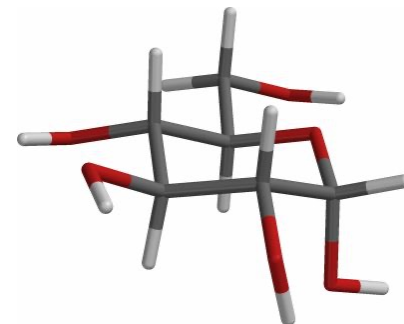


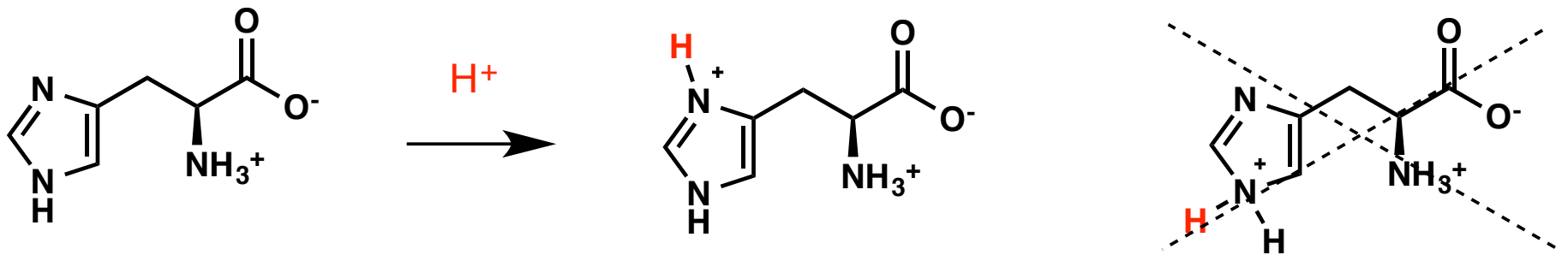
Chem 109 C



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Practice problem 1

Explain why, when the imidazole ring is protonated, the double-bonded nitrogen is the nitrogen that accepts the proton.



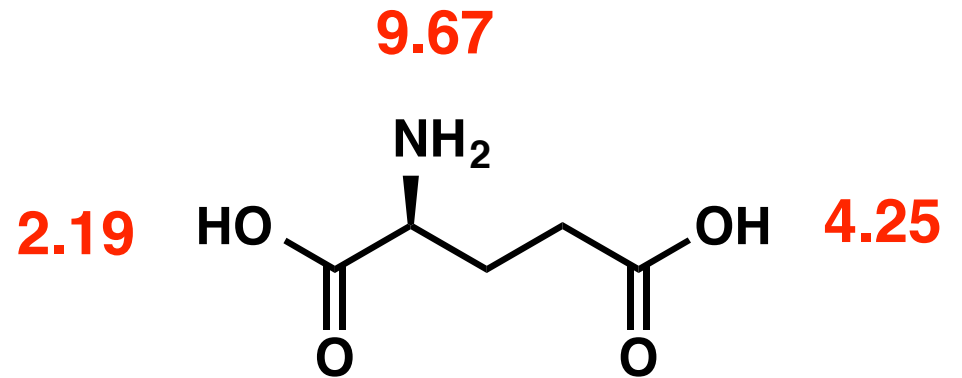
Practice problem 2

Do any other acids in Table 22.2 have more than one asymmetric center?

Practice problem 3

Draw the predominant form of glutamic acid in a solution with the following pH

- a. 0
- b. 3
- c. 6
- d. 11



Practice problem 3a

Draw the predominant form of the following amino acids at pH 7.4

- a. aspartic acid**
- b. histidine**
- c. glutamic acid**
- d. lysine**
- e. arginine**
- f. tyrosine**

