

**Problem of the Day 31 CHEM 1252**

**Suggested Book Problems for Chapter 17: 11, 13, 17, 21, 23, 33, 39, 41, 47, 51, 53, 65, 78**

1. Consider a buffer made by adding 0.140 mol cyanic acid (HCNO) and 0.110 mol potassium cyanate (KCNO) to water to give a final volume of 1.00 L. The  $K_a$  for HCNO is  $3.5 \times 10^{-4}$ .

a) Calculate the pH of the buffer.

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b) Calculate the pH after the addition of 0.015 mol of  $\text{HNO}_3$  to the original buffer.

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c) Calculate the pH after the addition of 0.015 mol KOH to the original buffer.

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2. a) Calculate the ratio of ammonium ion to ammonia that is needed for a buffer of  $\text{pH} = 9.20$ . ( $K_b$  for  $\text{NH}_3$  is  $1.8 \times 10^{-5}$ .)

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b) What mass of ammonium chloride,  $\text{NH}_4\text{Cl}$ , must be added to 400.00 mL of a 3.00 M  $\text{NH}_3$  solution to prepare the buffer?

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3. A 50.0 mL sample of 0.500 M  $\text{HBr}$  is titrated with 0.500 M  $\text{KOH}$ .

a) What is the initial pH of the solution.

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b) What is the pH of the solution after 28.0 mL of  $\text{KOH}$  have been added to the acid?

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