CONCEPT: ANTIPARALLEL & PARALLEL BETA SHEETS

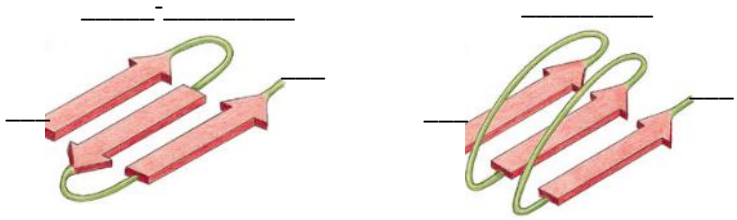
●*Antiparallel* β sheet: β strands aligned in _____ directions in terms of the N & C-terminal ends.

□ Rise per residue for antiparallel β sheets is _____ Å.

●*Parallel* β sheet: β strands aligned in the _____ direction in terms of the N & C-terminal ends.

□ Rise per residue for parallel β sheets is _____ Å.

EXAMPLE:



PRACTICE: Silk fibroin contains predominantly β sheet conformation. Which of the following is true regarding its β sheets?

a) Its antiparallel β sheets are oriented in the same direction.
b) Its parallel β sheets are oriented in opposite directions.
c) Its antiparallel β sheets are slightly more extended.
d) Its parallel β sheets are slightly more extended.

Antiparallel vs. Parallel β-Sheet Hydrogen Bonding

●β-sheets are stabilized by hydrogen bonds between C=O and N-H groups on the _____ of adjacent β-strands.

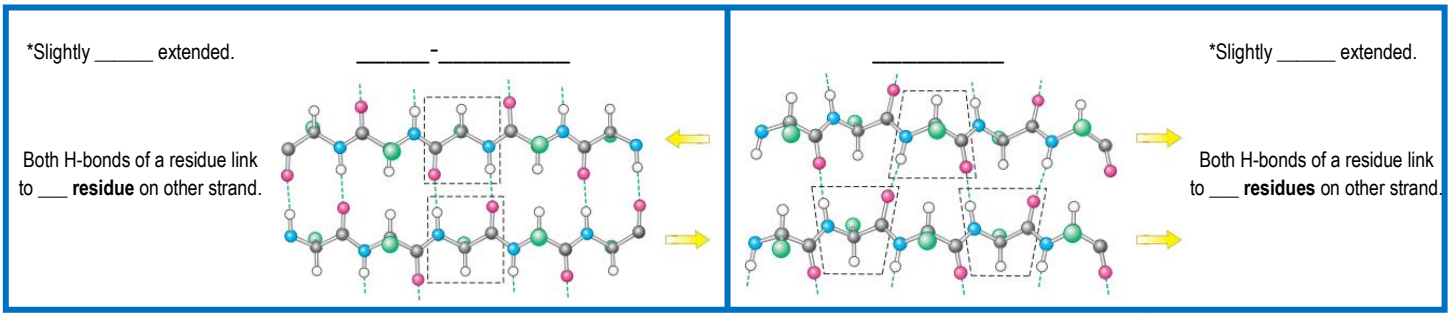
□ R-group hydrogen bonding is _____ involved in beta sheet stabilization.

●Each residue of both anti-parallel & parallel β-sheets forms ____ hydrogen bonds, but bonding is slightly _____.

□ Antiparallel β-sheets have *stronger*, _____ hydrogen bonds that are _____ stable.

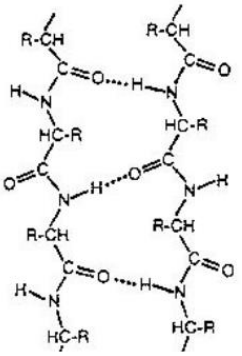
□ Parallel β-sheets have *weaker*, _____ hydrogen bonds that are _____ perfectly perpendicular.

EXAMPLE: Antiparallel vs. Parallel β-sheet H-bonds.



PRACTICE: The diagram to the right illustrates:

a) The polypeptide chain of an alpha helix.
b) Two polypeptides of a β-sheet running in a parallel fashion.
c) Two polypeptides of a β-sheet running in an antiparallel fashion.
d) Two polypeptides of a coiled coil.



CONCEPT: ANTIPARALLEL & PARALLEL BETA SHEETS

PRACTICE: The major reason that antiparallel β-sheets are more stable than parallel β-sheets is that the latter:

a) Are in a slightly less extended configuration than antiparallel strands.

b) Do not have as many disulfide crosslinks between adjacent strands.

c) Do not stack in sheets as well as antiparallel strands.

d) Have fewer lateral hydrogen bonds than antiparallel strands.

e) Have weaker hydrogen bonds laterally between adjacent strands.

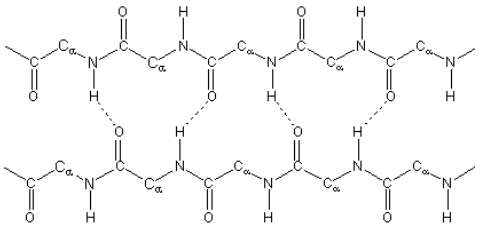
PRACTICE: Which (phi, psi) pair of bond angles is closest to those of the residues shown in the figure below?

a) (-90, -90).

b) (-90, 90).

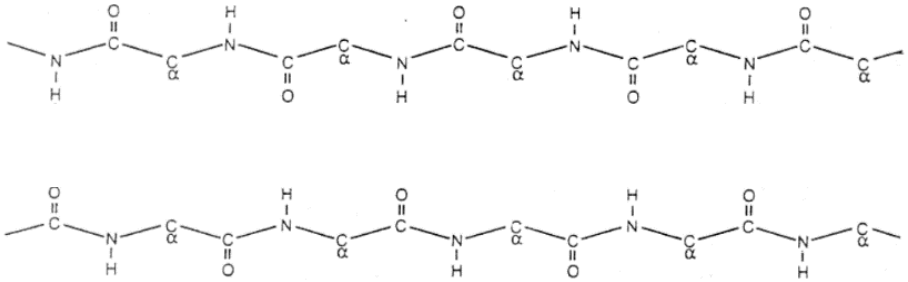
c) (90, -90).

d) (90, 90).



PRACTICE: What type of β-sheet is presented in the figure below? Draw all hydrogen bonds between appropriate groups.

a) Antiparallel β-sheet. b) Parallel β-sheet.



PRACTICE: Draw a two-stranded antiparallel β-sheet with appropriate hydrogen bonding between the following peptides:

1) L-A-D-Y. 2) G-A-G-A.