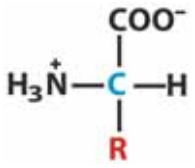
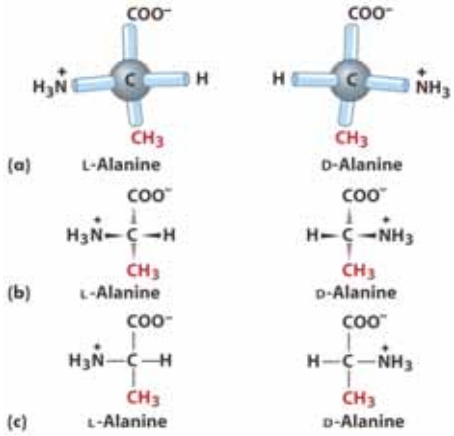
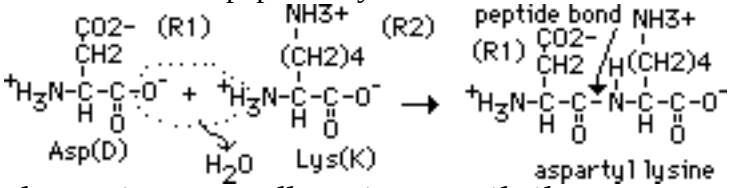
Chem 431A-L11-F'07
10//10/07; Wednesday
**admin**: reminder of Quiz Wednesday: on amino acids structure (KNOW all aa structures, their full names properly spelled 1 and 3 letter abbrevs. Know properties of all aa's and of peptide bond Know way to write sequence of polypeptides, eg. Draw structure of tripeptide WAQ; describe its hydrophobicity? behavior given pH conditions)\
Deadline for **Chapt 8 online** quiz tonight.
3 people did not do chapt1,2 quiz on time?




Last time: started discussion of aa properties.
Today: start amino acids (aa).

| | |
|---|---|
| Introduction to proteins:<br><br>First of all, by way of introduction, proteins are the most versatile of the bio macromolecules we are going to be able to study. These remarkable molecules do everything from catalysis, to providing support, to covering our body, to aiding in ionic transport, etc……<br><br>They can do these because of the versatility of the components that make them up. Recall that proteins are heteropolymers. What are the monomer components? There are 20 different amino acids that make up a protein.<br><br>To be more precise they are called α-amino acids. These contain an a carbon, ie the carbon that is bound to the carboxyl group, this same α carbon is bound to the amino group as well. So it is an α amino acid. Carbons can have 4 bonds. The other two groups are "H" and finally the fourth is the amino acid "residue". That residue is what confers uniqueness to each of the amino acids. | Let us look at the structure of these aa's. You are to commit to memory all these structures and know their full names as well as their 1- and 3-letter abbreviations.<br><br>View the structures overhead. Discuss the physical properties of these aa's.<br>glycine, alanine, valine, leu, ile (aliphatic); Pro; Ser. Thr, Cys, Met ("polar"), phe, tyr, trp (aromatic), Lys, Arg, His (basic), Asp, Glu (acidic), Asn, Gln(amides).<br>-H, -c3, cH2-ch- - ch3, -ch(-ch3)-ch2-ch3,<br><br>Note that these aa's have unique properties which you should master by reading the text book.<br>These aa's are zwitterions.<br>Both basic and acid groups. Can do titration of these aa's and get titration curves. They have various migration patterns if placed under electric field. PH dependent.<br><br>Each of these aa's are coded = matched to specific tRNAs |

| | |
|---|---|
| Let's conc on the behavior of these acids when they combine to form peptides by removal of water<br>  <br><br>elimination.we will continue with the amino acids:<br>1) α-amino acid's are called α-aa's because | are distinguished by assigning an "L" or a "D" to them, depending on whether they rotate the polarized light to the left (L) or to the right (D). All the 20 amino acids which are found in life are "L-amino acids". Why? Not clear since left handedness or right handedness are equally probable. There is no necessary preference for either one. It is probable that the evolution just got started on the "left |

| | |
|---|---|
| the amino group is attached to the $C_\alpha$. $C_\alpha$ is the carbon to which the carboxyl group is attached. If the amino group is attached to the "next" carbon ($C_\beta$), it would be a β-aa for instance. There are some β aa's used in the body, but these are not found as part of proteins.<br>2) the $C_\alpha$ is a <u>*chiral*</u> or asymmetric carbon. that means that the four groups bound to it are different (exc for Gly). the two mirror images (optical isomers) are called *enantiomers* and have a different effect in rotating polarized light passing thru a pure solution of either one of these enantiomers. As such they | foot". Note that proteins that are L -aa based can act on L proteins. It seems some attribute the advantage of L over D as arising somewhat from the left handedness of β-decay electrons. I don't know if that makes sense to me.<br><br>What is clear is that if organisms had to organize their molecules using both D and L aa's they would have to have to significantly multiply the number of metabolic machinery needed. |
| 3) We review the discussion on acids and bases: aa's have both acidic and basic groups. eg G has a $pK_a$ of 2.3 and 9.6. At pH7, we expect it to be ionized and become a zwitterion. Please keep in mind what we learned in Chapt 2 about acids and bases and their pKa's. In this instance, we note that at pH = 2.3, the carboxyl group would be 50% ionized. at pH>2.3, it would be predom ionized while pH<2.3, predom protonated. Now looking at the amino group, we note that at pH2.3, it would be <9.6 so that the amino grp would be protonated. until the pH | rose to 9.65 … At what pH would G be predom neutral? at pH= 2.3+9.6)/2=5.95 = pI (isoelectric point). At pI, G would not migrate under an electric field. show the a fraction. In the case of Lys, have 3 pKa's: 2.2, 9.0, 10.0. What is the a fraction profile of Lys? we note that its pI is at 9+10/2=9.5. So if the pH is 5.95, we could separate G from L since G would not migrate and L would go toward the "-" cathode. If the pH was 7, G would be "-" while L would be "+". |
| 3a) note that these aa's have unique properties which you should master by reading the text book. These aa's can be separated in solution based on their charge and partition properties (tendency to associate with one solvent or phase over another). | - electrophoresis (separation according to the charge of the aa) as discussed above.<br>-chromatography (ion exchange, gc, & hplc) |

In summary: These aa's are zwitterions. Both basic and acid groups. Can do titration of these aa's and get titration curves. They have various migration patterns if placed under electric field. pH dependent.