

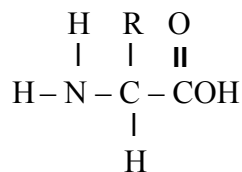
3.091 Fall Term 2002

Homework Quiz #12A

solution outline

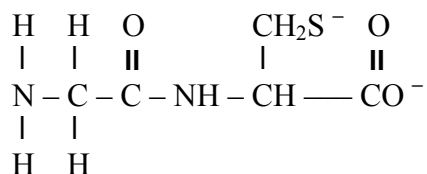
(a)

The skeletal structure of the amino acids is



where $-\text{R}$ is $-\text{H}$ in the case of glycine (Gly), and $-\text{CH}_2\text{SH}$ in the case of cystine (Cys).

Draw the skeletal structure of the dipeptide Gly-Cys when it is solvated in an aqueous solution of $\text{pH} = 11$. For Gly, the pK_a values for the α -carboxylic acid and the α -amino groups are 2.35 and 9.78, respectively. For Cys, the pK_a values for the α -carboxylic acid and the α -amino groups are 1.92 and 10.78, respectively. The pK_a for the titratable $-\text{SH}$ side chain is 8.33.



(b) Explain why polypeptide chains arrange themselves in helical molecular structures.

the helical structure maximally positions $\text{N}-\text{H}$ and $\text{C}=\text{O}$ opposite one another, thereby increasing the density of hydrogen bonds that form