

SMART Teams

Exploring the
Molecular World

Building Secondary Structures

Activity

1. Build an α -helix using 10 backbone pieces. Build a β -sheet (5 amino acids per β -strand).
 - a. How are these secondary structures the same? *The carboxyl carbon of one amino acid is connected to the nitrogen of the next amino acid. The backbone is a repeating -N-C-C-.*
 - b. How are these secondary structures different? *The phi-psi angle differs, so that the α -helix backbone forms a spiral, and the β -sheet backbone forms a pleat.*
2. Add the hydrogen bonds between an oxygen and a nitrogen.
 - a. What effect does the addition of the hydrogen bonds have on the stability of these secondary structures? *The structure is more stable with hydrogen bonds.*
 - b. Why does a hydrogen bond have to be between an oxygen and a nitrogen? *A hydrogen bond is the attraction between the H attached to the N, which has a partial positive charge, and the O, which has a partial negative charge.*
3. Measure the length of the α -helix and the β -sheet.
 - a. Which is longer? *The β -sheet*
 - b. Shorter? *The α -helix*
 - c. Why? *There are more amino acids per turn in an α -helix, so it forms a shorter, compact structure.*
 - d. What implications does this have on protein folding? *A protein with more alpha helices will be more tightly packed.*