Practice problem 3

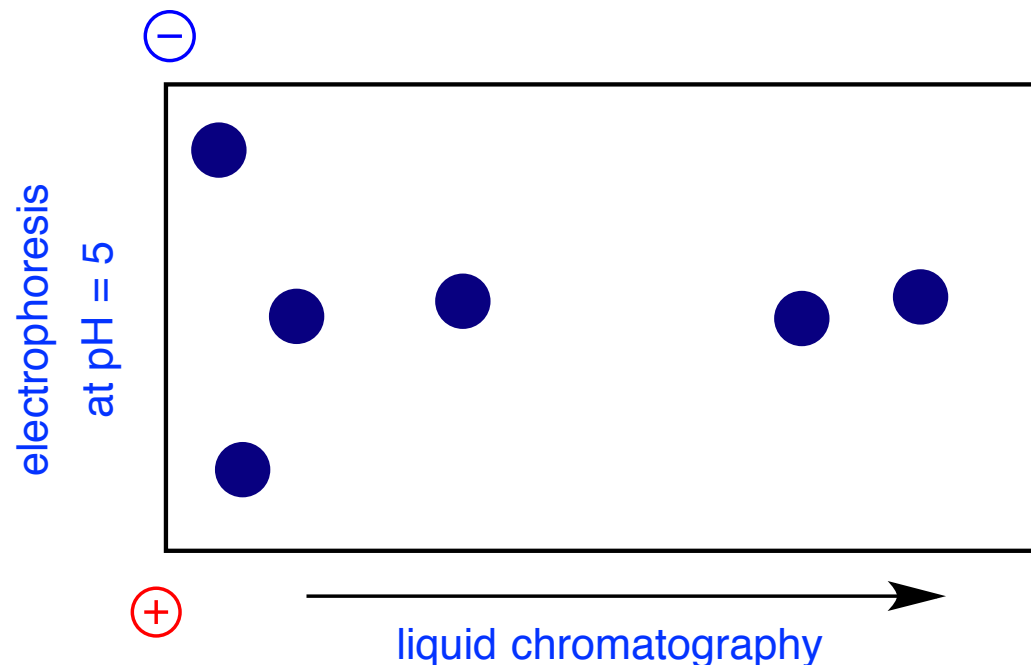
Think about the question in PROBLEM 13 (page 1064).

(Literature and website searches indicate that the method can be used)

Practice problem 4

A mixture of amino acids that do not separate sufficiently when a single technique is used can often be separated by two-dimensional chromatography. In this technique, the mixture of amino acids is applied to a piece of filter paper and separated by liquid chromatography, then the paper is rotated 90° and the mixture is separated by electrophoresis. The resulting chromatogram is called a fingerprint.

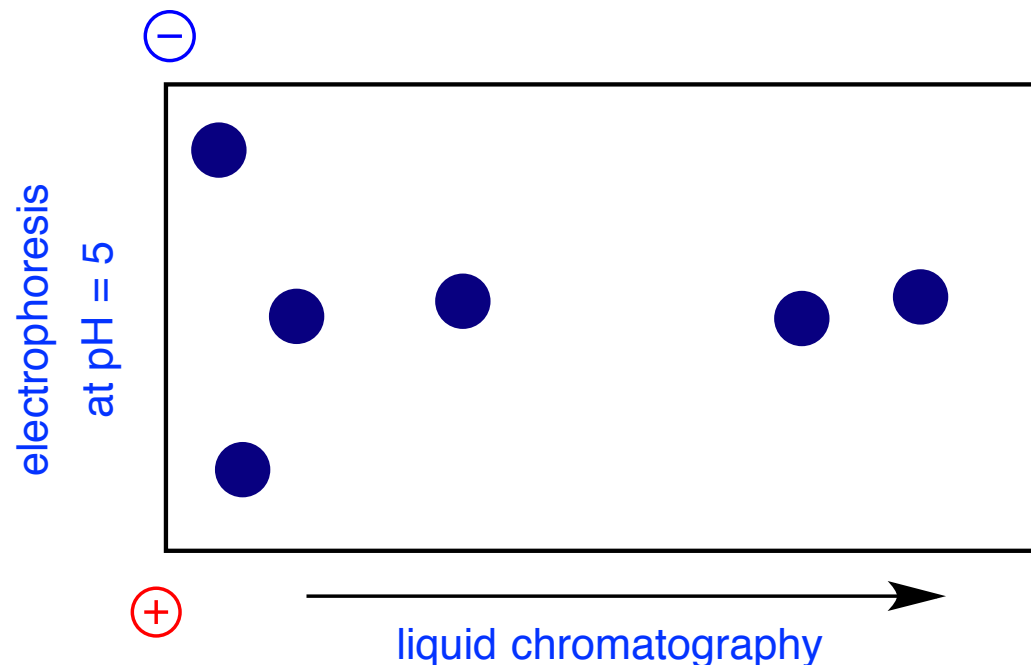
Identified the spots in the fingerprint below obtained from a mixture of Ser, Glu, Leu, His, Met, and Thr.



Practice problem 4

A mixture of amino acids that do not separate sufficiently when a single technique is used can often be separated by two-dimensional chromatography. In this technique, the mixture of amino acids is applied to a piece of filter paper and separated by liquid chromatography, then the paper is rotated 90° and the mixture is separated by electrophoresis. The resulting chromatogram is called a fingerprint.

Identified the spots in the fingerprint below obtained from a mixture of Ser, Glu, Leu, His, Met, and Thr.



