Chem 352 - Spring 2009
Quiz 1

$R = 8.314 \ J/(mol \cdot K) = 0.08206 \ (L \cdot atm)/(mol \cdot K)$

1. Lysine is one of the 20 common amino acids and has a side chain with a basic amino group. The structure for lysine in its fully protonated state is shown below along with the pK_a values, determined at 25°C, for each of its titratable groups:
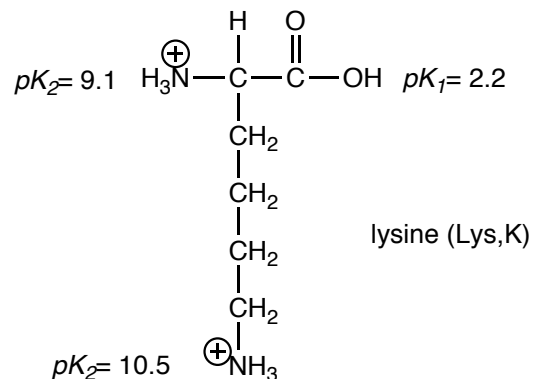
a. Sketch the titration curve for lysine (Be sure to label the axes.):

b. Draw the predominant ionic species for lysine that exists at *pH* 7. What is the *net charge* for this species?

Net charge = _____

c. What is the standard free energy change ($\Delta G°$) in kJ/mol at 25°C for the dissociation of the side chain proton from lysine?

2. Pyruvic acid is an important metabolic intermediate.

$$CH_3-\overset{\overset{O}{\|}}{C}-\overset{\overset{O}{\|}}{C}-OH$$
pyruvic acid
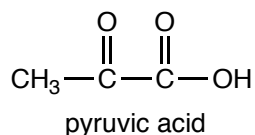
a. Pyruvic acid contains a carboxylic acid group having an acid dissociation constant of K_a = 3.98 x 10^{-3} M. Draw the structure for pyruvate, which is the conjugate base for pyruvic acid:

b. What is the *pH* of a pyruvate buffer that is made by mixing 250 mL of 0.2 M pyruvic acid with 750 mL of 0.2 M sodium pyruvate?