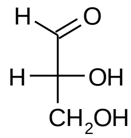
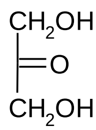
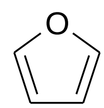
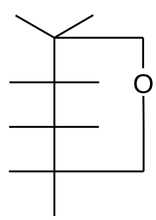
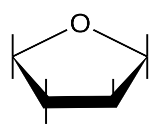
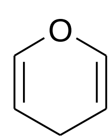
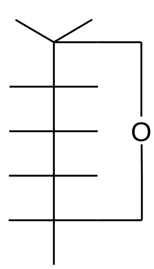
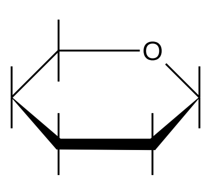
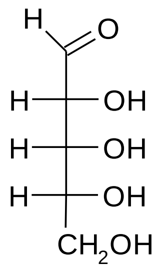
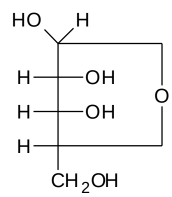
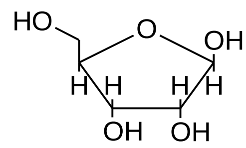
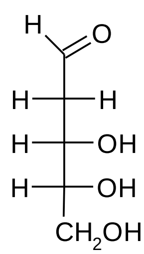
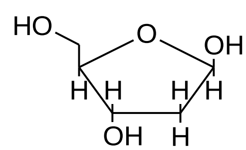
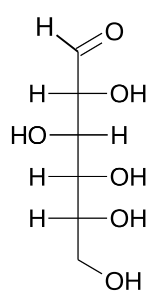
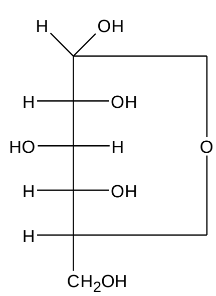
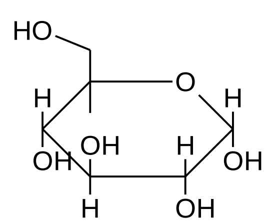
Table of Carbohydrates

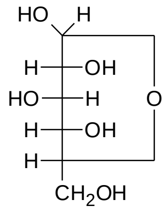
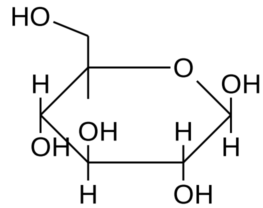
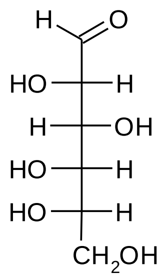
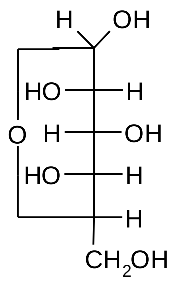
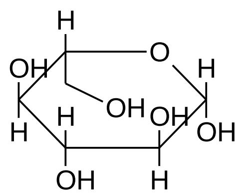
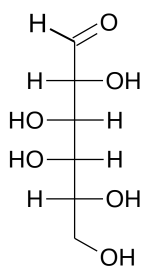
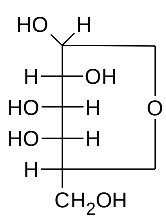
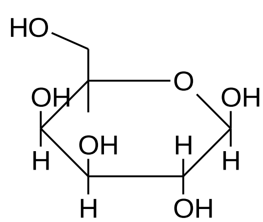
Names in bold represent sugars whose **structures you should learn!**