Practice problem 5

In what order would histidine, serine, aspartate, and valine be eluted (washed out) with a buffer of pH 4 from a column packed with an anion-exchange resin Dowex 1)?

Practice problem 6

Draw the structure of aldehyde needed to prepare tyrosine by the Stecker synthesis

Practice problem 7

Draw the structure of alkyl bromide needed to prepare leucine by the *N*-phthalimidomalononic ester synthesis

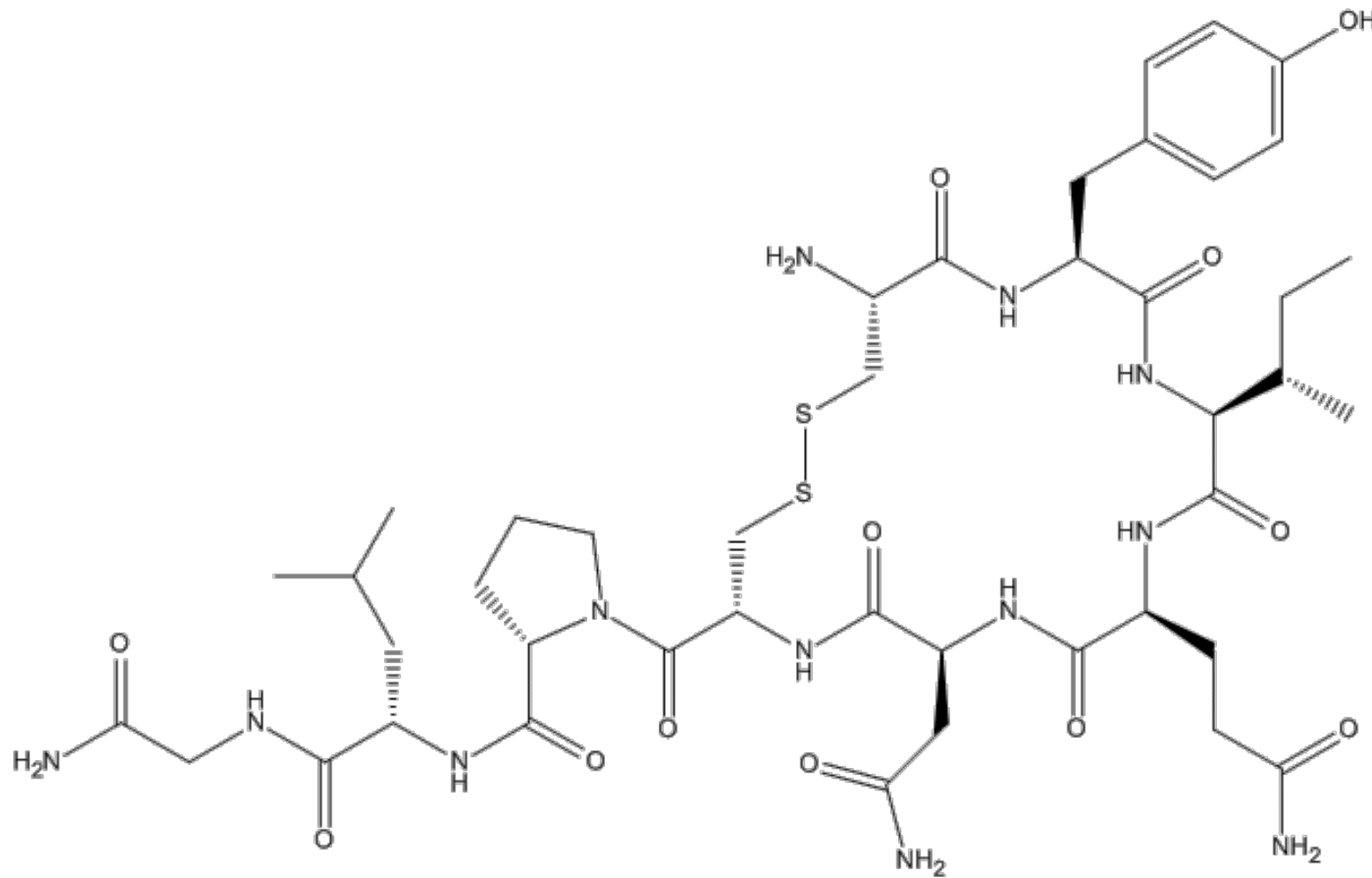
Practice problem 8

Using three-letter abbr., write all possible tripeptides containing one each of Ala, Gly, and Met

Practice problem 9

(built on **Problem 29**, page 1075)

Assign the absolute configuration to each asymmetric center in oxytocin



oxytocin

Practice problem 10

Show steps in the synthesis of Leu-Phe

Practice problem 11

A decapeptide undergoes partial hydrolysis to give peptides whose amino acid compositions are shown. Reaction of the intact decapeptide with Edman's reagent releases PTH-Gly. What is the sequence of the decapeptide?

