Due: Monday, 27-February -2006. Remember this is to be your own work.

1) A solution contains 0.775 g of ethylamine, C\textsubscript{2}H\textsubscript{5}NH\textsubscript{2}, per 100.0 mL of solution. Electrically conductivity experiments show that 0.915% of the ethylamine has reacted with water. Write the equation for this reaction. Calculate the pH of the solution.

2) Pure phosphoric acid ionizes in a way similar to that of water.
   a) Write the equilibrium reaction of pure phosphoric acid.
   b) Will potassium dihydrogenphosphate, KH\textsubscript{2}PO\textsubscript{4}, be an acid or a base in phosphoric acid?

3) A 2.775 g sample of a mixture of sodium carbonate and sodium chloride is dissolved in 25.00 mL of 0.879 M HBr. Some acid remains after the treatment of the sample.
   a) Write the net ionic equation for the complete reaction of sodium carbonate with hydrobromic acid.
   b) If 27.8 mL of 0.108 M NaOH were required to titrate completely the excess hydrobromic acid, how many moles of sodium carbonate were present in the original sample?
   c) What is the percent composition of the original sample?

4) Hypophosphorous acid, H\textsubscript{3}PO\textsubscript{2}, and phosphoric acid, H\textsubscript{3}PO\textsubscript{4}, have approximately the same acid strengths. From this information, and noting the possibility that one or more hydrogens may be bonded directly to the phosphorus atom, draw the structural formula of hypophosphorous acid. How many grams of sodium hydroxide would be required to neutralize completely 1.00 g of this acid?

5) Like any equilibrium constant, K\textsubscript{w} changes with temperature.
   a) Given that autoionization is an endothermic process, does K\textsubscript{w} increase or decrease with rising temperature? Explain with a reaction that explicitly includes heat.
   b) In many medical applications, the value of K\textsubscript{w} at 37°C (body temperature) may be more appropriate than the value at 25°C, 1 \times 10^{-14}. The pH of pure water at 37°C is 6.80. Calculate K\textsubscript{w}, pOH, and [OH\textsuperscript{-}] at this temperature.