

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
 $K_a = 1.8 \times 10^{-5}$

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) pK_a 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 HNO_3 to a buffer made by combining 0.500 L of 0.380 M $HC_3H_5O_2$ ($K_a = 1.30 \times 10^{-5}$) and 0.500 L of 0.380 M $NaC_3H_5O_2$ <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 CH_3COOH has been titrated with 35.0 mL of 0.100 M $NaOH$? ($K_a = 1.8 \times 10^{-5}$) <u>pH = 5.11</u></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 total molarity of acid and conjugate base in this buffer is 0.1000 M. A student adds 7.300 ml of a 0.3600 M HCl solution to the beaker. How much will the pH change? The pK_a of acetic acid is 4.752. <u>pH = 4.518</u></p>	
	<p>11) Calculate the ratio of CH_3NH_2 to CH_3NH_3Cl required to create a buffer with pH = 10.14 The pK_b of $CH_3NH_2 = 3.357$ <u>base/acid ratio = 0.314</u></p>