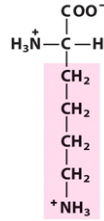


Quiz 1 Answer Key

NAME: _____ SID: _____

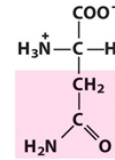
$$\text{pH} = \text{pK}_a + \log \frac{[\text{H acceptor}]}{[\text{H donor}]}$$

1a) What is this amino acid name?



Lysine

OR



Asparagine

1b) What is its 3 letter and 1 letter abbreviation?

Lys, K : polar, positively charged, hydrophilic or Asn, N : polar, hydrophilic

1c) Circle the properties that it has. **See above**

Aliphatic Aromatic Nonpolar Polar Charged Hydrophobic Hydrophilic

2. Draw the structures of the amino acids phenylalanine and aspartate in the ionization state you would expect at pH 7.0. Why is aspartate very soluble in water, whereas phenylalanine is much less soluble?

Ans: Aspartate has a polar (hydrophilic) side chain, which forms hydrogen bonds with water. In contrast, phenylalanine has a nonpolar (hydrophobic) side chain. (See Fig. 3-5, p. 79 for structures.)

3. Why do smaller molecules elute after large molecules when a mixture of proteins is passed through a size-exclusion (gel filtration) column?

Ans: The column matrix is composed of cross-linked polymers with pores of selected sizes. Smaller molecules can enter pores in the polymer beads from which larger molecules would be excluded. Smaller molecules therefore have a larger three-dimensional space in which to diffuse, making their path through the column longer. Larger molecules migrate faster because they pass directly through the column, unhindered by the bead pores.

4) A weak acid HA, has a pK_a of 5.0. If 1.0 mol of this acid and 0.1 mol of NaOH were dissolved in one liter of water, what would the final pH be?

Ans: Combining 1 mol of weak acid with 0.1 mol of NaOH yields 0.9 mol of weak acid and 0.1 mol of salt (.1 mole of NaOH converts .1 mole of weak acid to conjugate base, leaving .9 mole of weak acid).

$$\text{pH} = \text{pK}_a + \log \frac{[\text{conjugate base}]}{[\text{acid}]} = 5.0 + \log (0.1/0.9) = 4.05$$