

Donald Voet • Judith G. Voet

Biochemistry

Third Edition

Chapter 11:

Carbohydrates

David L. Nelson & Michael M. Cox

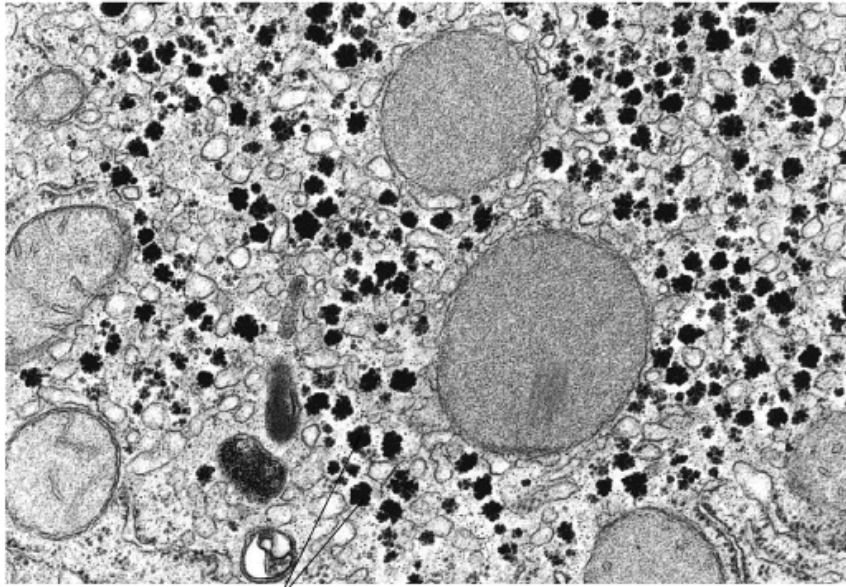
Lehninger Principles of

Biochemistry

Sixth Edition

Chapter 7:

Carbohydrates



Glycogen granules

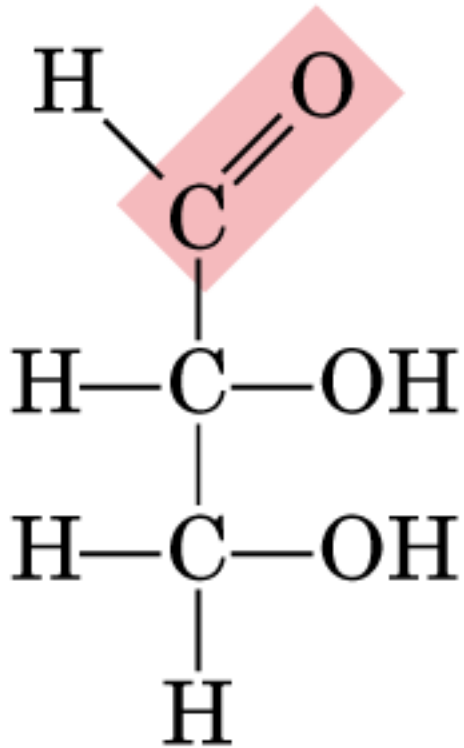
(b)

Grânulos de **glicogênio**

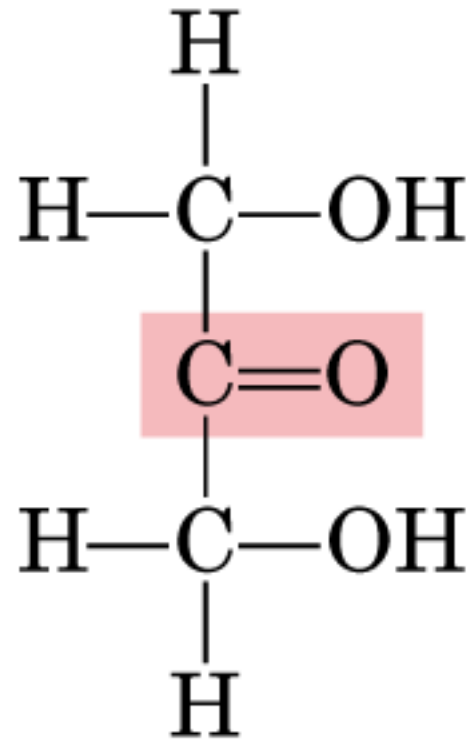


Fibras de **celulose**

Monossacarídeos

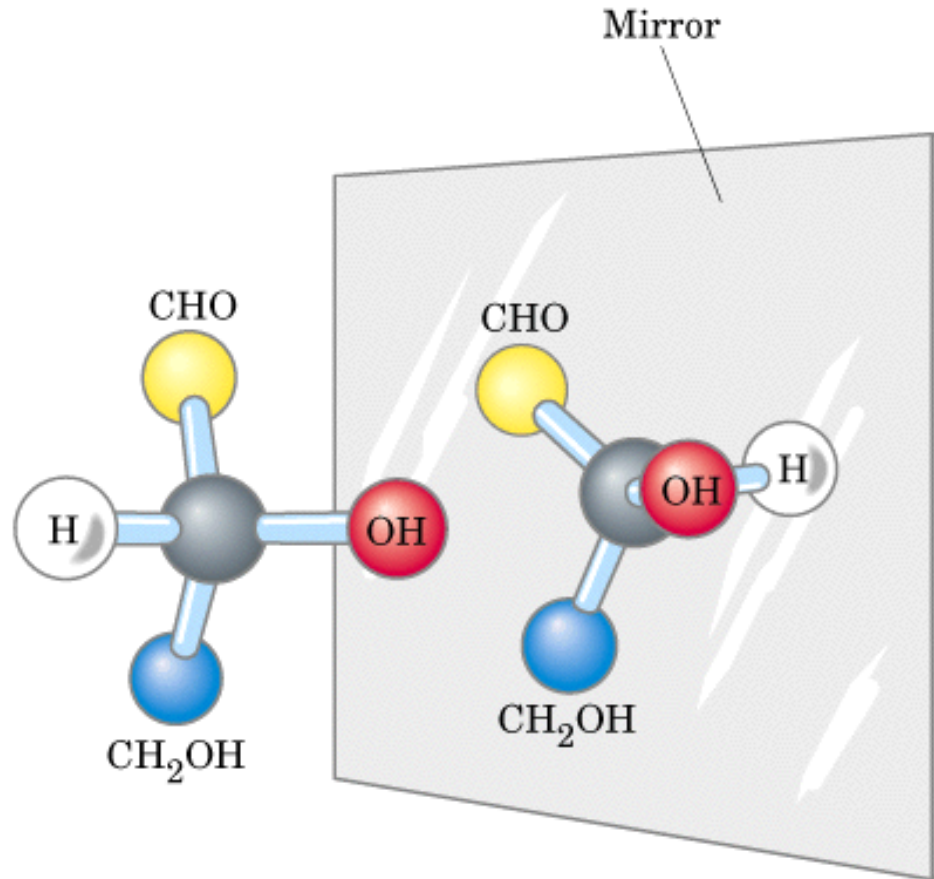
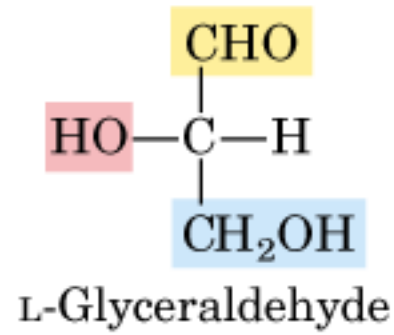
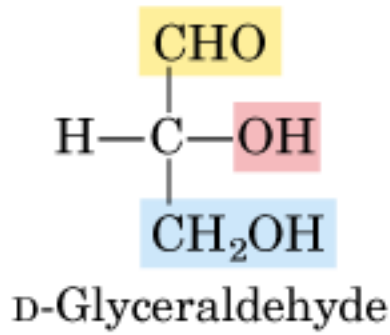


Gliceraldeído
Aldose



Dihidroxiacetona
Cetose

Isomeria



Ball-and-stick models

Aldoses

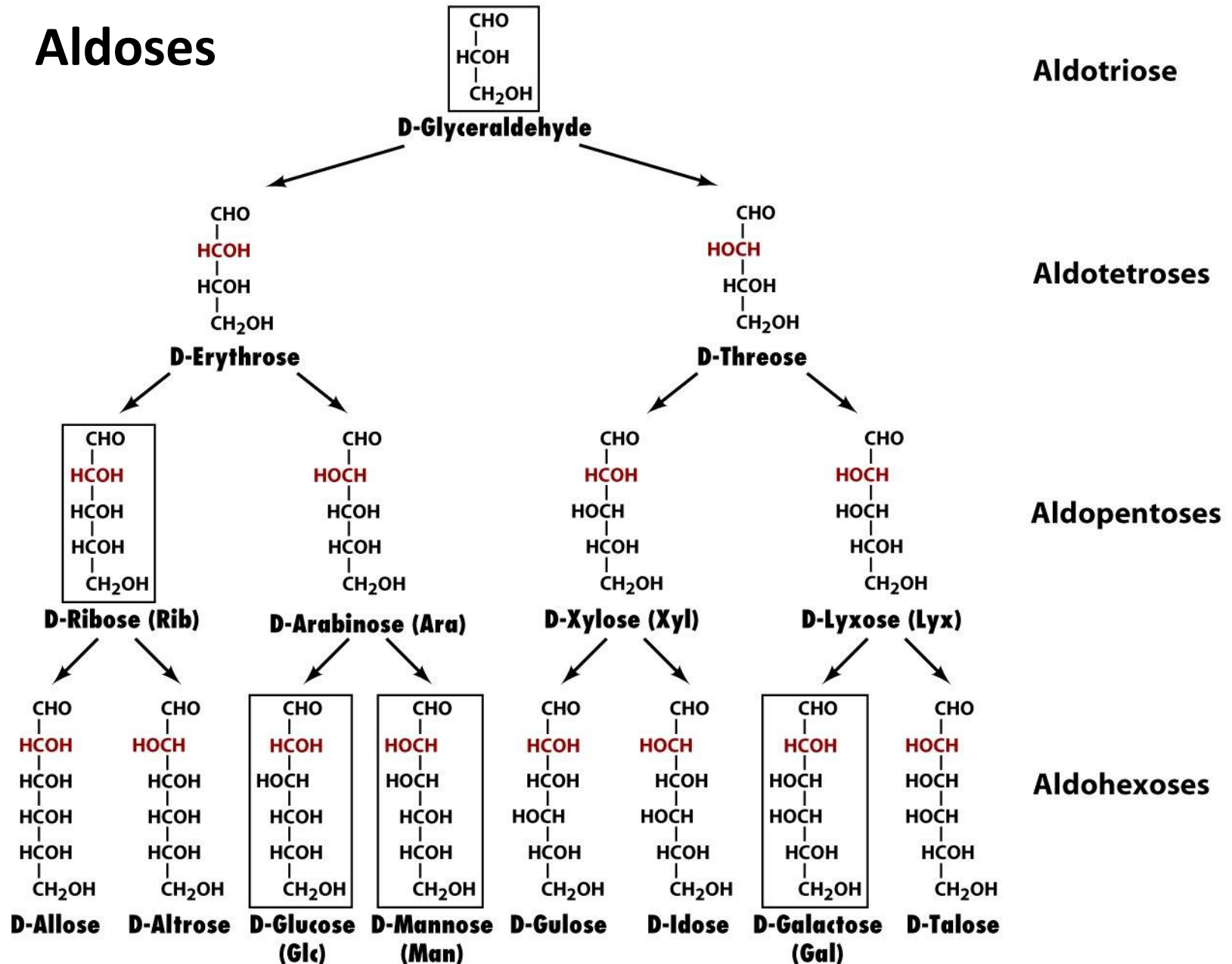


Figure 8-1 Fundamentals of Biochemistry, 2/e
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Cetoses

