NAME _____

MMBB 380 - Fall 2007

HOMEWORK #2 - Amino Acids & Protein Analysis

Homework is due one week after assignment. This homework is due 5:30 pm, Wed. Sept 05. Please show your work (include worksheets if needed).

(6,000 pts)

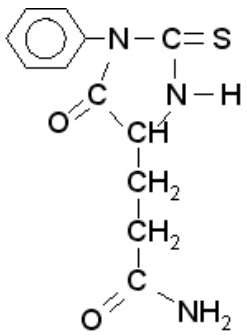
1. Identify the primary amino acid sequence of this heptapeptide. The following was observed.

a. Amino acid analysis (hydrolyzes all peptide bonds) identified the following 8 compounds:

Lys Asp Glu Phe Ser Gly Met $1NH_4^+$

b. Trypsin treatment generated free glycine.

c. Edman degradation generated the following PTH derivative: →



d. Chymotrypsin treatment yielded two products, a tripeptide and a tetrapeptide; the tripeptide contained an amino acid with a basic side chain.

e. Brief elastase treatment had no effect on the heptapeptide. Extensive elastase treatment generated a dipeptide and a pentapeptide.

f. CNBr treatment yielded a tripeptide and a tetrapeptide. Amino acid analysis of the isolated tripeptide generates stoichiometric levels of NH_4^+ and 2 amino acids with acidic side chains.

a _____ _____ _____ _____ _____ _____ _____

b _____ _____ _____ _____ _____ _____ _____

c _____ _____ _____ _____ _____ _____ _____

d _____ _____ _____ _____ _____ _____ _____

e _____ _____ _____ _____ _____ _____ _____ _____ _____

f. _____ _____ _____ _____ _____ _____ _____

_____ _____ _____ _____ _____ _____ _____ **FINAL ANSWER**

(6,000 pts)

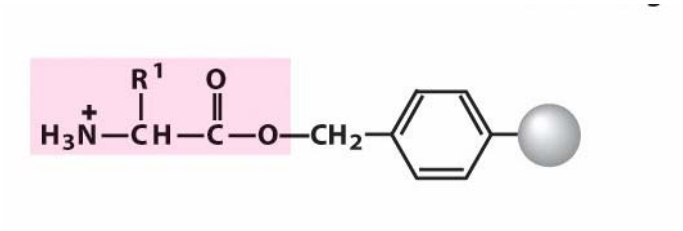
2. Peptides are chemically synthesized routinely using a process developed by Bruce Merrifield consisting of 3 sequential steps: 1) activation of a blocked amino acid; 2) addition to the growing aminoacyl-resin; 3) removal of the blocking group. Consult pp 104-106 (4th Edition); pp 150-152 (3rd Edition) in Lehninger.

(2,000 pts)

a) What is the blocking group? Identify the function of the blocking group (why is it necessary)?

(4,000 pts)

b) Illustrate the 3-step mechanism of adding blocked-valine (FMOC-Ser) to the aminoacyl-resin shown here.



(8,000 pts)

3) Arginine can act as a triprotic acid in aqueous solutions. This means that each arginine molecule can exist in one of four protonated forms. Draw the structure of these forms.

H_3A^{+2} **H_2A^{+1}** **HA^{0}** **A^{-1}**

Identify the predominant or most abundant form of arginine at each of the following pH's.

a) pH 1.0 _____

b) pH 3.0 _____

c) pH 5.0 _____

d) pH 7.0 _____

e) pH 10.0 _____

f) pH 12.0 _____

g) pH 14 _____