Name _____

Chem 352 - Spring 2018
Quiz 1

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

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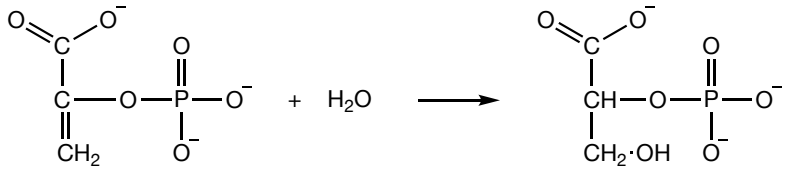
1. One of the reactions in the gluconeogenesis pathway, an *anabolic* metabolic pathway that leads to the synthesis of glucose, involves the hydration of *phosphoenolpyruvate* to form *2-phosphoglycerate*.



phosphoenolpyruvate 2-phosphoglycerate

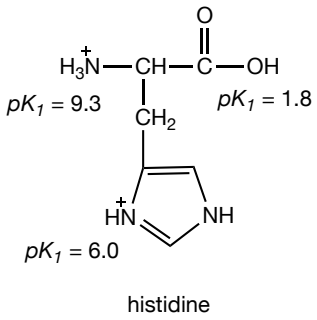
   a. Under standard state conditions at 25°C, the equilibrium constant for this reaction is $K_{eq} = 2.07$. Is this reaction favorable (spontaneous) at standard state conditions?
   (Y/N?)_____
   Explain:

   b. Determine the standard free energy change, $\Delta G°'$, for this reaction at 25°C.

   c. If the cellular concentrations of *phosphoenolpyruvate* and *2-phosphoglycerate*, are 1.2 mM and 5.1mM, respectively, is this reaction favorable under conditions found in a cell at 25°C
   (Y/N)? _____
   Explain:

   d. What is *anabolism*?

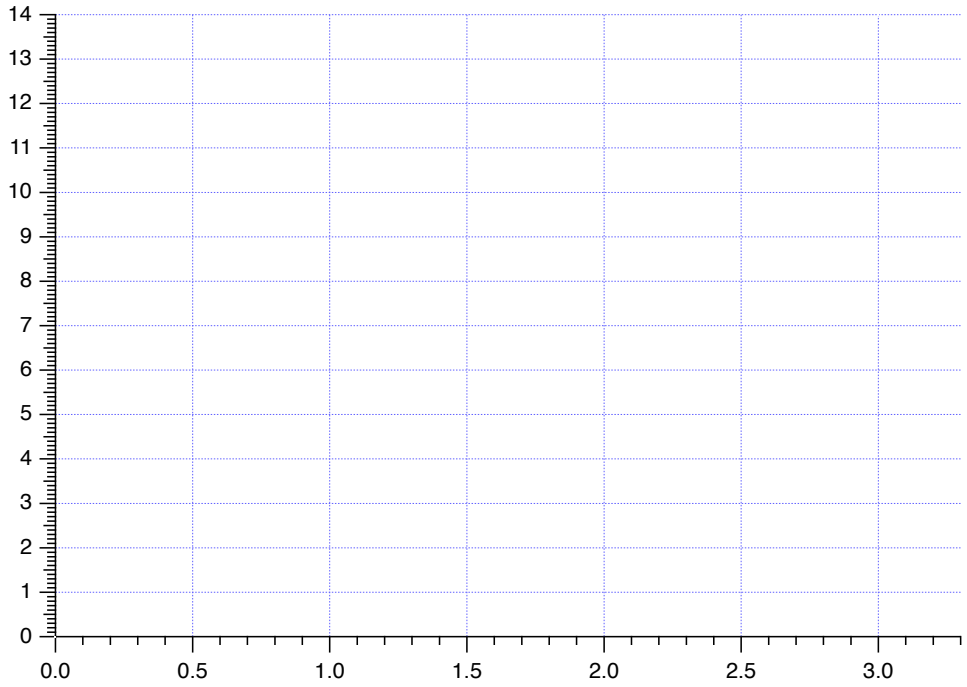
2. To the right is shown the structural formula for the amino acid histidine. Histidine contains three ionizable groups; the structure shown has all three of these groups in their protonated, acid form. The pK_a values for these three acids are indicated in the figure.



histidine

   a. What is the expected *pH* for a 50 mM solution of histidine in its fully protonated form?

   b. Sketch the titration curve for a 50 mM solution of histidine. Be sure to properly label the axes.



   c. What is the isoelectric *pH* for histidine? *pI* = _____

   d. Draw the structure for the predominant species of histidine that exists at its isoelectric *pH*.