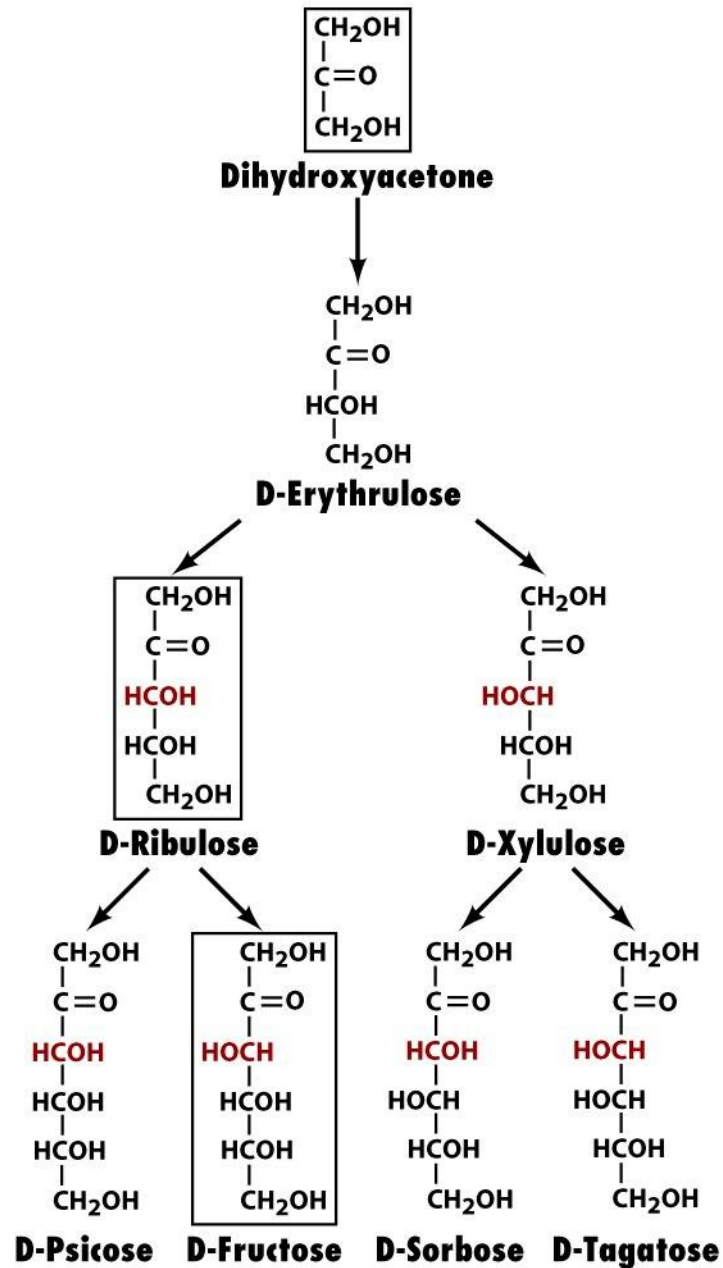


Figure 8-2 Fundamentals of Biochemistry, 2/e
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- Fase Regenerativa (Não-Oxidativa)

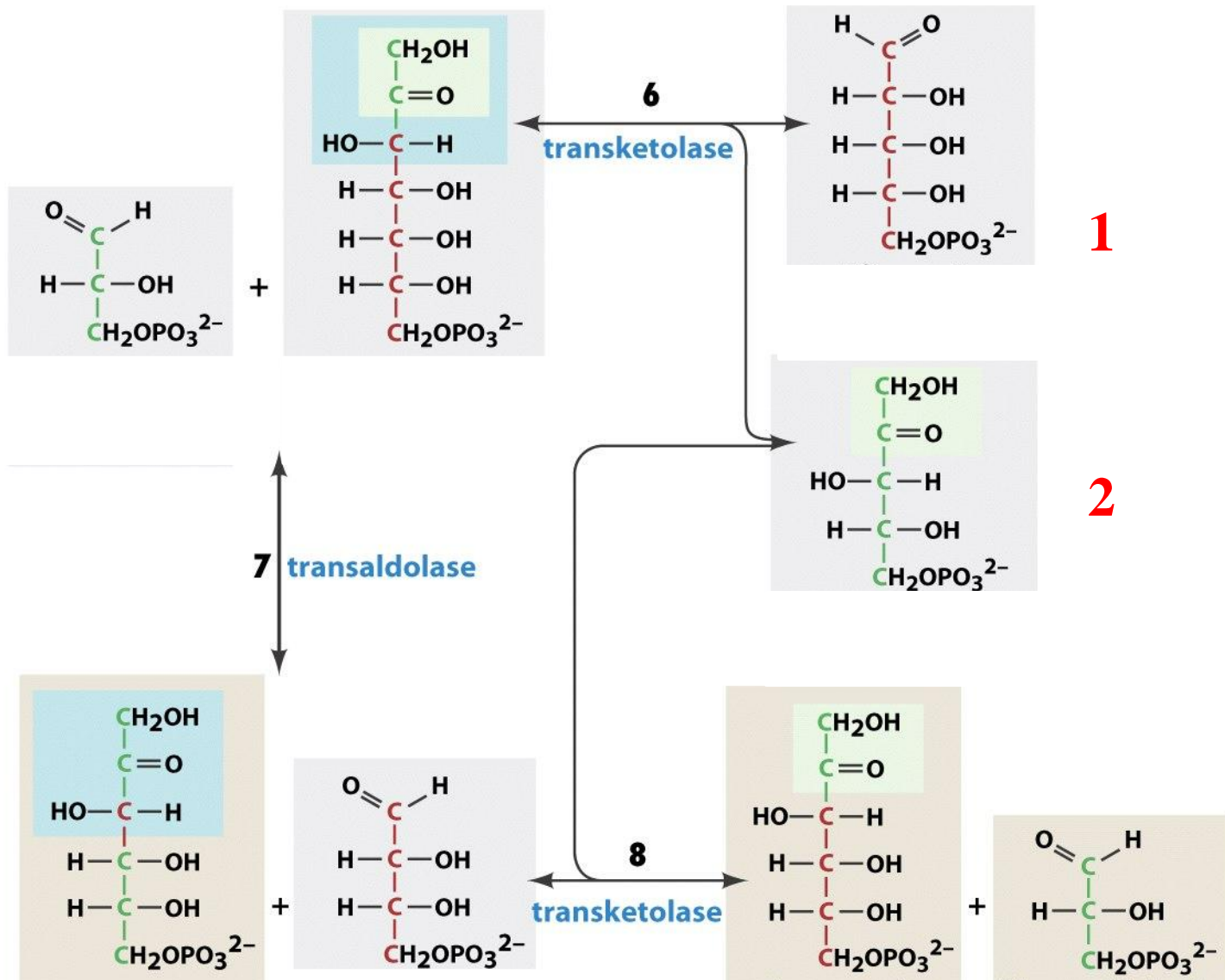
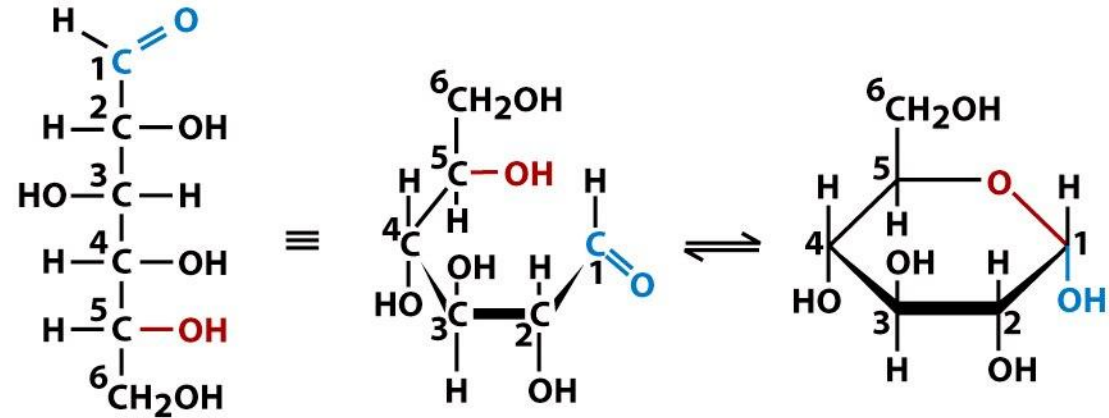


Figure 14-30 part 2 Fundamentals of Biochemistry, 2/e
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D-glucose em água: ciclização

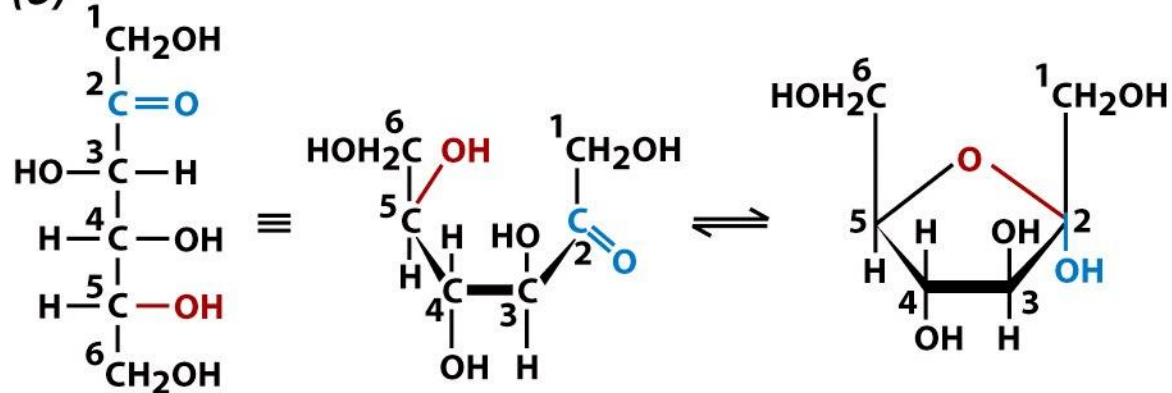
(a)



