BCHM461 Graded Quiz #2 (20 points) **Due date/time: Oct 7, 2026 by 11:59 pm**

This is graded quiz #2. You can type/paste your answers directly in the textbox on ELMS or upload scanned copies of your answers. If the latter, before uploading your work to ELMS please make sure all scanned/photocopied material has good resolution and is readable both on your computer and in ELMS. If the uploaded material is unreadable it will not be graded.

Consider a hexapeptide with the following sequence of amino acids:

The N-terminal residue contains an aromatic ring that can get phosphorylated.
The next residue has the shortest side chain containing 2 methyl groups.
The next residue's side chain is readily oxidized to form covalent bonds.
The next residue has the longest side chain that is negatively charged at neutral pH.
The next residue, when repeated 6 or more times one after another, is used as a tag in affinity chromatography.
Lastly, the C-terminal residue has a nonpolar aliphatic side chain containing only methylene groups.

Answer the following questions. Use the pKa values for side chains (R groups) from Table 3-1 in the Lehninger textbook or from the lecture slides. You can assume the "common" values for the terminal carboxyl and amino groups: pK_1=2.3 and pK_2=9.7, respectively.

(A) Write the amino-acid sequence of this peptide in 3-letter and 1-letter abbreviations.

(B) What is the net charge on the peptide at pH = 13?

(C) What is the net charge on the peptide at pH = 6?

(D) Estimate the isoelectric point of this peptide. *Show the equation you used.*

(E) What fraction of the peptide molecules is in the zwitterionic state at the isoelectric point? *Show the equation you used.*

(F) You want to use ion-exchange chromatography to purify this peptide by retaining it on the column. Do you need a cation or anion column for this if the peptide is in phosphate buffer at pH=6.8? *Explain your reasoning*.