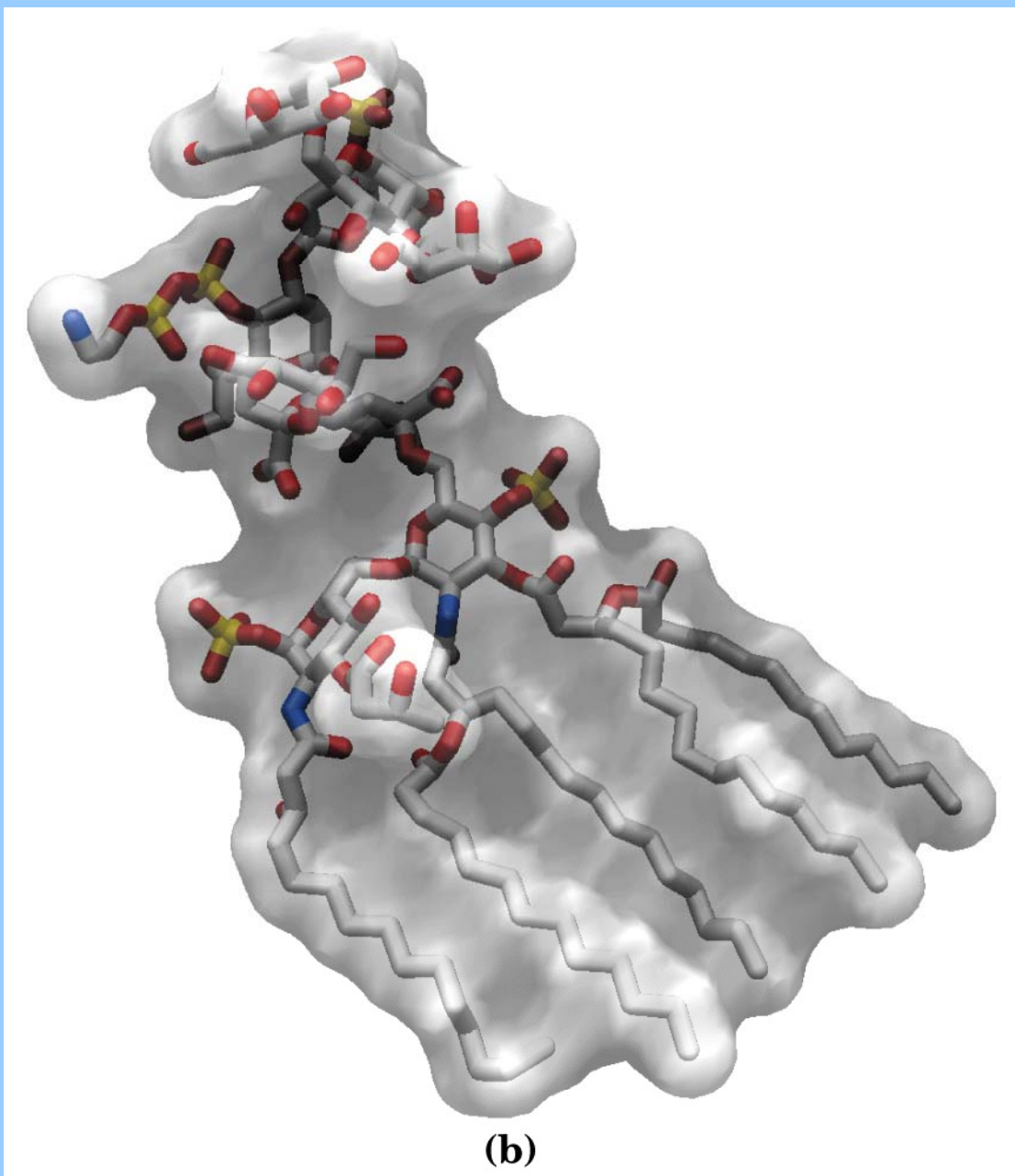


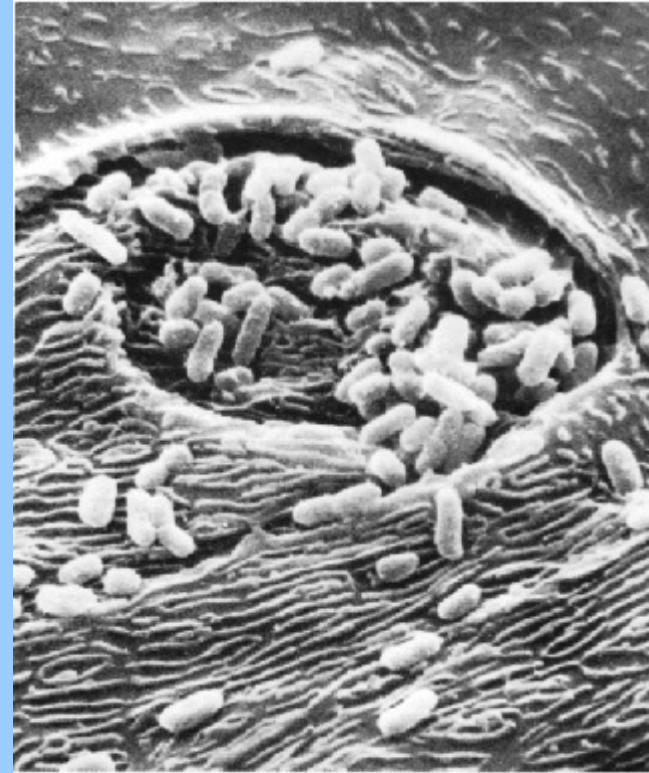
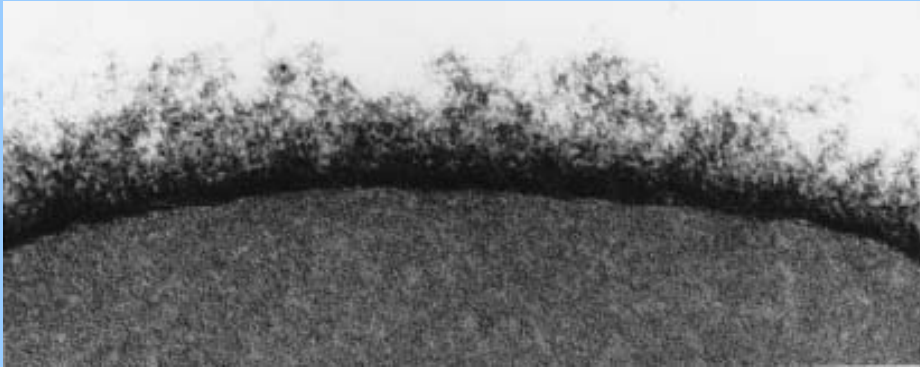
Examples:



Glicolipidi







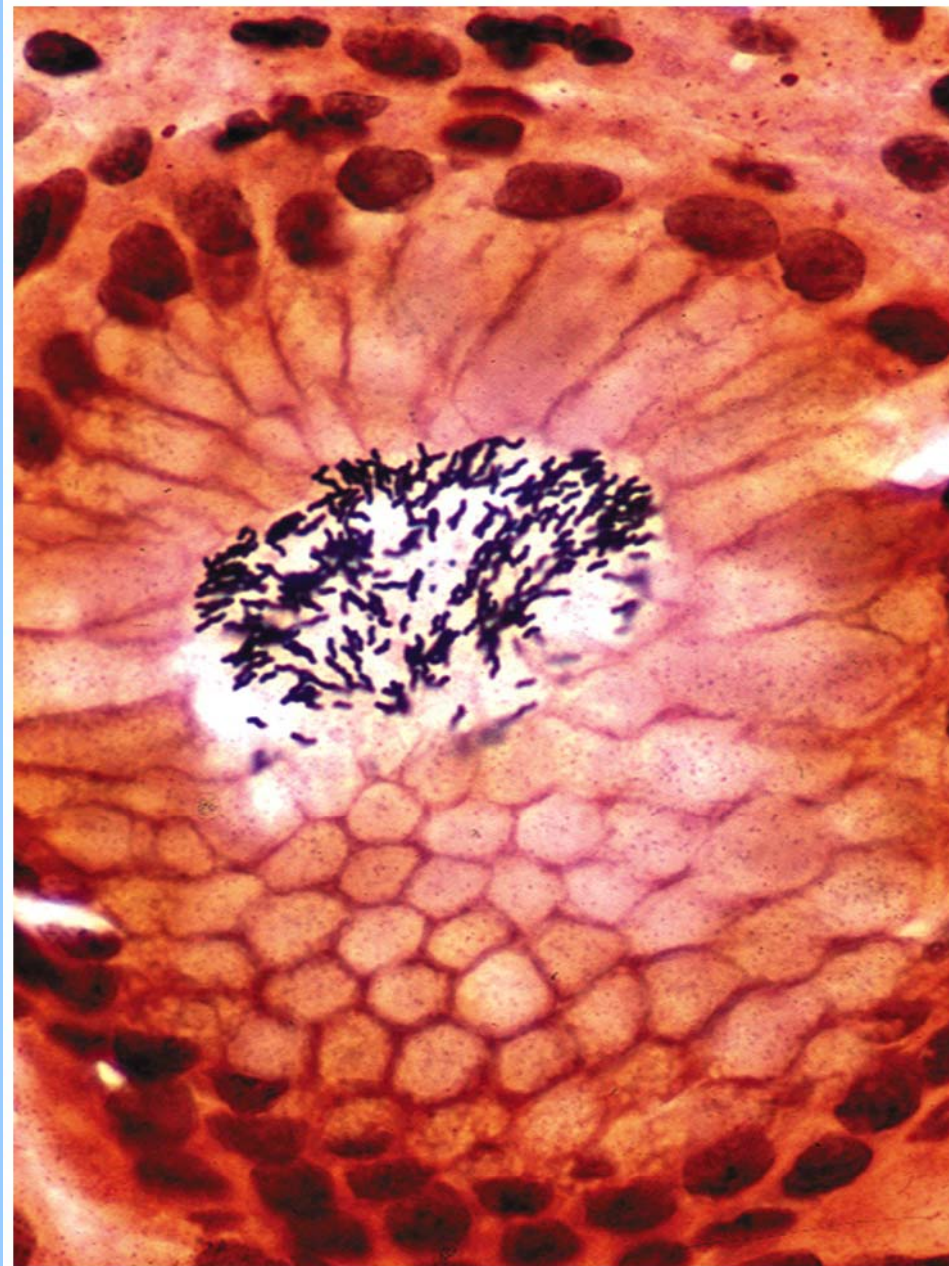


table 9–3

Lectins and the Oligosaccharide Ligands That They Bind

Lectin family and lectin	Abbreviation	Ligand(s)
Plant		
Concanavalin A	ConA	Man α 1—OCH ₃
<i>Griffonia simplicifolia</i> lectin 4	GS4	Lewis b (Le ^b) tetrasaccharide
Wheat germ agglutinin	WGA	Neu5Ac(α 2→3)Gal(β 1→4)Glc GlcNAc(β 1→4)GlcNAc
Ricin		Gal(β 1→4)Glc
Animal		
Galectin-1		Gal(β 1→4)Glc
Mannose-binding protein A	MBP-A	High-mannose octasaccharide
Viral		
Influenza virus hemagglutinin	HA	Neu5Ac(α 2→6)Gal(β 1→4)Glc
Polyoma virus protein 1	VP1	Neu5Ac(α 2→3)Gal(β 1→4)Glc
Bacterial		
Enterotoxin	LT	Gal
Cholera toxin	CT	GM1 pentasaccharide

Source: Weiss, W.I. & Drickamer, K. (1996) Structural basis of lectin-carbohydrate recognition. *Annu. Rev. Biochem.* **65**, 441–473.