**D-Glucose
(linear form)**

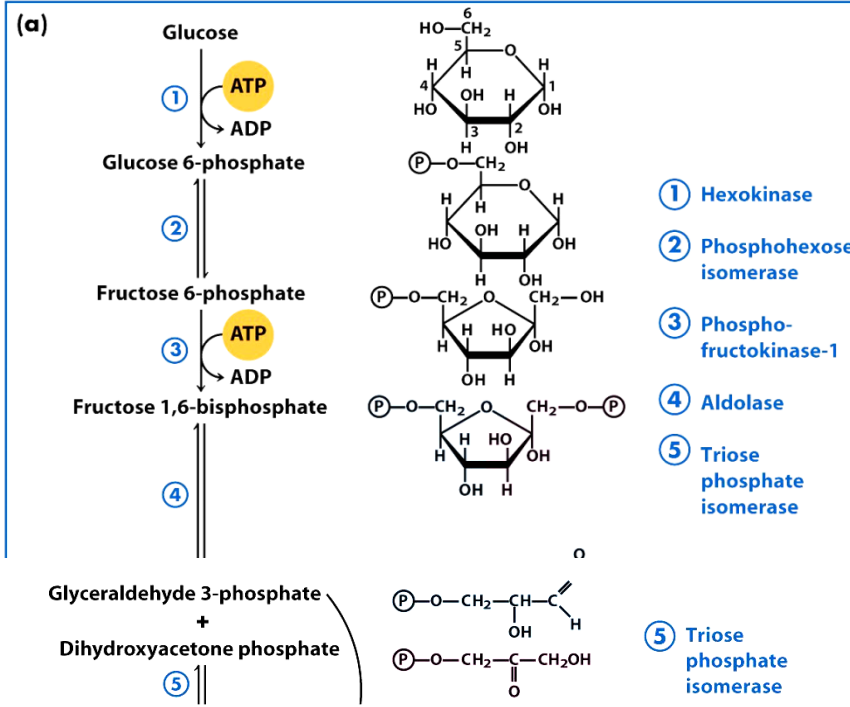
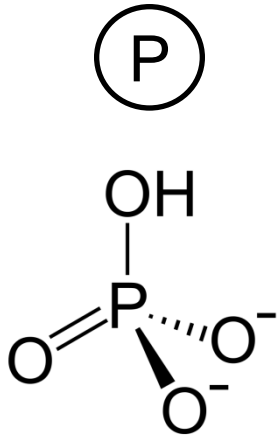
**α-D-Glucopyranose
(Haworth projection)**

(b)

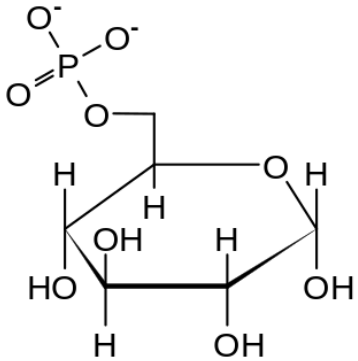


**D-Fructose
(linear form)**

**α-D-Fructofuranose
(Haworth projection)**



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<https://commons.wikimedia.org/w/index.php?curid=325551>



<https://commons.wikimedia.org/wiki/File:Glucose-6-phosphat.svg#/media/File:Glucose-6-phosphat.svg>

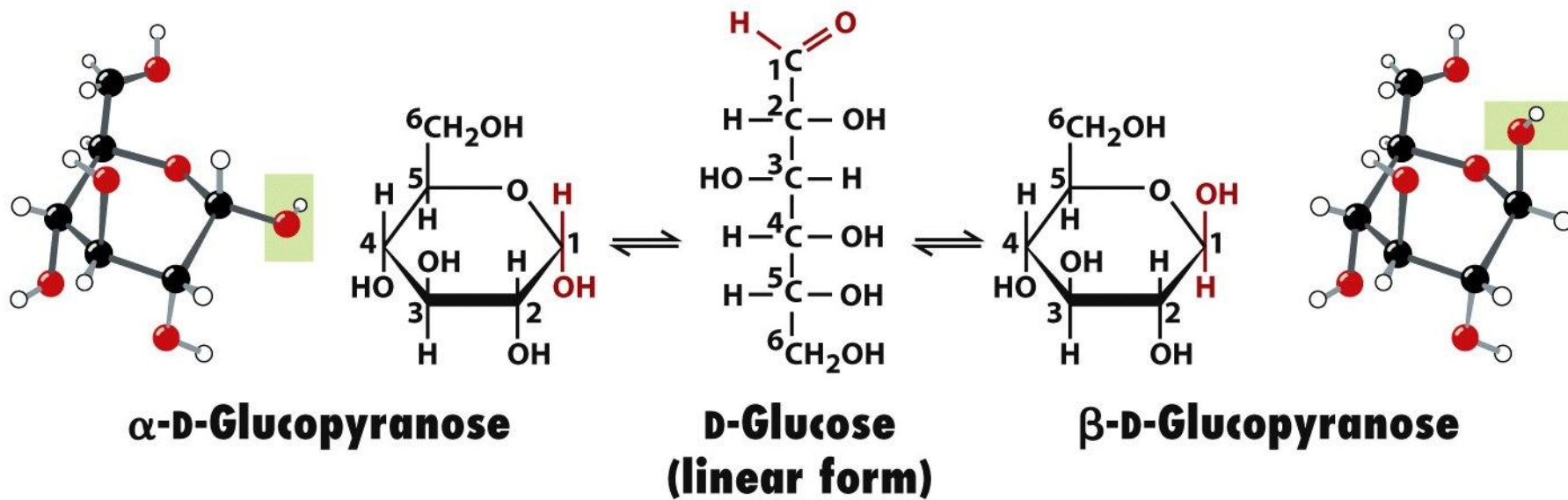
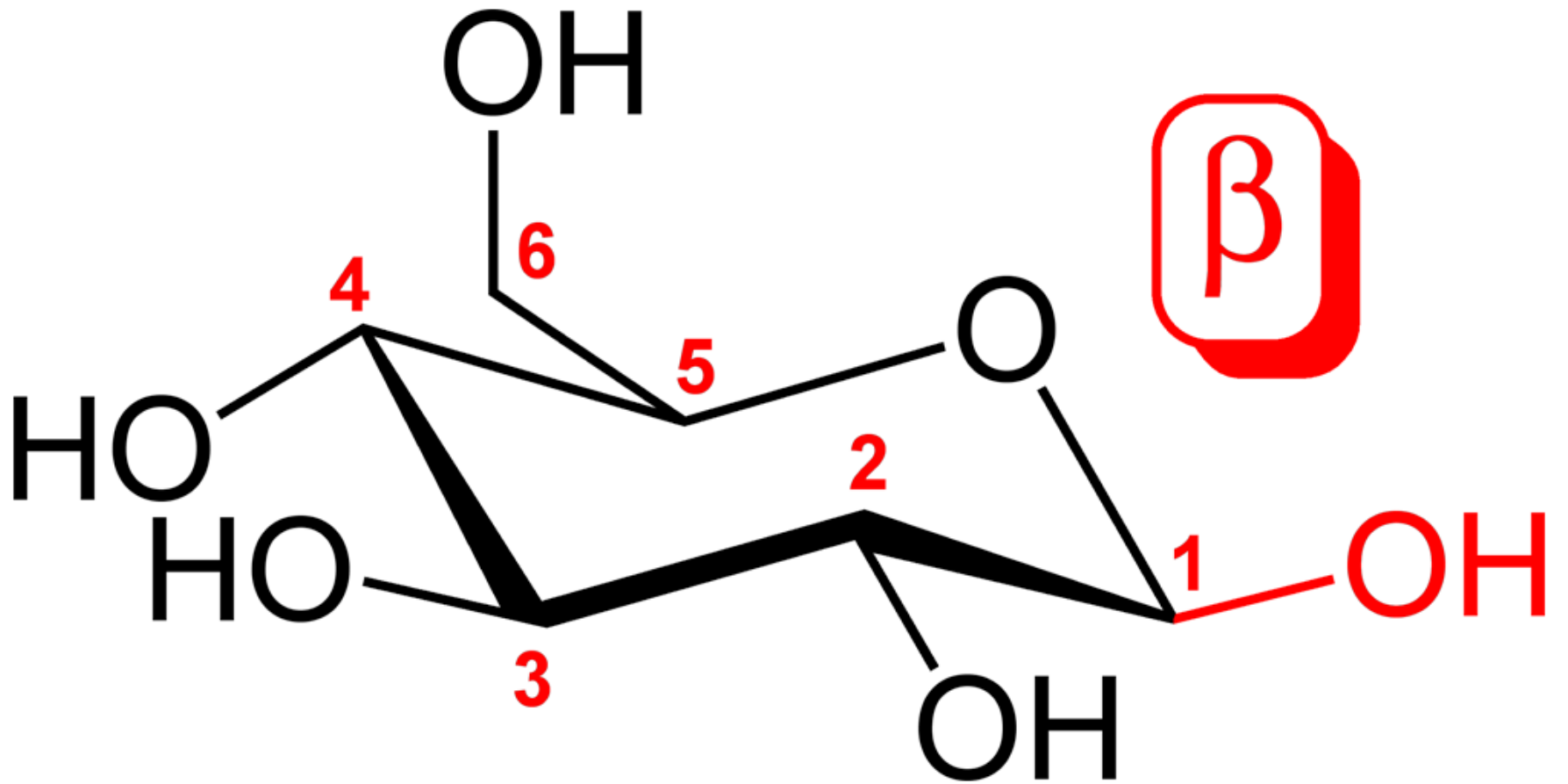
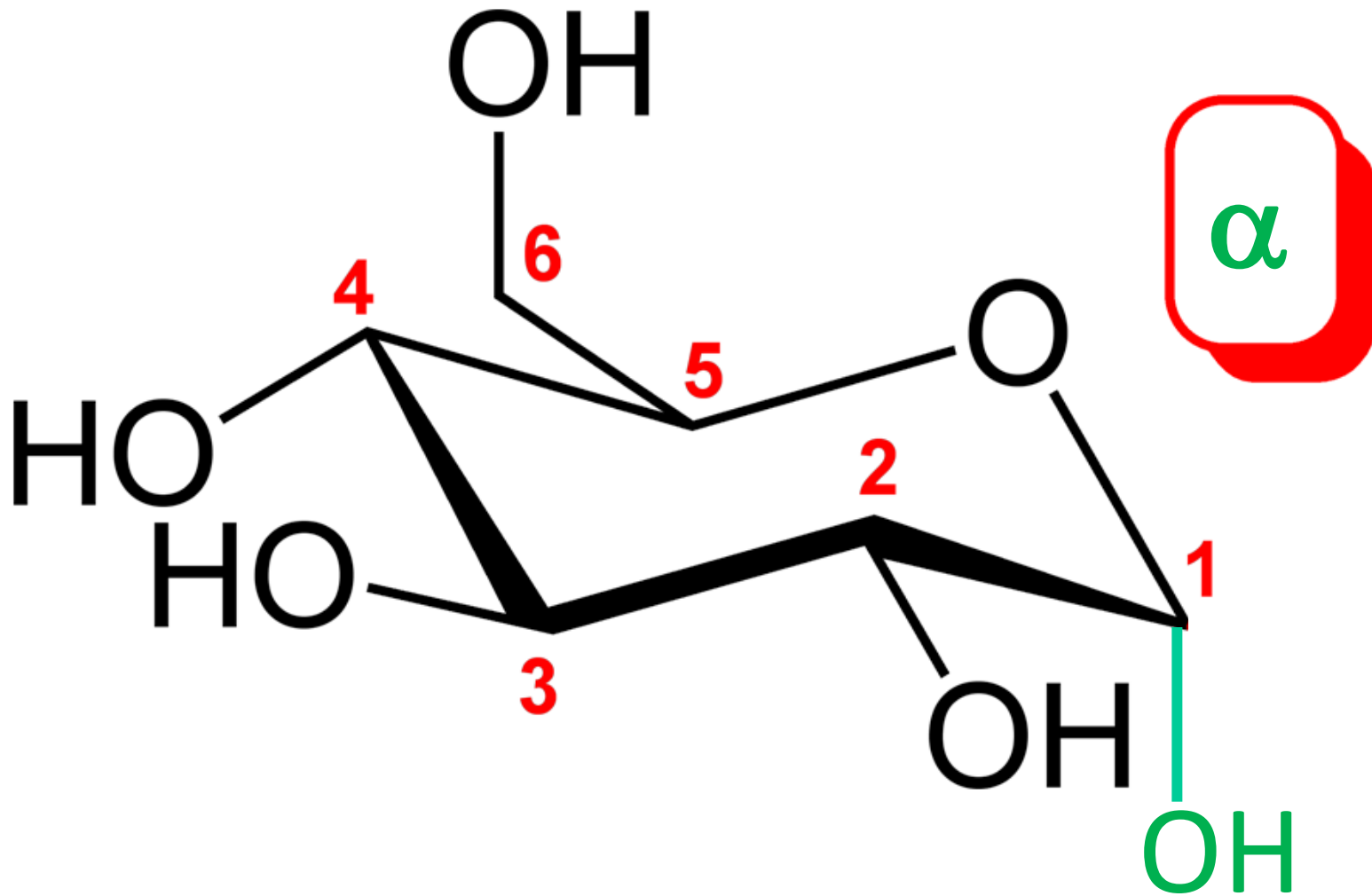
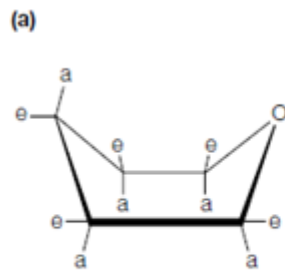


