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Protein Primary and Secondary Structure

This worksheet accompanies the Jmol Exploration: Protein Primary and Secondary Structure which can be accessed at: <https://crestresources.org/tutorials/proteinPrimSecStructure.html>

Question numbers are included in the exploration for easy referencing.

Protein Secondary Structure

1. Draw the chemical structure of the backbone of an amino acid.
2. Identify the α -carbon with an arrow. What bonds to the α -carbon?
3. What part of the amino acid structure is missing in this representation?

α Helices

4. Describe the stability/flexibility of the alpha helix backbone.
5. How do the hydrogen bonds affect the structure of the alpha helix?
6. Where are the side chains (R groups) – inside the alpha helix or outside the alpha helix? Why?

Antiparallel β Sheet

7. Do the two beta strands connect to each other?
8. How do the hydrogen bonds affect the structure of the beta sheet?

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Comparing Parallel and Antiparallel β Sheets

9. The hydrogen bonds in a (circle one) *parallel* / *antiparallel* sheet form a zig-zag pattern and the hydrogen bonds in a (circle one) *parallel* / *antiparallel* sheet are parallel to each other, like the rungs of a ladder.

10. Which type of sheet (parallel or antiparallel) do you think is more stable and why?

11. Give an example (using colors) of two adjacent strands that are antiparallel in GFP.

12. Give an example (using colors) of two adjacent strands that are parallel in GFP.

13. Where are the side chains (R groups) on the beta sheet? Why?