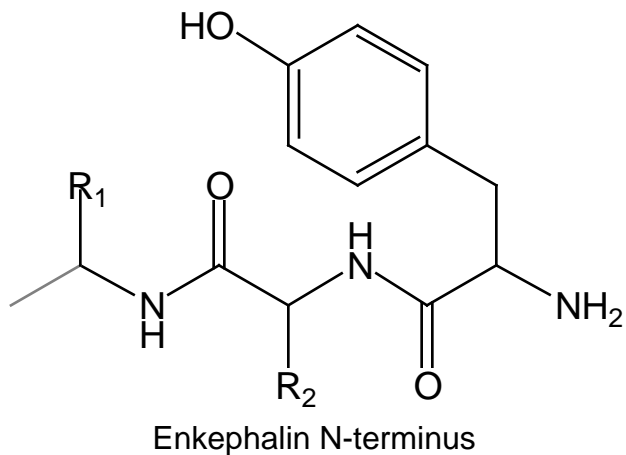
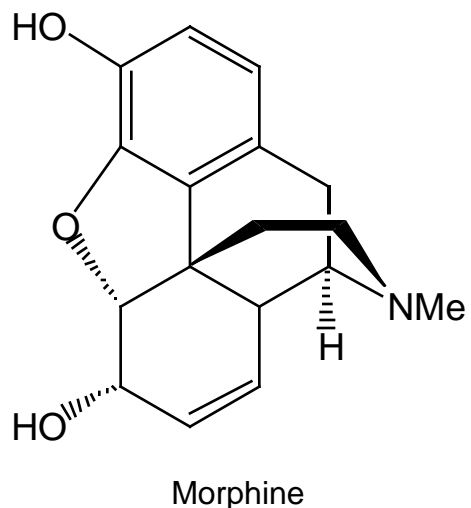


Biochemistry 341
Problem Set II - Due Monday 24

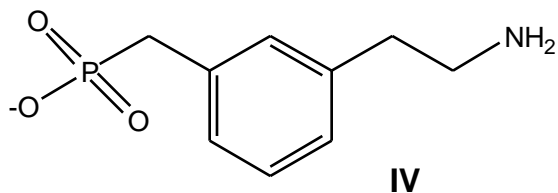
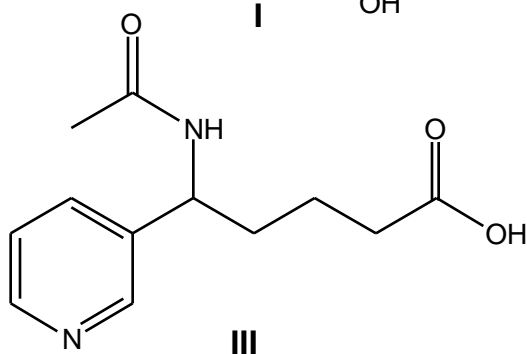
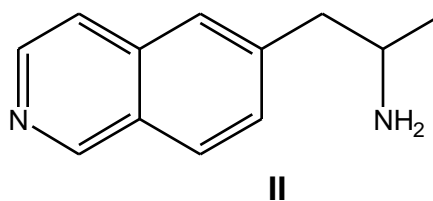
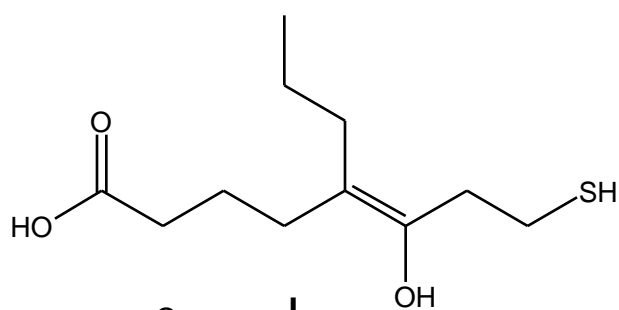
- a) (20 points) Most opioid alkaloids have the general structure shown below (morphine is shown). As you probably know, all these compounds are CNS (central nervous system) stimulants. Explain this by comparing the structure of morphine to the structure of enkephalin, which is considered to be the natural opioid of the brain.



Hint: Look for the similarities between both molecules. Check for places that are polar, non-polar, etc., etc...

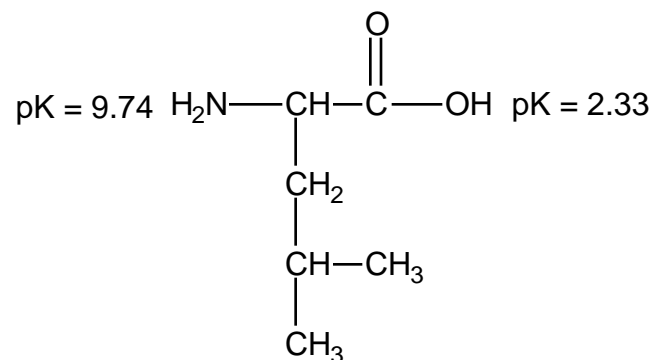
b) (40 points) For the following molecules, clearly indicate:

- 1) Which regions are polar and which regions are non-polar.
- 2) Which groups will participate in salt-bridges and H-bonds.
- 3) How much energy (approximately) will these molecules gain if all the possible H-bonds and salt-bridges they can form are formed.



- 4) For molecule IV, draw an hypothetical complementary receptor in which all non-covalent interactions are maximized. Draw molecule IV inside, and indicate all interactions.

c) (20 point) Say you have a solution of leucine (formula below, together with pK values) in which the total concentration in all its possible forms is 0.75 M.



- i) Calculate the proportions of $\text{H}_2\text{N-Leu-COOH}$, $\text{H}_2\text{N-Leu-COO}^-$, $^+\text{H}_3\text{N-Leu-COO}^-$, and $^+\text{H}_3\text{N-Leu-COOH}$ at pH 1.00, 2.40, 6.04, 8.80, and 12.00.
- ii) Calculate the total charge on the molecule at those pH values.