Figure 8-4 Fundamentals of Biochemistry, 2/e
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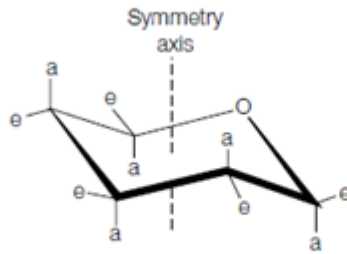






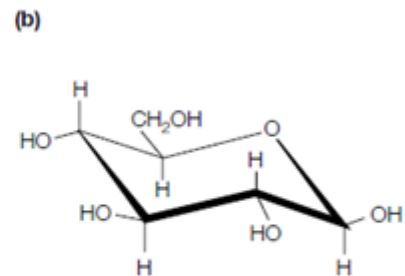
Boat form

barco

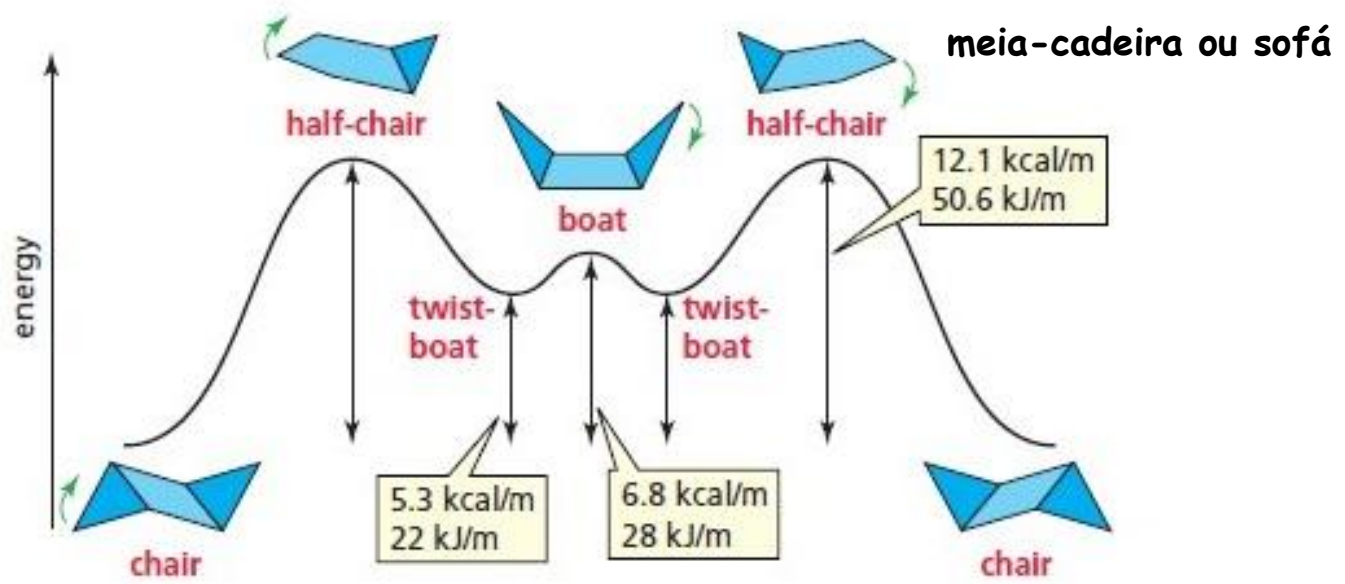


Chair form

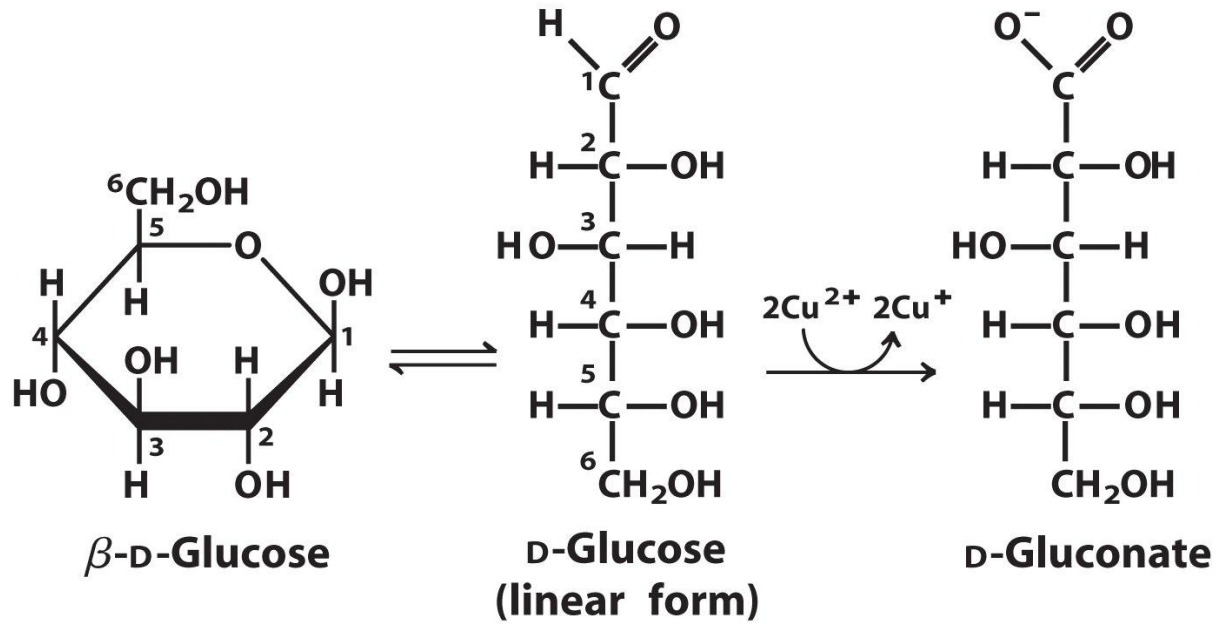
cadeira

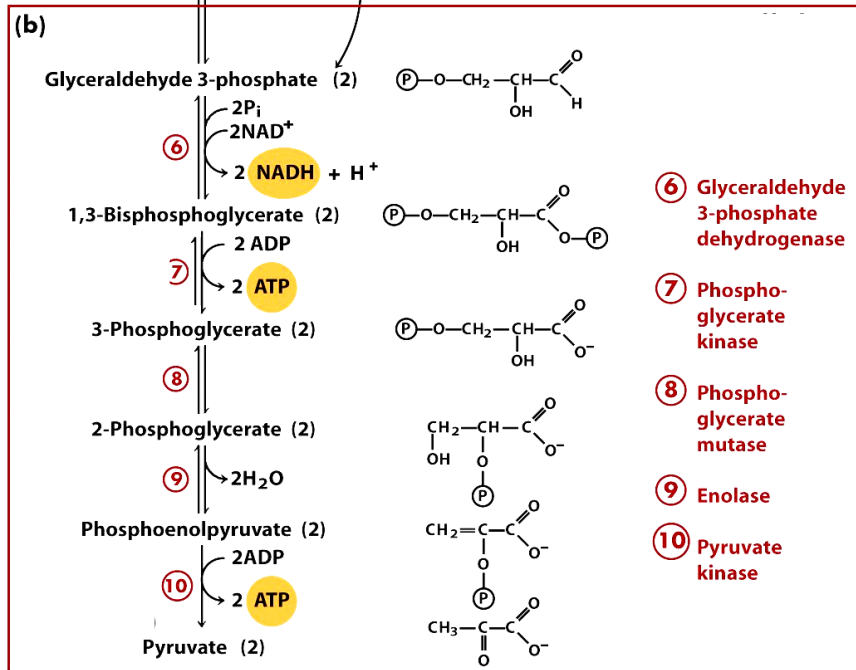
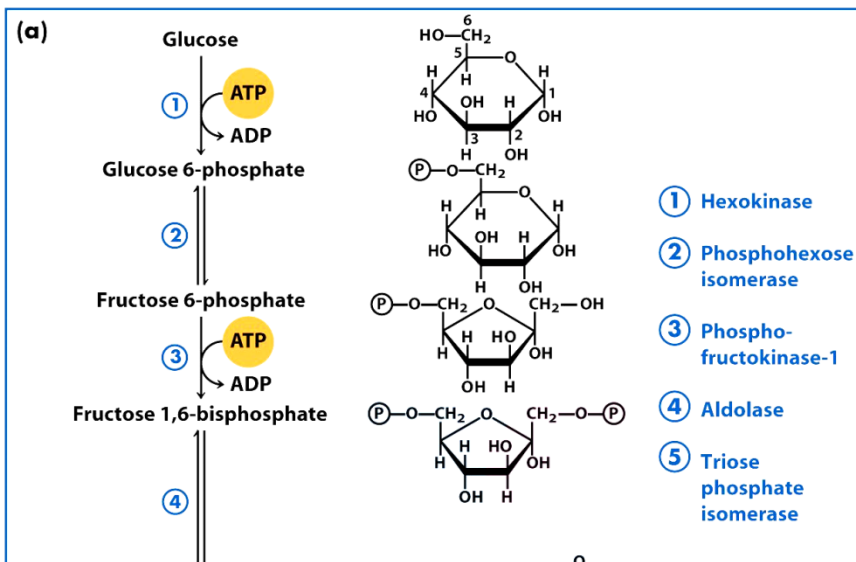
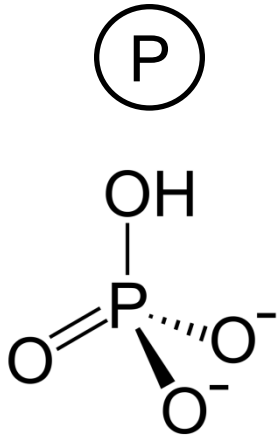