- | | | | |
|------------------|-------------|------------------|-----------------------|
| 1. Ala, Trp | 3. Pro, Val | 5. Trp, Ala, Arg | 7. Glu, Ala, Leu |
| 2. Val, Pro, Asp | 4. Ala, Glu | 6. Arg, Gly | 8. Met, Pro, Leu, Glu |

Practice problem 12

Indicate peptides that would result from cleavage by the indicated reagent

- a. **His-Lys-Leu-Val-Glu-Pro-Arg-Ala-Gly-Ala** by trypsin
- b. **Leu-Gly-Ser-Met-Phe-Pro-Tyr-Gly-Val** by chymotrypsin

Practice problem 11

A decapeptide undergoes partial hydrolysis to give peptides whose amino acid compositions are shown. Reaction of the intact decapeptide with Edman's reagent releases PTH-Gly. What is the sequence of the decapeptide?

- | | | | |
|------------------|-------------|------------------|-----------------------|
| 1. Ala, Trp | 3. Pro, Val | 5. Trp, Ala, Arg | 7. Glu, Ala, Leu |
| 2. Val, Pro, Asp | 4. Ala, Glu | 6. Arg, Gly | 8. Met, Pro, Leu, Glu |

Gly-Arg-Trp-Ala-Glu-Leu-Met-Pro-Val-Asp

Practice problem 13

Determine the amino acid sequence of a polypeptide from the following data

a. Complete hydrolysis gives Arg, 2Gly, Ile, 3Leu, 2Lys, 2Met, 2Phe, Pro, Ser, 2Tyr, Val

b. Edman's reagent gives PTH-Gly

c. Carboxypeptidase A releases Phe

d. Treatment with BrCN gives three peptides:

1. Gly-Leu-Tyr-Phe-Lys
2. Gly-Leu-Tyr-Lys-Val-Ile-Arg-Met
3. Leu-Pro-Phe

e. Trypsin gives the following four peptides

1. Gly-Leu-Tyr-Phe-Lys
2. Ser-Met-Gly-Leu-Tyr-Lys
3. Val-Ile-Arg
4. Met-Leu-Pro-Phe

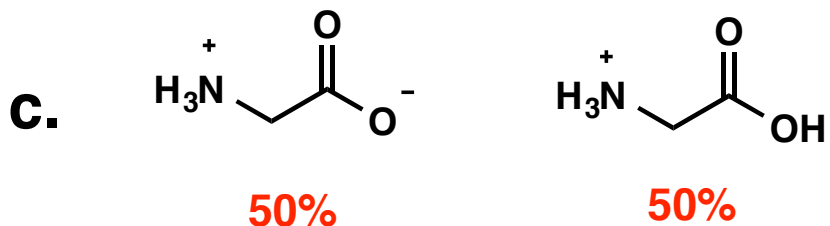
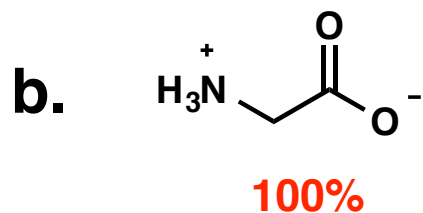
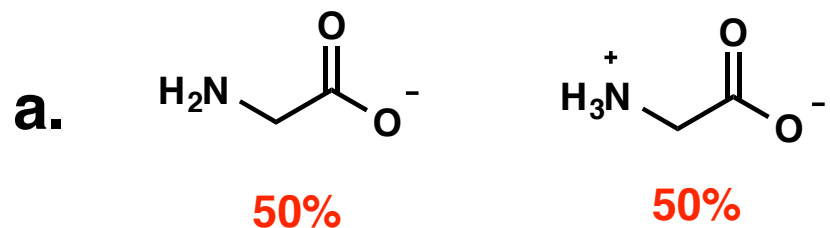
Practice problem 14

α -Amino acids can be prepared by treating an aldehyde with ammonia/trace acid, followed by hydrogen cyanide, followed by acid-catalyzed hydrolysis.

- Draw the structure of the two intermediates in this process.
- What amino acid would be formed from 3-methylbutanal?
- What aldehyde would be needed to prepare phenylalanine?

Practice problem 48

Alanine has pKa values of 2.34 and 9.69. At what pH will alanine exist in the indicated form



Practice problem 58a

Identify the location and type of charge on the tetrapeptide Ala-His-Lys-Gly at each of the following pH values

a. 0

b. 7

c. 11