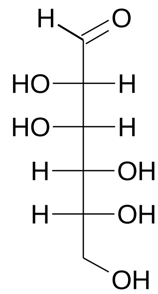
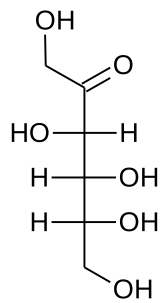
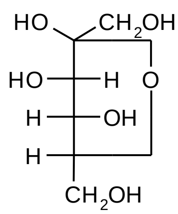
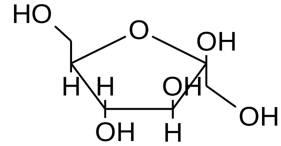
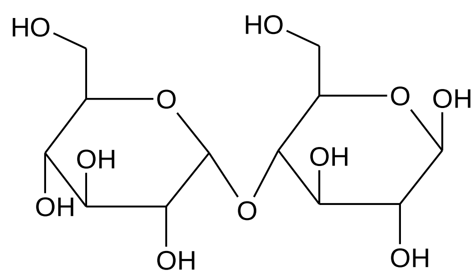
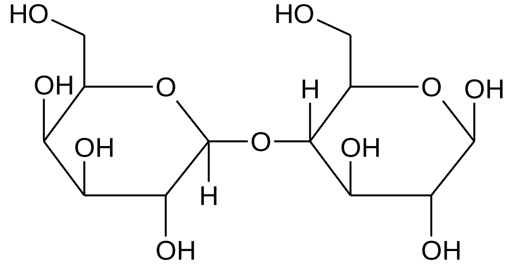
name	Fischer projection	Haworth projection	comments
D-glyceraldehyde		only cyclic sugars can have a Haworth projection	to determine whether a sugar is of the D- or L- type, look at the –OH group on the lowest chiral center in the Fischer projection
dihydroxyacetone		in the standard Fischer projection for carbohydrates, the aldehyde group is at the top; for ketoses, the ketone group is as close to the top as possible; for amino acids, the carboxyl group is at the top.	
furan a cyclic unsaturated ether	---		sugars which form cyclic hemiacetals or hemiketals with 5-membered rings are called "furanoses" in analogy with furan
furanose: basic depiction			the standard orientation in the Haworth projection is with the ring oxygen at the top, representing the back edge of the molecule. C-1 is at the right. The ring atoms at the bottom are the front edge of the molecule. Shading has been omitted from the structures below for clarity.
γ-pyran a cyclic unsaturated ether	---		sugars which form cyclic hemiacetals or hemiketals with 6-membered rings are called "pyranoses" in analogy with pyran
pyranose: basic depiction			the standard orientation in the Haworth projection is with the ring oxygen at the top right, representing the back edge of the molecule. C-1 is at the right. The ring atoms at the bottom are the front edge of the molecule. Shading has been omitted from the structures below for clarity.

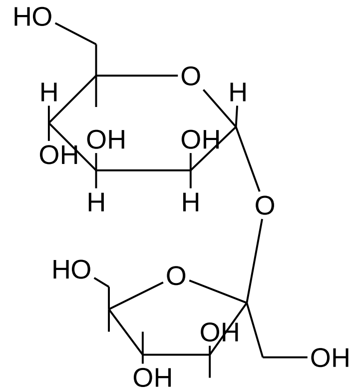
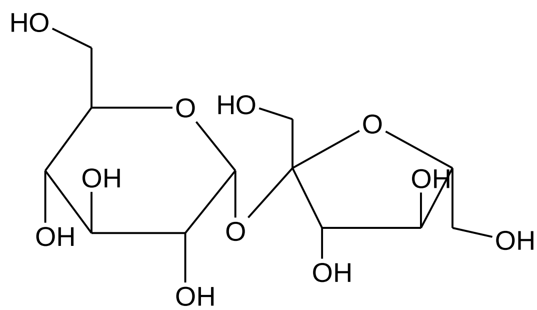
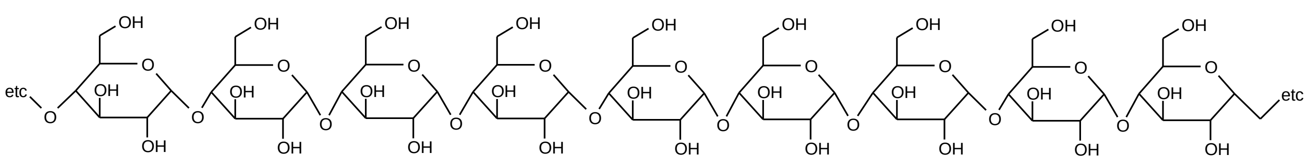
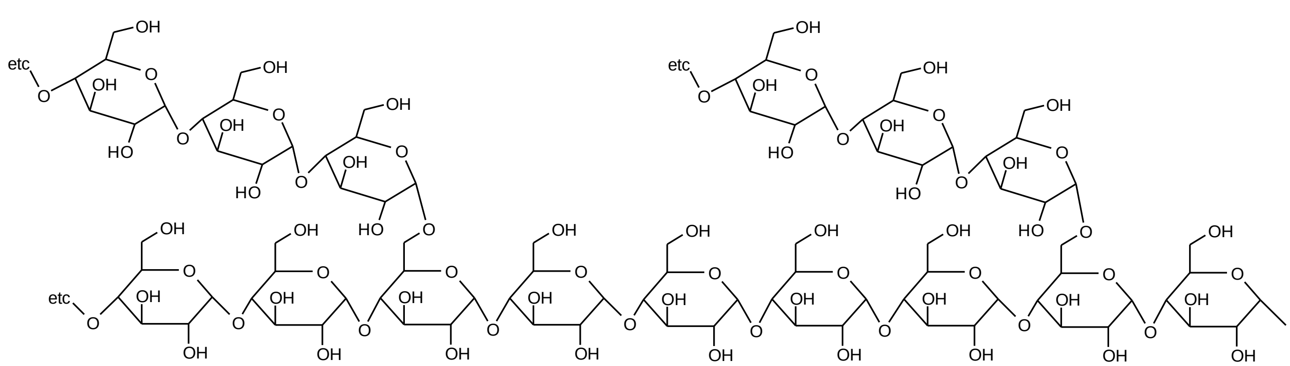
D-ribose		only cyclic sugars can have a Haworth projection	one of eight possible aldopentoses, it's the easiest to remember because all the –OH groups are on the right.
β-D-ribofuranose			In RNA, the –OH at C-1 is replaced by N-1 of a pyrimidine base or N-9 of a purine base; the –OH on C-3 and C-5 are converted to phosphate esters