Chair form of β -D-glucose

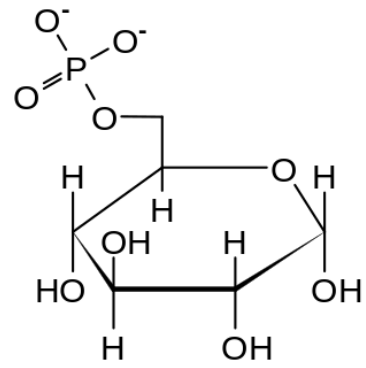


Oxidação



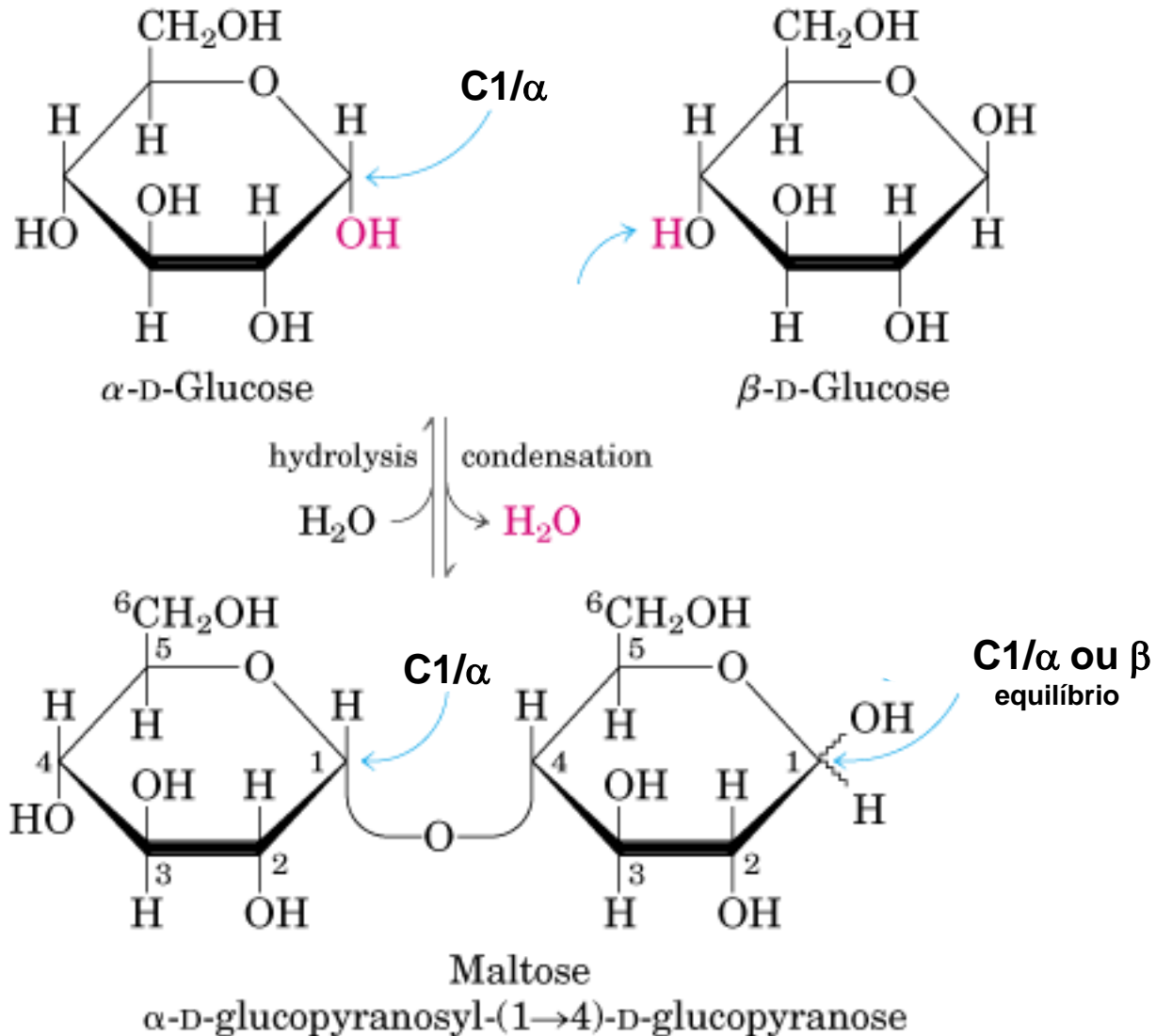


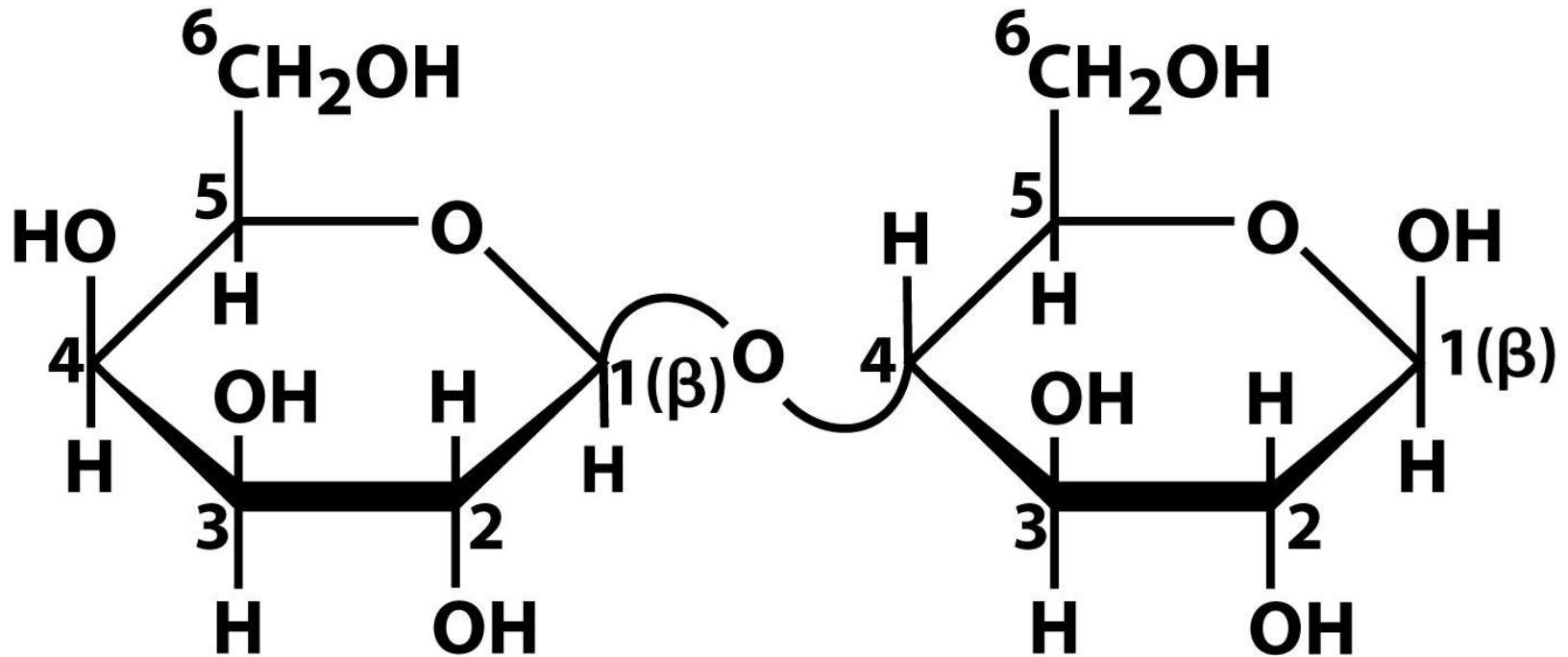
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<https://commons.wikimedia.org/wiki/File:Glucose-6-phosphat.svg#/media/File:Glucose-6-phosphat.svg>

