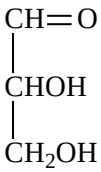
Basic Biochemistry

Carbohydrates – polyhydroxyaldehydes, polyhydroxyketones, or substances that give such compounds upon hydrolysis (i.e. addition of H_2O/H^+)

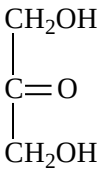
1) Monosaccharides (simple sugars)

a) cannot be hydrolyzed to simpler compounds
b) classified according to number of carbon atoms (triose, tetrose, pentose, hexose, etc.)

Shown below are the 2 common trioses:



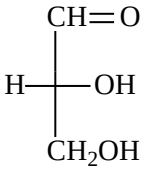
glyceraldehyde (an aldose)



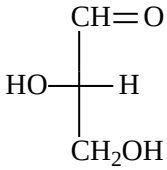
dihydroxyacetone (a ketose)

** Other aldoses and ketose are derived from glyceraldehydes and dihydroxyacetone by adding carbon atoms, each with a hydroxyl group **

c) Chirality in monosaccharides – in carbohydrates, the R configuration is given the designation D (and +) and the S configuration is given the designation L (and –).



D-(+)-glyceraldehydes

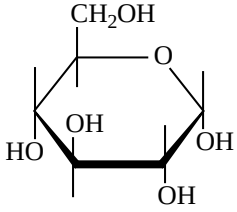


L-(–)-glyceraldehyde

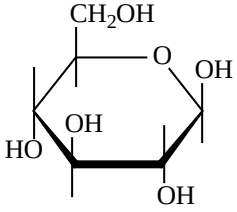
** To get the configuration of carbohydrates with more than 3 carbons, **look at the stereogenic carbon farthest from the aldehyde or ketone carbonyl group** **

d) Cyclic hemiacetal structure of monosaccharides – the actual configuration of monosaccharides

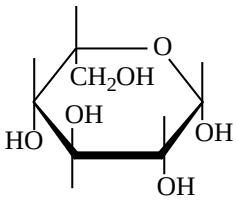
The cyclic structures are represented by Haworth projections. **In a Haworth projection, the ring is represented as if it were planar and viewed edge on, with the oxygen at the upper right. The carbons are arranged clockwise numerically, with C-1 at the right.**



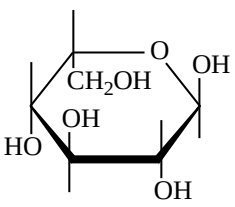
α -D-glucose



β -D-glucose



α -L-glucose



β -L-glucose

2) Disaccharides – 2 monosaccharides linked; hydrolysis gives 2 individual monosaccharides

Examples: maltose, lactose, sucrose (glucose and fructose)

3) Polysaccharides

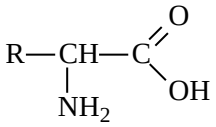
Examples: Starch – the form in which glucose is stored by plants for later use; complete hydrolysis gives only D-glucose.

Cellulose – just like starch, but with a different kind of linkage between monosaccharide units; complete hydrolysis gives only D-glucose.

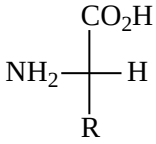
Amino Acids, Peptides, Proteins

Proteins are natural polymers composed of **amino acid units** joined one to another by **amide (or peptide) bonds**

1) Naturally-occurring amino acids

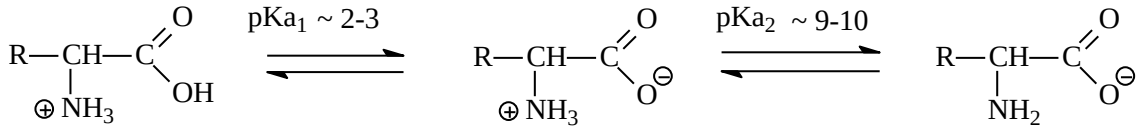


→ amino acids obtained from protein hydrolysis are α –amino acids



→ naturally-occurring amino acids have the L configuration

2) Acid-base properties of amino acids



Amino acid at low pH (acid) | dipolar ion (zwitterion) (neutral) | amino acid at high pH (base)

3) Protein Structure – amino acids linked by peptide bonds

2 things you want to know about a protein: a) which amino acids are there and how many of each there are
b) the sequence of amino acids in the chain

The abbreviated formula for a protein uses 3-letter abbreviations for the amino acid sequence. The first amino acid listed is the N-terminal amino acid; the N-terminal acid has a free amino group. The last amino acid listed is the C-terminal acid; the C-terminal acid has a free carboxyl group.

For Gly-Ala-Ser we have