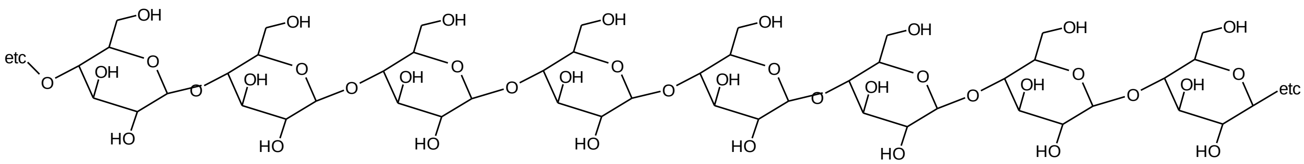
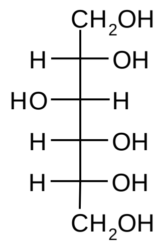
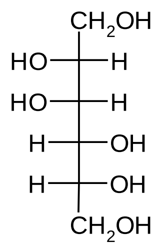
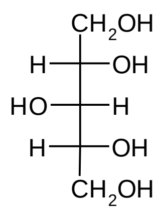
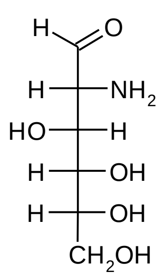
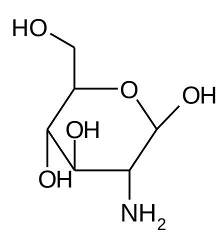
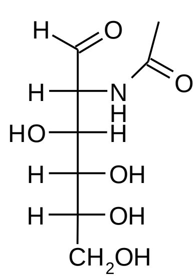
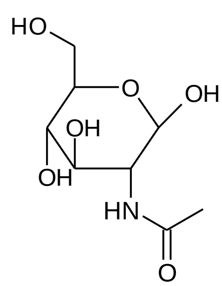
The **β-anomer** can be identified in the following manner: In the Fischer projection with the ring O shown to the right of the vertical axis, the anomeric –OH is on the left. In the Haworth projection, the anomeric –OH is on the same side of the ring as the terminal –CH_2OH group [up for D-sugars].

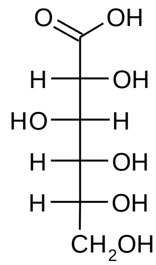
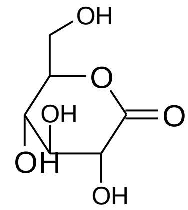
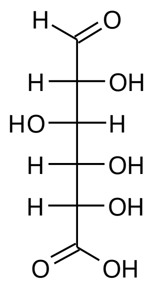
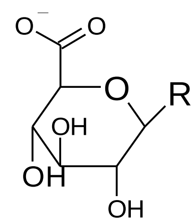
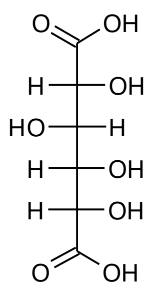
D-2-deoxyribose			found in DNA; the lack of the –OH at C-2 makes DNA much more stable to alkaline hydrolysis than RNA is.
D-glucose		Only cyclic saccharides can have a Haworth projection	the most common and most important of all the monosaccharides
α-D-glucopyranose			the alpha-structure is conserved in maltose, sucrose, amylose, amylopectin, and glycogen.