Monossacarídeos → oligossacarídeos → polissacarídeos

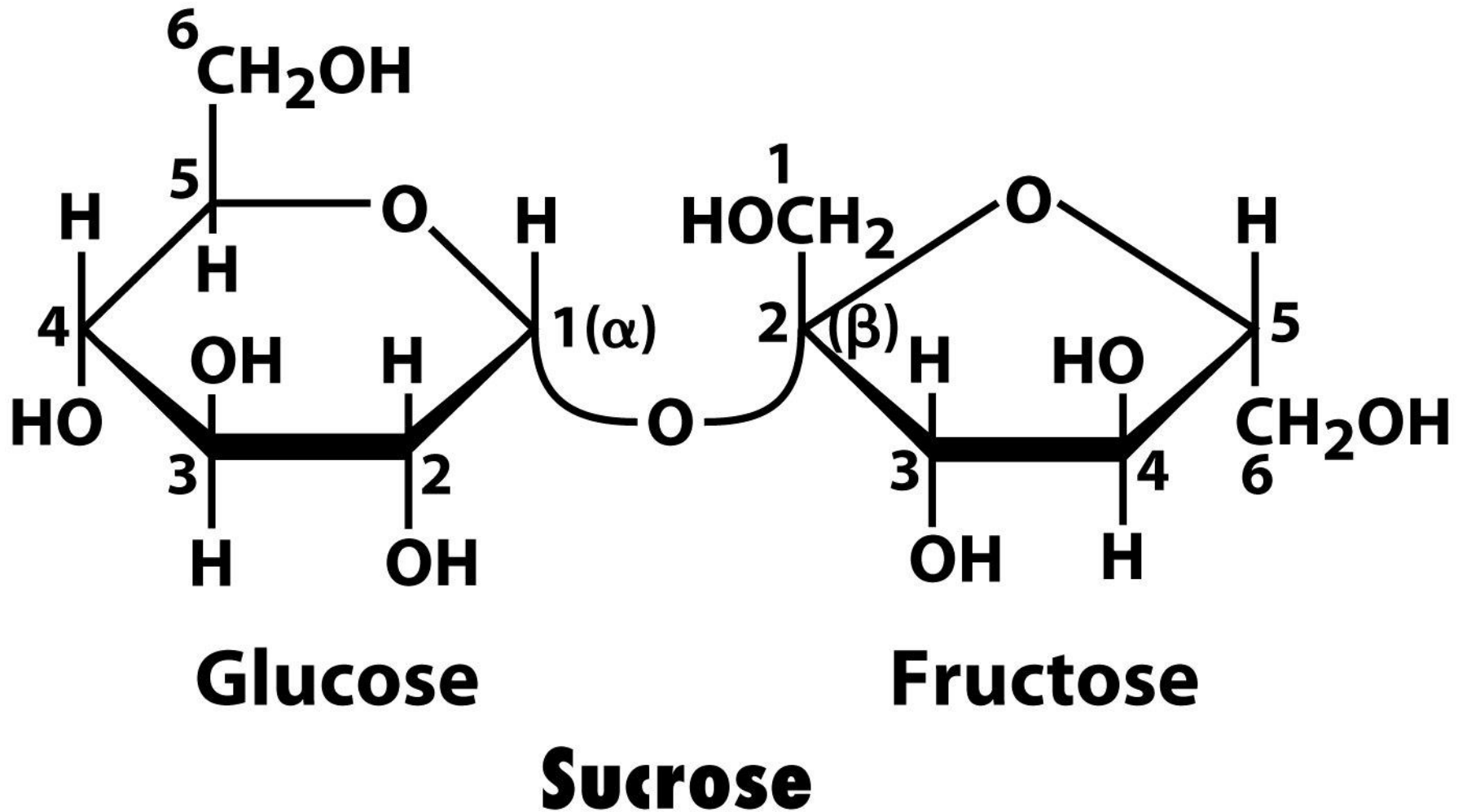




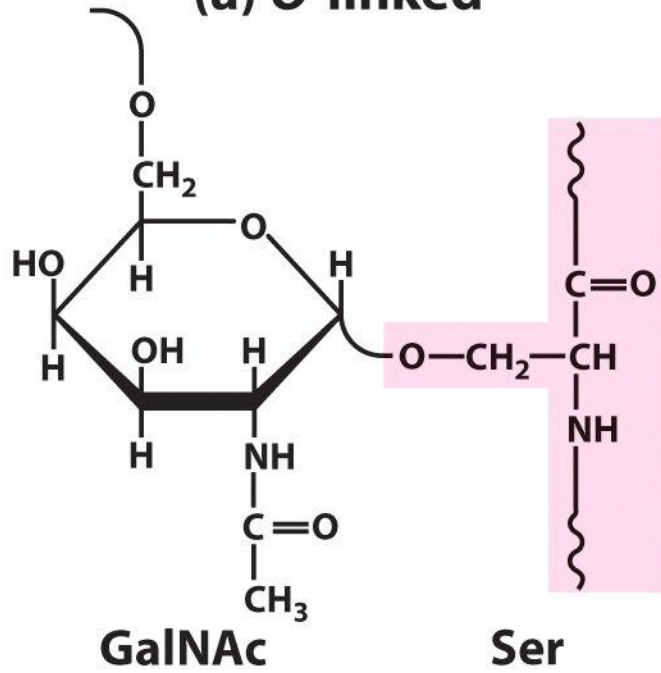
Galactose

Glucose

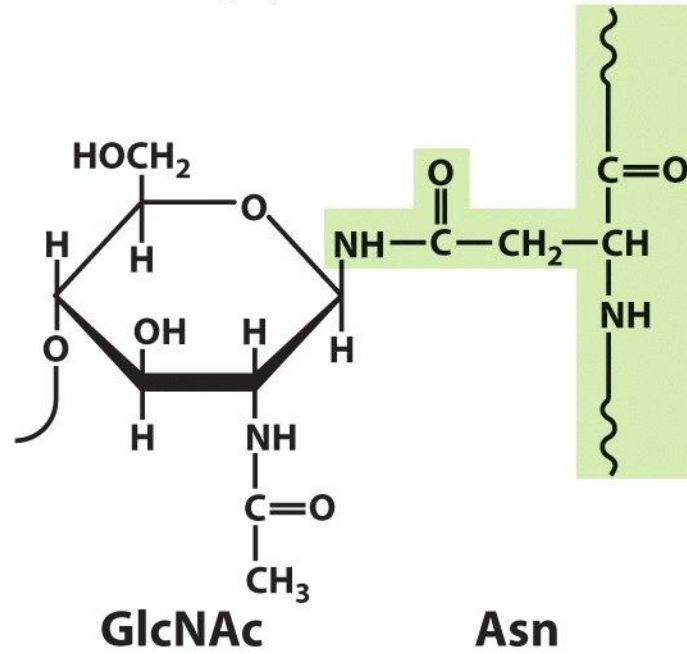
Lactose



(a) O-linked



(b) N-linked

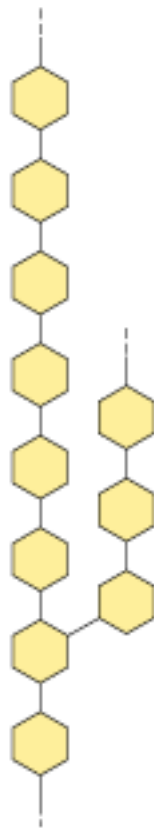


Homopolysaccharides

Unbranched



Branched



Heteropolysaccharides

Two monomer types, unbranched



Multiple monomer types, branched

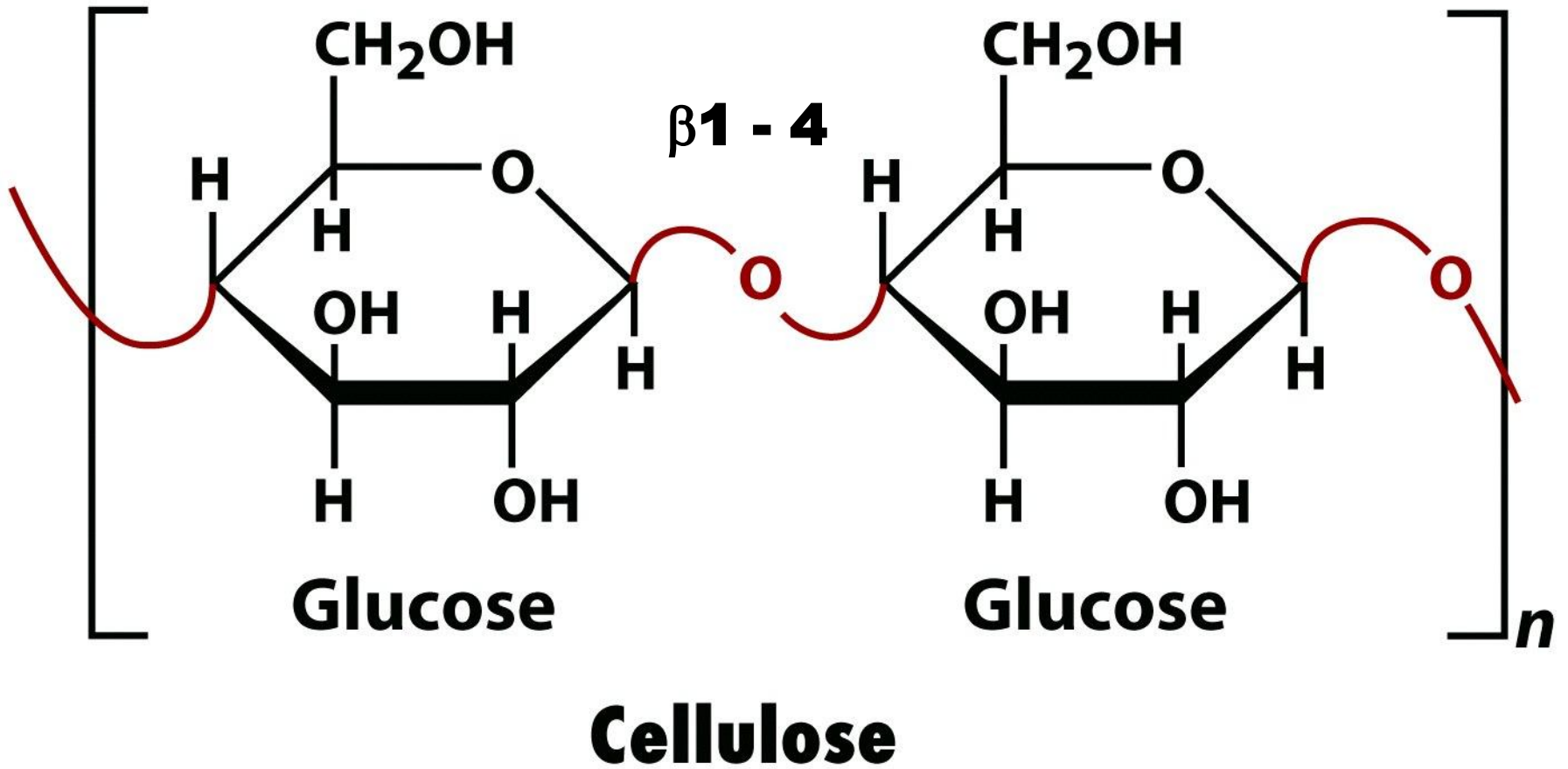


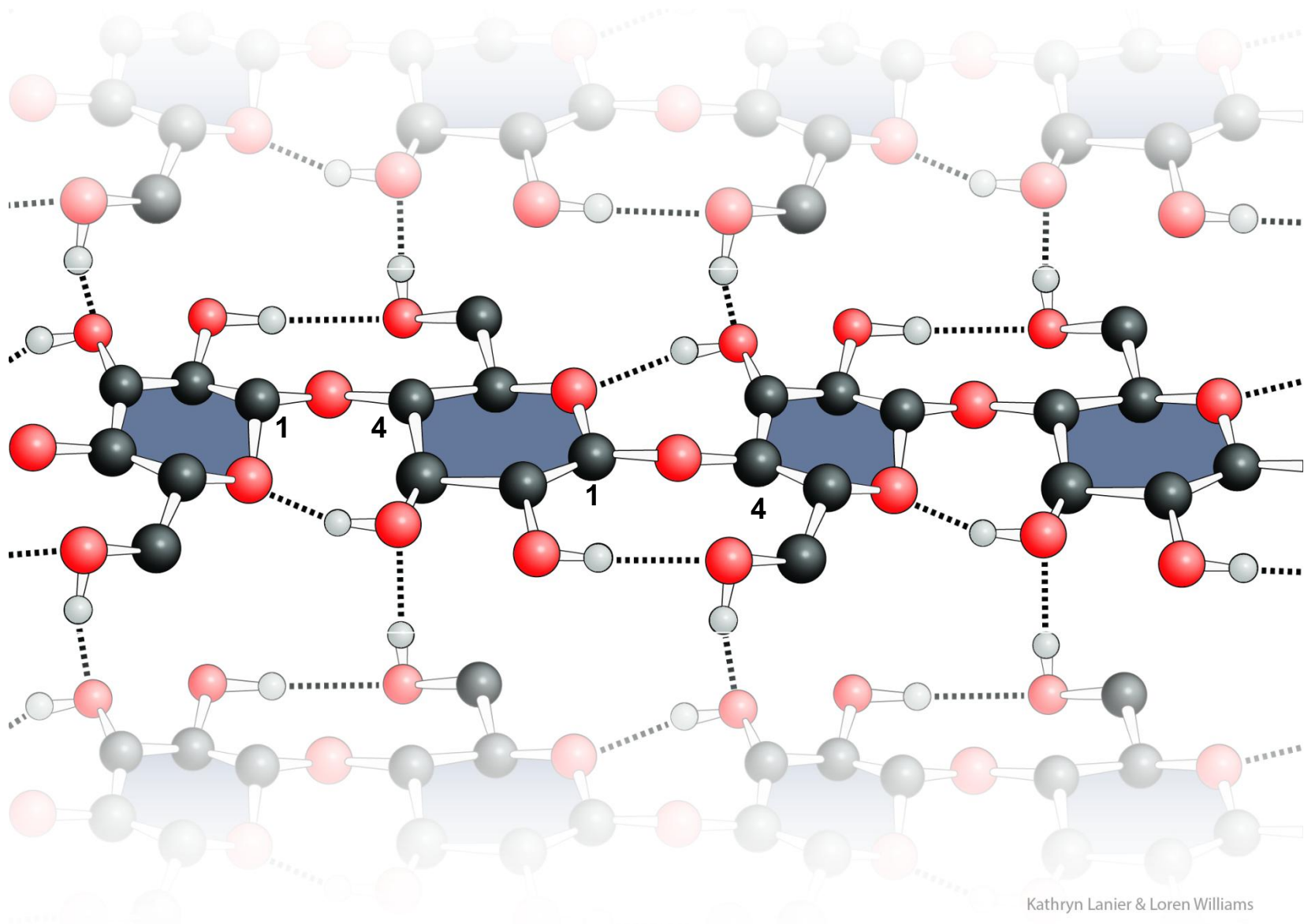
TABLE 7-2 Structures and Roles of Some Polysaccharides

<i>Polymer</i>	<i>Type*</i>	<i>Repeating unit[†]</i>	<i>Size (number of monosaccharide units)</i>	<i>Roles/significance</i>
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 24–30 residues	Up to 10 ⁶	
Glycogen	Homo-	(α 1→4)Glc, with (α 1→6)Glc branches every 8–12 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
