Macromolecule Models
Part 2: Proteins and Nucleic Acids

LO: SYI-1.B. Describe the properties of the monomers and the types of bonds that connect the monomers in biological macromolecules.

- EK: SYI-1.B.2. Structure and function of polymers are derived from the way their monomers are assembled-
    - a. In nucleic acids, biological information is encoded in sequences of nucleotide monomers. Each nucleotide has structural components: a five-carbon sugar (deoxyribose or ribose), a phosphate, and a nitrogen base (adenine, thymine, guanine, cytosine, or uracil). DNA and RNA differ in structure and function.
    - b. In proteins, the specific order of amino acids in a polypeptide (primary structure) determines the overall shape of the protein. Amino acids have directionality, with an amino (NH2) terminus and a carboxyl (COOH) terminus. The R group of an amino acid can be categorized by chemical properties (hydrophobic, hydrophilic, or ionic), and the interactions of these R groups determine structure and function of that region of the protein.

Begin model building. Cut apart models. Be prepared to demonstrate all of these to your teacher or the class. Look in your text for molecular detail.

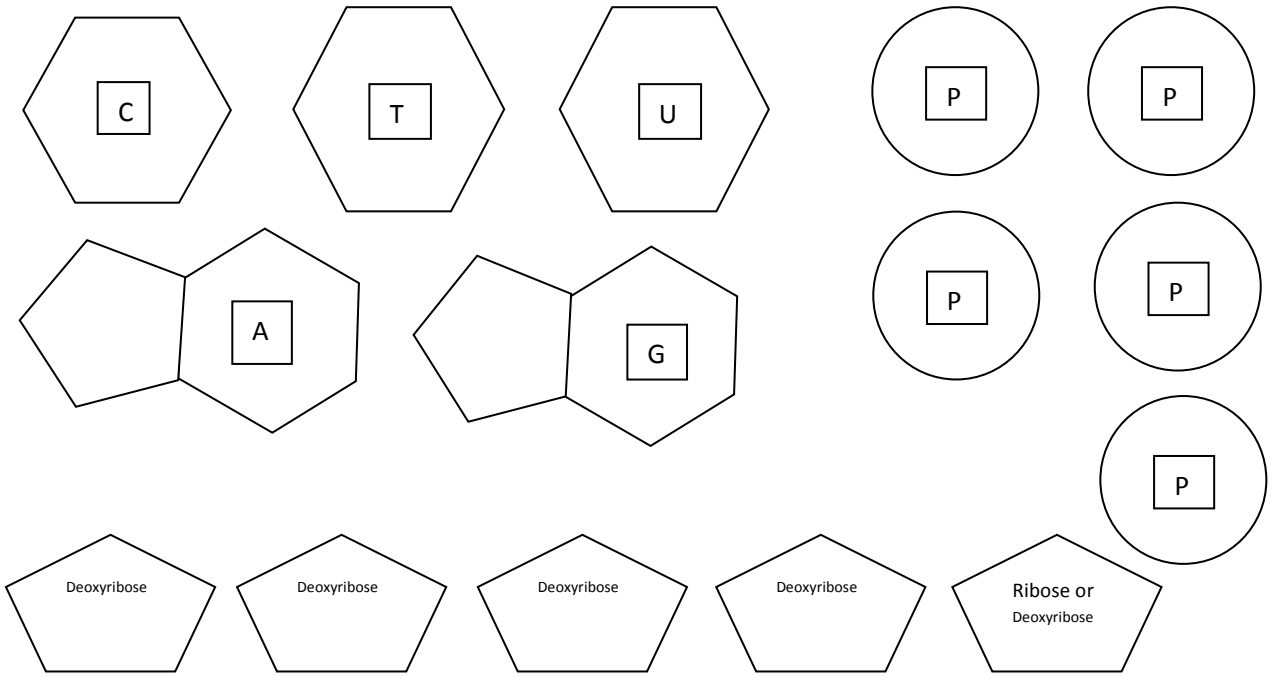
Proteins

1. Find the amino acids. Using research divide these into polar and non-polar amino acids. Be prepared to tell what that means. How many amino acids are there?
2. Make a polypeptide from your amino acids. As you make this molecule use the water molecule models to show how they join.
3. Label the bonds between the amino acids.
4. What level of conformation does your model show?
5. Form a disulfide bridge. What is its significance?
6. Model the folding and denaturing of a protein using your long "NCC" backbone.
7. Model an enzyme using the long "NCC" backbone.
8. Be able to tell what environmental conditions affect protein structure.

