Biochemistry 2

- send answer to iClicker Question 14A now.
- Polysaccharides (a.k.a carbohydrates)
  - blood type
- Proteins I
  - amino acids (polymerization animation)
    - side-chain properties
    - proteins & folding demo
- iClicker Question 14B

Be sure you have a piece of wire.
⇒ Due in lab NEXT week:
    – Pre-lab for Lab 06 (Lab Manual p 85 and on-line)

Exam I: Monday 10/19 (info in Chemistry 2 handout)
- Last names starting with A through E: 11th floor of Healy Library
- Last names starting with F through Z: Lipke Auditorium (here)
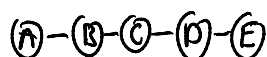(1 bonus point for going to right room)

Polysaccharides (aka Carbohydrates)
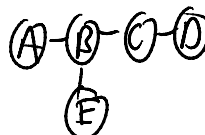
❋ monomers = sugars (100's of different kinds)

❋ all monomers have many $H-\overset{|}{\underset{|}{C}}-OH$ groups ∴ "philic

❋ polymers can be

  a) linear   or   b) branched

    Ⓐ-Ⓑ-Ⓒ-Ⓓ-Ⓔ   Ⓐ-Ⓑ-Ⓒ-Ⓓ
                                      Ⓔ

due to differences in lipo polysaccharides

red blood cell

surface molecule
A, B, or O
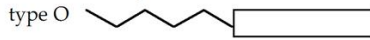- anchored in 'phobic core of membrane by via 'phobic effect
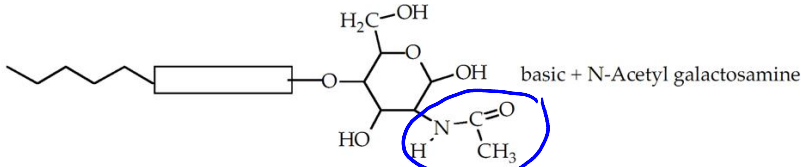
Bio 111 Macromolecules Handout

Blood type

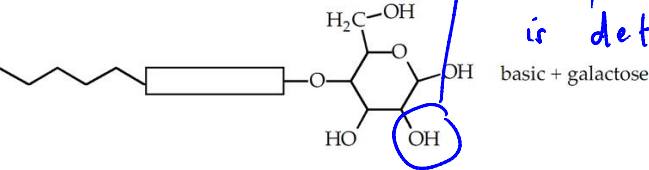lipid tail   "basic" polysaccharide
(4 sugars)

type O

type A H_2C-OH basic + N-Acetyl galactosamine

HO

~ tiny difference is detectable by your immune system

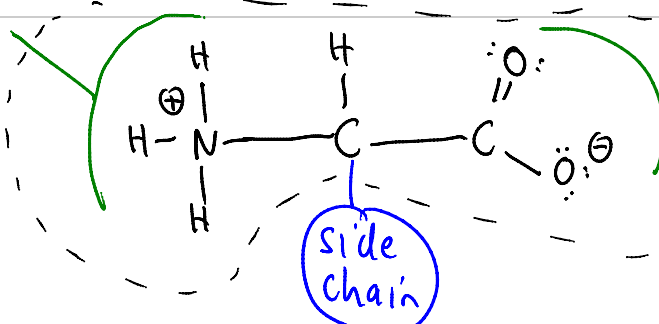type B H_2C-OH basic + galactose

HO   OH

type AB = mixture of BOTH A and B

Proteins : monomer : amino acid * 20 different types
polymer : never branched

Biochemistry 2-2

"generic" amino acid

amino group   "backbone" same for all 20

$H-N-C-C-O$

side chain   Carboxyl group

⌐different in each

Properties of amino acids depend on side chain structure
    (rare exceptions)
  ex

| Property	alanine (ala)	aspartic acid (asp)
- side chain	$- CH_3$	$- CH_2 - C \underset{O}{\overset{O}{\parallel}} \ominus$
x bonds it can make	'phobic int.	H-bonds ionic bond
x phobic or philic	'phobic	'philic
x size/shape	small	medium

Protein folding demo

  * all proteins "born" as linear chain of amino acids
    then fold into complex 3d shapes
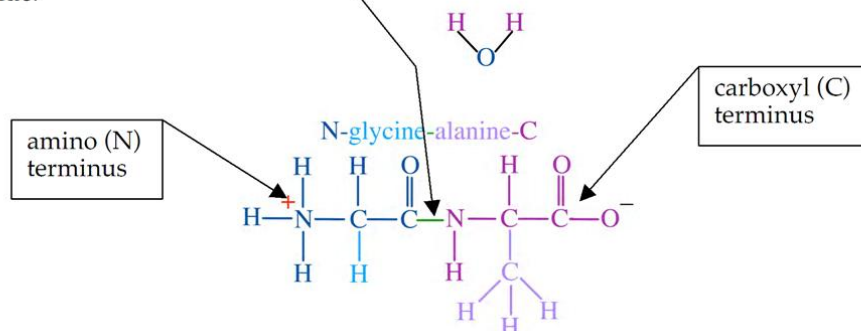   Q: how? As side-chain interactions (mostly)