Dextran	Homo-	(α 1→6)Glc, with (α 1→3) branches	Wide range	Structural: in bacteria, extracellular adhesive
Peptidoglycan	Hetero-; peptides attached	4)Mur2Ac(β 1→4)GlcNAc(β 1)	Very large	Structural: in bacteria, gives rigidity and strength to cell envelope
Agarose	Hetero-	3)D-Gal(β 1→4)3,6-anhydro-L-Gal(α 1	1,000	Structural: in algae, cell wall material
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

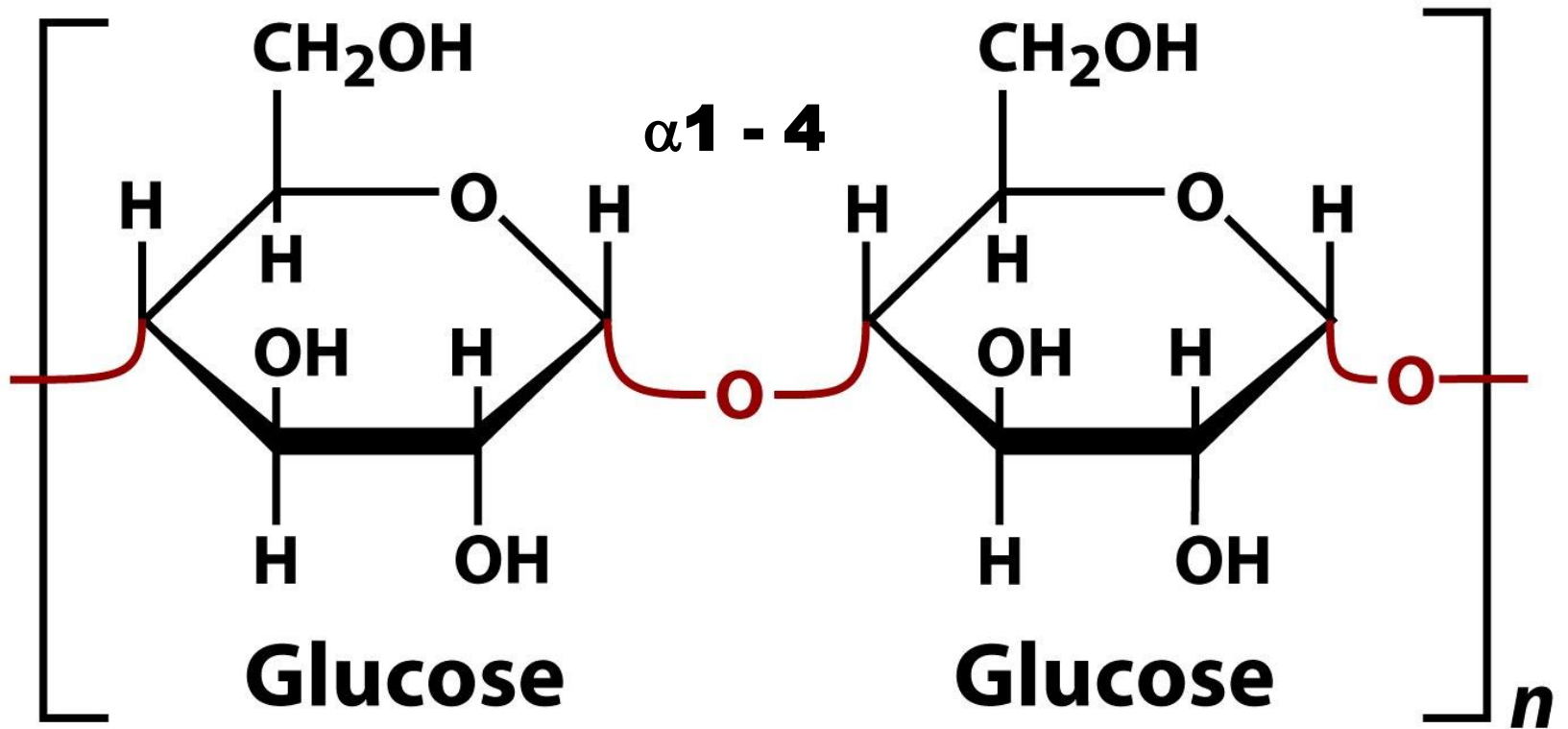
*Each polymer is classified as a homopolysaccharide (homo-) or heteropolysaccharide (hetero-).

[†]The abbreviated names for the peptidoglycan, agarose, and hyaluronate repeating units indicate that the polymer contains repeats of this disaccharide unit. For example, in peptidoglycan, the GlcNAc of one disaccharide unit is (β 1→4)-linked to the first residue of the next disaccharide unit.