β-D-glucopyranose			in solution, there is a mixture of ~⅔ β and ~⅓ α with <1% open-chain form present. The beta-structure is conserved in cellulose
L−glucose		only cyclic saccharides can have a Haworth projection	L- sugars are the COMPLETE enantiomers [mirror images] of the corresponding D-sugar of the same name. You'd starve to death if this was the sugar you ate.
β-L-glucopyranose			L- sugars are the COMPLETE enantiomers [mirror images] of the corresponding D-sugar of the same name.
D-galactose		only cyclic saccharides can have a Haworth projection	a common sugar in nature, it makes up half of the disaccharide lactose. A serious disorder called galactosemia results when some individuals have a hereditary inability to metabolize galactose. If not treated by total removal of galactose and lactose from the diet, irreversible mental retardation and even death can result.
β-D-galactopyranose			
You can view Dave Woodcock's Chime structure of **β-D-galactopyranose at** http://www.molecularmodels.ca/molecule/Natural_Products.htm			

D-mannose		only cyclic saccharides can have a Haworth projection	derived from ivory nuts and other sources.
D-fructose		only cyclic saccharides can have a Haworth projection	the only ketohexose on this list; sweetest of all natural sugars
β-D-fructofuranose			note that C-1 is not part of the ring – the anomeric carbon is C-2
maltose	 4-O-(α-D-glucopyranosyl)-β-D-glucose		for clarity, unnecessary hydrogens are often not shown in Haworth structures. Maltose is produced by the breakdown of starch by enzymes in malted [sprouted] barley, and is fairly sweet.
lactose	 4-O-(β-D-galactopyranosyl)-β-D-glucose		milk sugar; almost tasteless, but helps keep Ca^{2+} in solution by complexing it.

<table>
<tr><td>sucrose</td><td>
α-D-glucopyranosyl-β-D-fructofuranoside
D-glc(α1↔β2)D-fru</td><td>in order to draw sucrose, either one of the rings has to be shown in nonstandard orientation or the length of the glycosidic bonds has to be exaggerated. I went for the latter option just to keep it simple. Since both anomeric positions are tied up in acetal linkages, sucrose is not capable of reducing Benedict's reagent.</td></tr>
<tr><td>sucrose</td><td></td><td>this is what sucrose looks like when the standard ring orientation is sacrificed for more reasonable bond lengths</td></tr>
<tr><td colspan="3">
a very small portion of an amylose chain. all the subunits are α-D-glucose and all the acetal links connect C-1 of one subunit to C-4 of the next subunit. Thus the linkage abbreviation α(1→4). Amylose is responsible for the formation of a deep blue color in the presence of iodine.</td></tr>
<tr><td colspan="3">
very small portion of an amylopectin-type or glycogen-type polysaccharide showing two branch points [drawn closer together than they should be] Most linkages are still α(1→4), but the branch linkages are α(1→6). In glycogen, the branches occur at intervals of 8-10 glucose units, while in amylopectin the branches are separated by 10-12 glucose units. Natural starches are mixtures of amylose and amylopectin.</td></tr>
</table>

<table>
<tr><td colspan="4">
very small portion of a cellulose chain. . all the subunits are β-D-glucose and all the acetal links connect C-1 of one subunit to C-4 of the next subunit. Thus the linkage abbreviation β(1→4)</td></tr>
<tr><td>sorbitol</td><td></td><td></td><td>used as a noncaloric, noncarieogenic sweetener</td></tr>
<tr><td>mannitol</td><td></td><td></td><td>used as a laxative for babies and by drug dealers to cut heroin, and other illegal drugs</td></tr>
<tr><td>xylitol</td><td></td><td></td><td>used as a noncaloric, noncarieogenic sweetener</td></tr>
<tr><td>glucosamine</td><td></td><td></td><td>component of many heteropolysaccharides, including some found in cartilage. You've seen it advertised on TV!</td></tr>
<tr><td>N-acetylglucosamine</td><td></td><td></td><td>the repeating unit in chitin, the structural material of arthropod exoskeletons</td></tr>
</table>

D-gluconic acid			the Haworth projection is of gluconolactone, the cyclic ester form
D-glucuronic acid		 structure of a glucuronidate conjugate of "R"	the body "conjugates" [attaches by a glycosidic link] this compound to many foreign substances to render them more water-soluble and thus excretable in urine.
D-glucaric acid		---	it's just here to torture you with completeness!
Structures drawn with MDL IsisDraw® and ACD Labs Chemsketch® by Ron Rinehart			