

Name: \_\_\_\_\_

Period: \_\_\_\_\_

Seat#: \_\_\_\_\_

**Directions:** Show all work. Box your final answer.

*\*Remember – lots of ways to do these. If you get the right answer and someone can follow your work and units etc. then you are FINE!*

$$pK_a = -\log(K_a)$$

$$K_a = \frac{[H^+][A^-]}{[HA]}$$

$$[H^+] = \frac{K_a[A^-]}{[HA]}$$

$$pH = pK_a + \log\left(\frac{[\text{salt form}]}{[\text{acid form}]}\right)$$

$$pOH = pK_b + \log\left(\frac{[\text{salt form}]}{[\text{base form}]}\right)$$

1) A buffer is prepared containing 1.00 molar acetic acid and 1.00 molar sodium acetate. What is its pH? 4.752  
 $K_a = 1.76 \times 10^{-5}$

2) A buffer is prepared containing 1.00 molar acetic acid and 0.800 molar sodium acetate. What is its pH? 4.655  
 $K_a = 1.76 \times 10^{-5}$

3) A buffer is prepared containing 0.600 M anisic acid and 0.800 M sodium anisate. What is its pH? 4.596  
 $K_a = 3.38 \times 10^{-5}$

4) A buffer is prepared containing 1.00 M ammonia and 1.00 M ammonium chloride. What is its pH? 9.248  
 $K_b = 1.8 \times 10^{-5}$

5) A buffer is prepared containing 1.00 M ammonia and 0.800 M ammonium chloride. What is its pH? 9.345  
 $K_b = 1.8 \times 10^{-5}$

6) A buffer is prepared containing 0.600 M nicotine and 0.800 M nicotine hydrochloride. What is its pH? 7.896  
Nicotine is a base.  $pK_a = 8$

<p>7) <math>pK_a</math> for phenolphthalein is 9.3 at room temperature.</p> <p>a. Calculate ratio of its anionic form to acid form at pH 8.2 and then again at pH 10. <u>At pH 8.2 = ratio of base form to acid form = 0.0794 to 1</u>  <u>At pH 10 = ratio of base form to acid form = 5.01 to 1</u></p>	<p>b. Using these values, explain the color change within this pH range from 8.2 – 10</p>
<p>8)* Calculate the pH of the solution that results from the addition of 0.040 moles of <math>HNO_3</math> to a buffer made by combining 0.500 L of 0.380 M <math>HC_3H_5O_2</math> (<math>K_a = 1.30 \times 10^{-5}</math>) and 0.500 L of 0.380 M <math>NaC_3H_5O_2</math> <u>pH = 4.700</u>  *Assume addition of the nitric acid has no effect on volume.</p>	<p>9) What is the pH when 25.0 mL of 0.200 M of <math>CH_3COOH</math> has been titrated with 35.0 mL of 0.100 M <math>NaOH</math>? (<math>K_a = 1.8 \times 10^{-5}</math>) <u>pH = 5.11</u>  (*hint* Think about how much <math>A^-</math> is formed when mol HA + mol OH react. Then think about if you have <math>[HA]</math> and <math>[A^-]</math> left over that you can use with the He-Ha equation!)</p>
<p>10) A beaker with 100.0 mL of an acetic acid buffer with a pH of 5.000 is sitting on a benchtop. The molarity of acid is 0.100 M and the molarity of the conjugate base in this buffer is 0.100 M. A student adds 7.300 ml of a 0.3600 M <math>HCl</math> solution to the beaker. How much will the pH change? The <math>pK_a</math> of acetic acid is 4.752. <u>pH = 4.518</u></p>	
	<p>11) Calculate the ratio of <math>CH_3NH_2</math> to <math>CH_3NH_3Cl</math> required to create a buffer with pH = 10.14  The <math>pK_b</math> of <math>CH_3NH_2 = 3.357</math> <u>base/acid ratio = 0.314</u></p>