Protein Synthesis
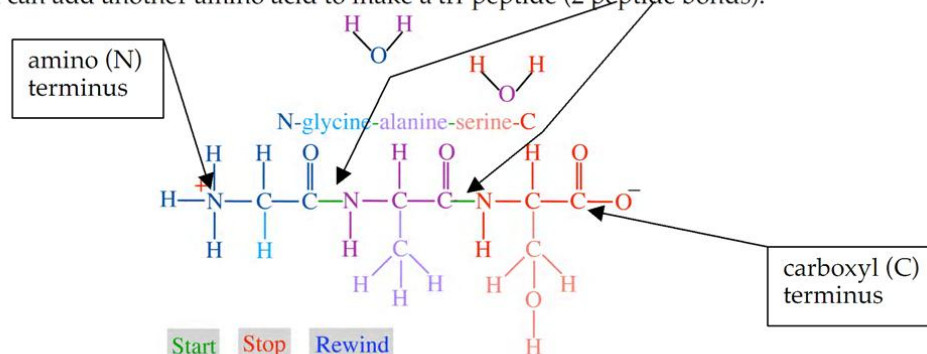## = joining amino acids = peptide bond formation

1) Start with 2 amino acids

N-glycine-C

N-alanine-C

side chain = -H

side chain = $-CH_3$
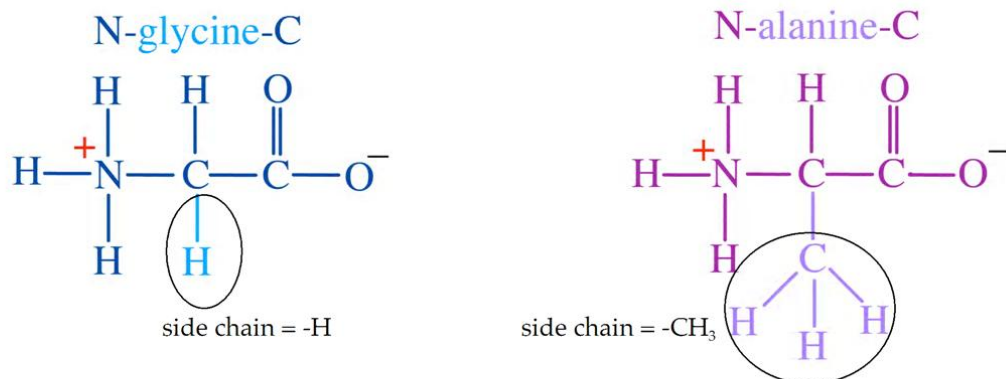
2) Join them: lose H_2O and form a peptide bond (a kind of covalent bond). Now, you have a di-peptide:

amino (N) terminus

carboxyl (C) terminus

N-glycine-alanine-C

3) You can add another amino acid to make a tri-peptide (2 peptide bonds):

amino (N) terminus

N-glycine-alanine-serine-C

carboxyl (C) terminus

Start   Stop   Rewind

Note that a protein always has only one N-terminus and one C-terminus and the (+) and (-) charges of the internal amino acids are no longer present.

Biochemistry 2-3

Bio 111: Protein Folding Demonstration

Today in lecture, you will twist a piece of wire so that it simulates the behavior of a chain of amino acids (also known as a protein). We will then use this to explore protein folding in lecture.

A simulated 7-amino acid protein is shown below; your protein will be similar although it may have a different pattern of loops.

- The more-or-less straight part of the wire simulates the **backbone**
- The loops simulate the **side-chains** (there are 7 in this example)

| Amino Acid #1 | Amino Acid #2 | Amino Acid #3 | Amino Acid #4 | Amino Acid #5 | Amino Acid #6 | Amino Acid #7 |
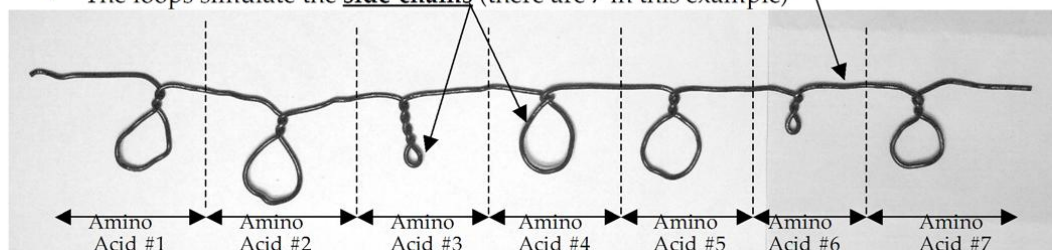
- One end is the amino terminus; the other is the carboxyl terminus (for this demonstration, it does not matter which is which).

Side-chains

In the simplified world of this demonstration, there are three kinds of amino acids, each of which is represented by a different type of loop:

Hydrophobic	**Positively-charged**	**Negatively-charged**
A <u>large open loop</u>. Make it two finger-widths wide.	A <u>long closed loop</u>. Make it <u>four</u> twists long.	A <u>short closed loop</u>. Make it <u>two</u> twists long.

How to do it

Now you will twist your wire to make a protein of seven or eight amino acids. The sequence of amino acids is up to you, but it works best if your protein contains:

- More hydrophobic amino acids than charged ones.
- At least one positively-charged and one negatively-charged amino acid.

The measurements in this demonstration need not be precise; you will use the width of your fingers as a ruler.

- Leave two finger-widths of space un-twisted at the starting end.
- Leave three finger-widths of space between each amino acid.

Biochemistry 2-5