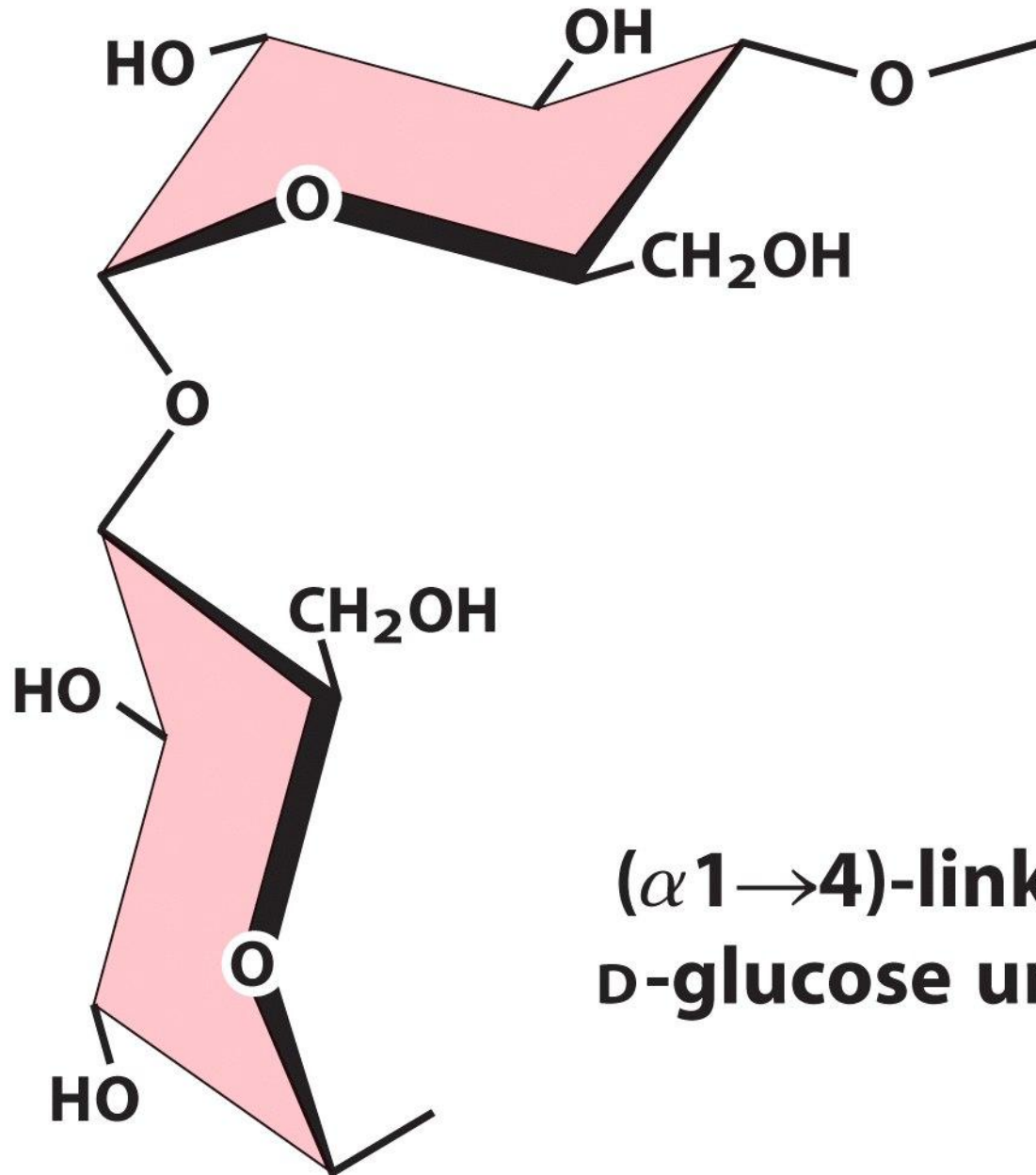




Kathryn Lanier & Loren Williams



α -Amylose



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

Amilose

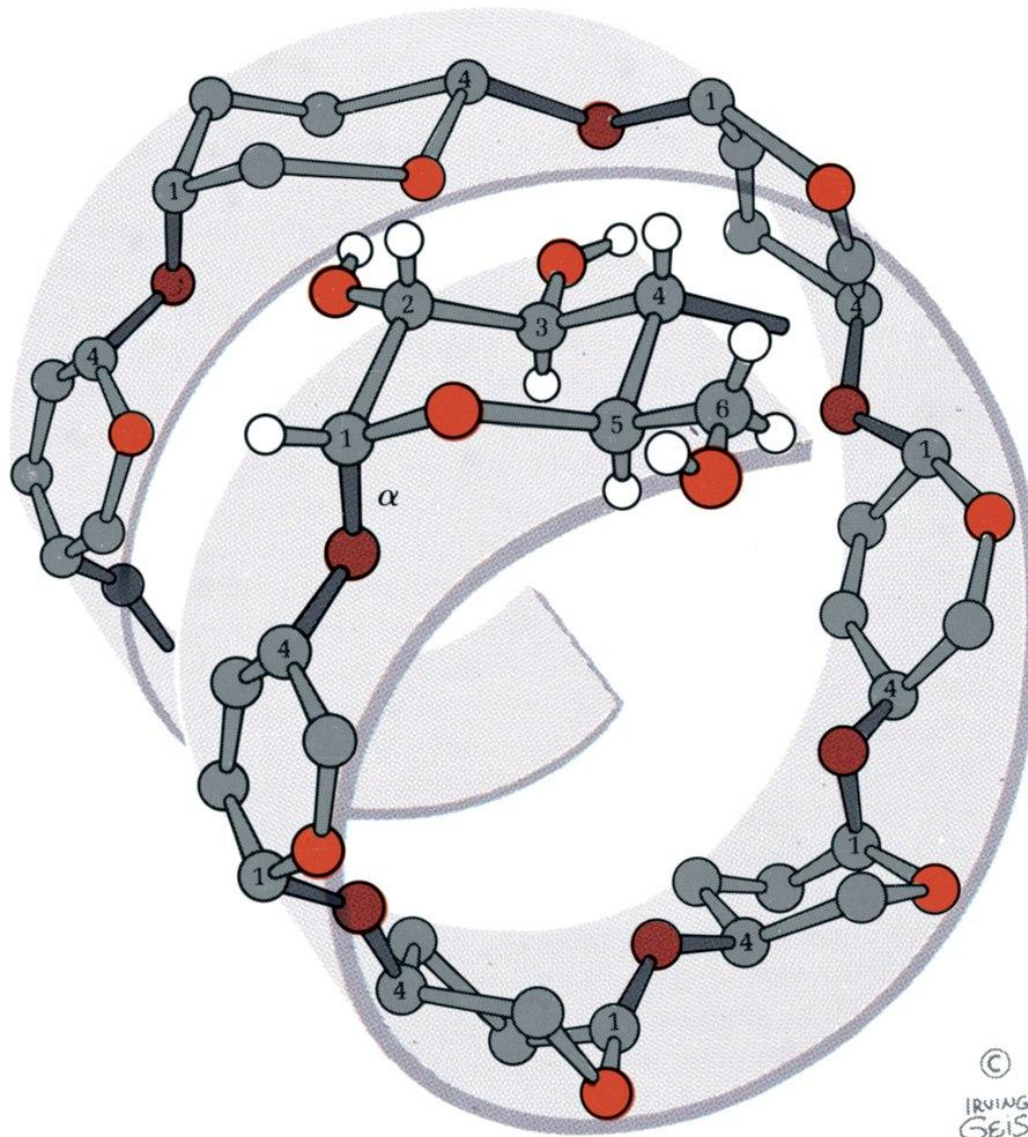
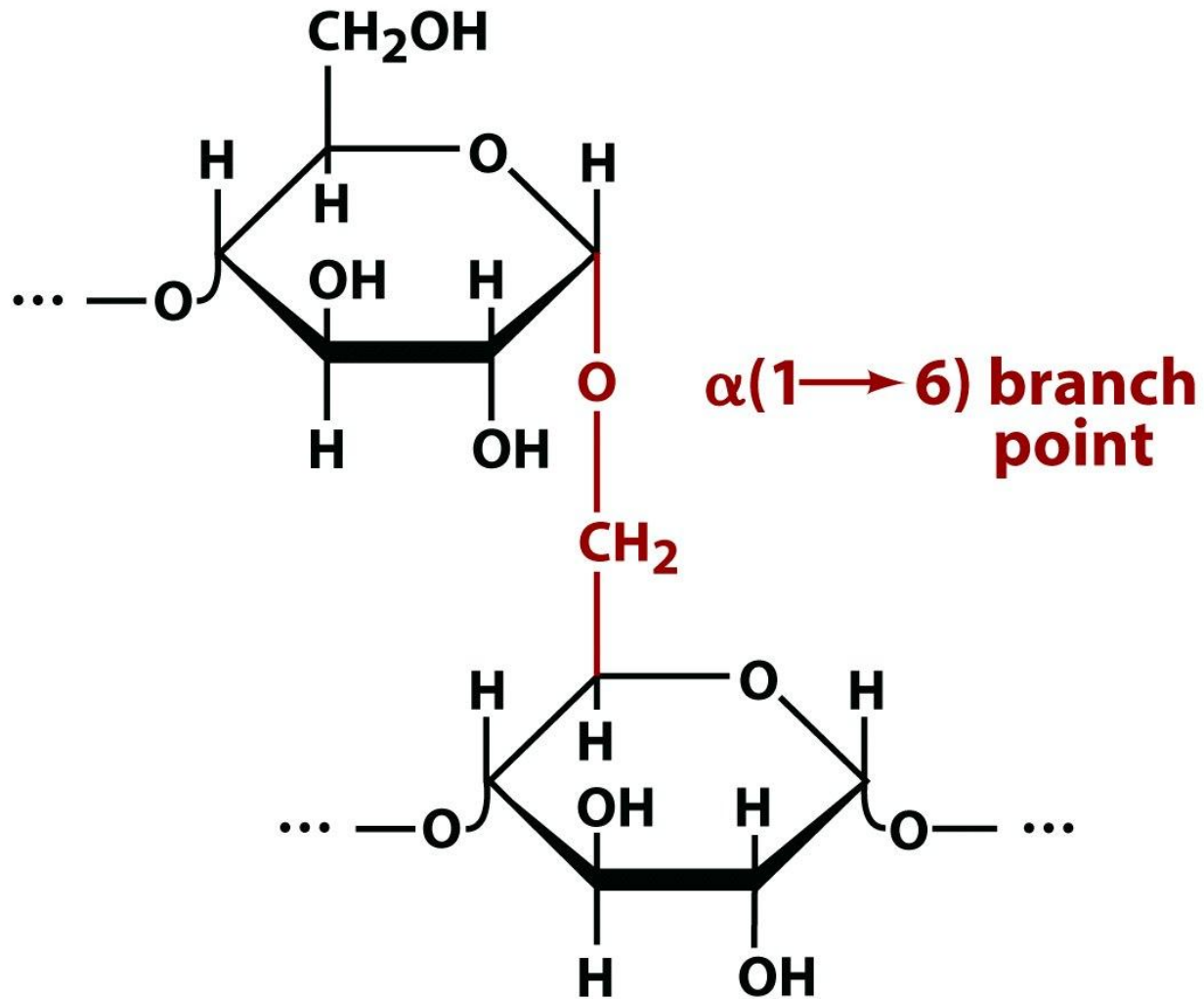


Figure 8-10 Fundamentals of Biochemistry, 2/e



Amylopectin

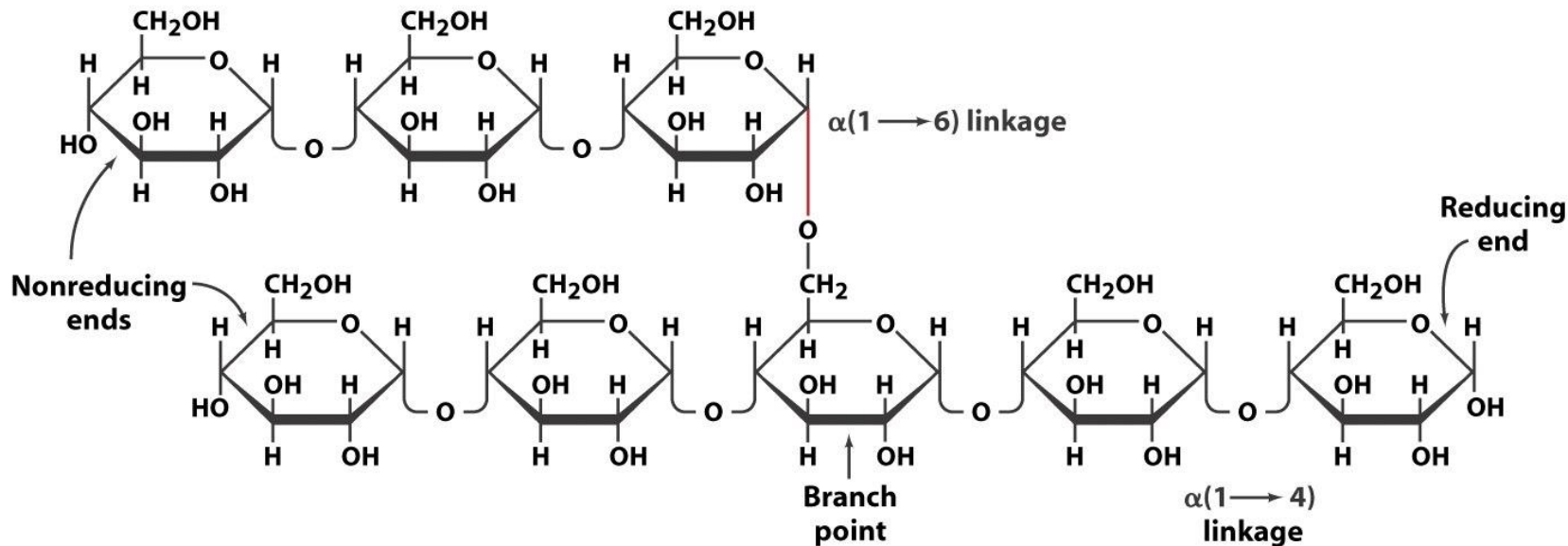


Figure 15-2a Fundamentals of Biochemistry, 2/e
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