Carbohydrates

General Information:

Most abundant class of biomolecules (billions of tons of glucose produced annually by photosynthesis)

Functions:

Energy - starch, glycogen
Cell structure - cellulose, mucopolysaccharides, peptidoglycans
Cell Labeling - gangliosides, glycoproteins

General Structure:

$[C(H_2O)]_n$ classify by:

carbons - trioses, tetroses, pentoses, hexoses
carbonyl - aldoses, ketoses (structural isomers if same # carbons)

Aldopentoses

3 chiral carbons ⇨ 8 stereoisomers in straight chain structures (enantiomers, diastereomers, epimers)

(Fischer Projections)
H's on chiral carbons not shown
OH's on chiral carbons as line segments
aldehyde is carbon #1
D enantiomers have carbon #4 OH to the right
L enantiomers are mirror images of D (all chiral carbons)

Straight chain structures in dynamic equilibrium with ring structures (furanose, pyranose) - mutarotation
Intramolecular addition reaction - produces another chiral carbon called the anomeric carbon (hemiacetal)
anomers termed alpha (α) or beta (β) form of ring structure
16 stereoisomers of furanoses, 16 stereoisomers of pyranoses

(Haworth Projections)
H's on chiral carbons not shown
OH's on chiral carbons as line segments
hemiacetal carbon is #1
α anomer of D enantiomer has OH up
β anomer of L enantiomer has OH down
L enantiomers are mirror images of D (all chiral carbons)
OH on Fischer right is down on Haworth
nucleophile attack from the "right", bottom of chain "up"

complete naming ≡ anomer + enantiomer + parent prefix + ring form

Aldohexoses

4 chiral carbons ⇨ 16 stereoisomers in straight chain structures (enantiomers, diastereomers, epimers)

(Fischer Projections)
D enantiomers have carbon #5 OH to the right

(Haworth Projections)
32 stereoisomers of furanoses, 32 stereoisomers of pyranoses