

Key Teaching Points for Amino Acid Building Block Models[©]

Overall Student Learning Objective: What Dictates How a Protein Folds?

- Amino acids are the building blocks of proteins.
- All amino acids have an identical core structure consisting of an alpha-carbon, carboxyl group, amino group and R-group (sidechain).
- A linear chain of amino acids is a polypeptide.
- The primary sequence of a protein is the linear sequence of amino acids in a polypeptide.
- Proteins are made up of amino acid monomers linked together by peptide bonds.
- Peptide bond formation between amino acids results in the release of water (dehydration synthesis or condensation reaction).
- The protein backbone is characterized by the “N-C-C-N-C-C. . .” pattern. The “ends” of the protein can be identified by the N-terminus (amino group) end and the C-terminus (carboxyl group) end.

★ For a more complete lesson guide, please visit:

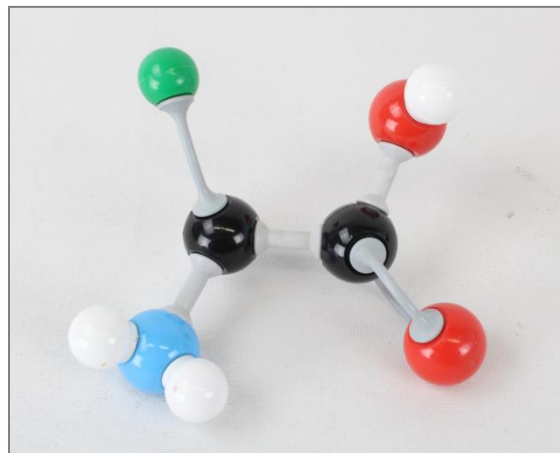
<http://www.3dmoleculardesigns.com/3DMD-Files/AABB/ContentsandAssembly.pdf>

Amino Acid Core Structure

Build an amino acid according to the diagram to the right:

1. Identify the alpha carbon, amino group, carboxyl group and R-group (sidechain representation) in the structure you have constructed.

Two amino acids can be chemically linked by a reaction called “condensation” or “dehydration synthesis” to form a dipeptide bond linking the two amino acids. A chain of amino acid units (monomers) linked together by **peptide bonds** is called a **polypeptide**.



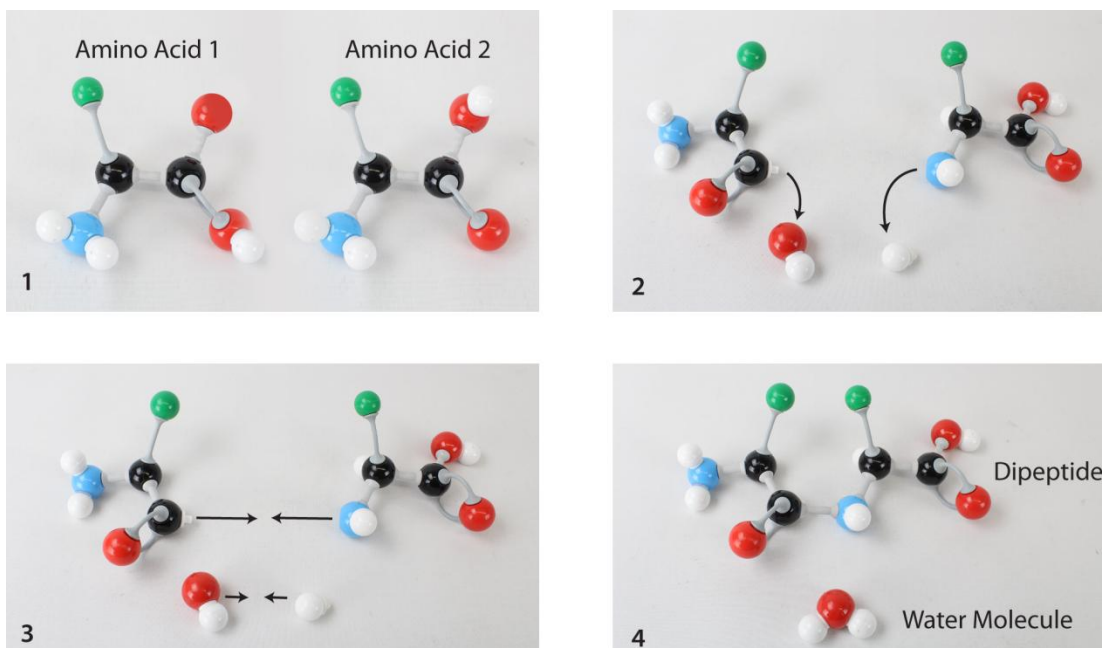
General Dipeptide Structure

Construct a model of a dipeptide using the amino acid models previously built.

2. What are the products of the condensation reaction (dehydration synthesis)?

3. Identify the peptide bond.

Link two dipeptides together to form a polypeptide.



4. Identify the N-terminus and C-terminus of the polypeptide you created.

5. What would the backbone pattern of a 4 amino acid long polypeptide look like?

6. How many peptide bonds would be present in this polypeptide?

7. How many peptide bonds would be in a polypeptide comprised of 12 amino acids?

! Caution – Note This Limitation in the Model - Students should note that the atoms may rotate around the bonds that are formed. This may be observed in this model. However, even though the peptide bond in this model allows for rotation, this does not occur in an actual peptide bond. Bond rotation is important to keep in mind as it plays a role in protein folding.

Amino Acid Building Block Models® can be purchased from 3D Molecular Designs (www.3dmoleculardesigns.com).