Nucleic acids

1. Identify the nitrogenous bases.
2. Divide the bases into purines and pyrimidines.
3. Make a nucleoside. Make a nucleotide.
4. Make a short nucleic acid. Label the bonds.
5. Label the 5' and 3' end. Be able to explain how you determine this.
6. Show a dehydration synthesis reaction involving nucleotides.
7. Using your models differentiate DNA from RNA.

Nucleic Acids: Print Red



Phosphodiester linkage | **Phosphodiester linkage** | **Phosphodiester linkage**

3’ | **3’** | **3’** | **5’** | **5’** | **5’**

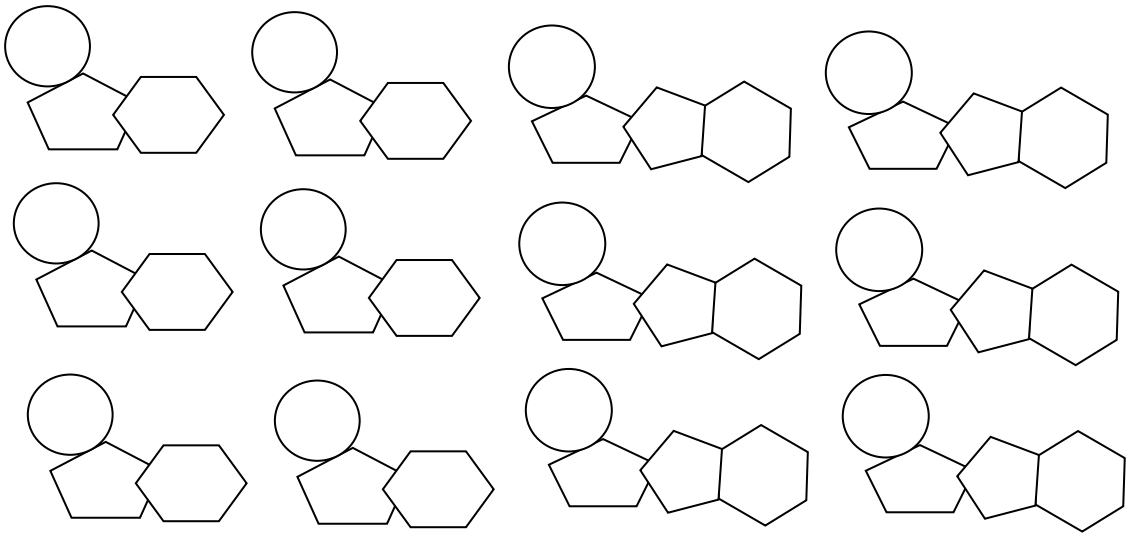
H Bond

H Bond

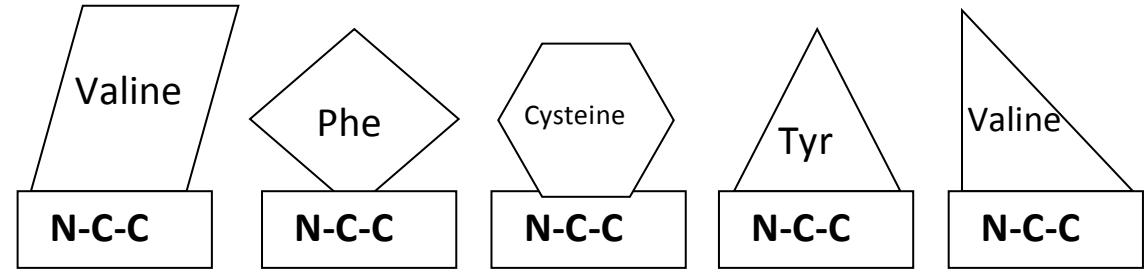
H Bond

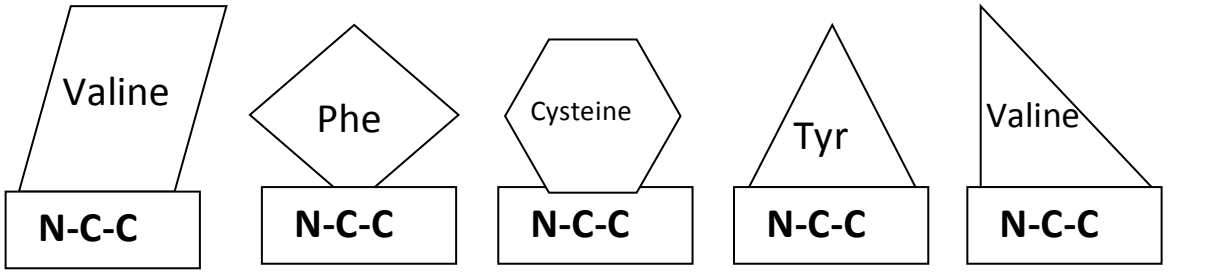
H Bond

H Bond



Proteins: Print Orange





Peptide bond | Peptide bond | Peptide bond | Peptide bond | Peptide bond

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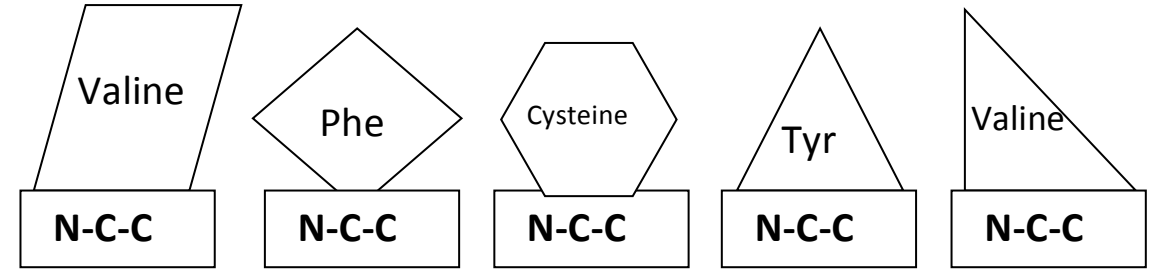

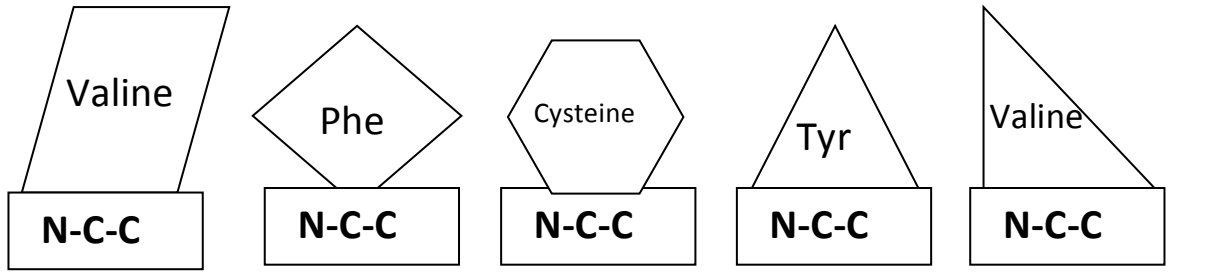

Peptide bond | Peptide bond | Peptide bond | Peptide bond | Peptide bond

N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C-N-C-C