Buffer Practice Worksheet Name: _____

1. What is the pH of a solution containing 0.75 M lactic acid and 0.25 M sodium lactate?

$pH = -\log 1.38 \times 10^{-4} + \log \frac{.25}{.75}$

$pH = 3.38$

2. What is the pH of a solution containing 0.25 M ammonia and 0.40 M ammonium chloride?

$pH = -\log 5.6 \times 10^{-10} + \log \frac{.25}{.40}$

$pH = 9.05$

3. What is the ratio of sodium benzoate to benzoic acid that will produce a pH of 4.30?

$4.30 = -\log 6.4 \times 10^{-5} + \log R$

$R = 1.28$

$\frac{1.28}{1}$ $NaC_7H_5O_2$

$HC_7H_5O_2$

4. What is the pH of 70 grams of ammonium chloride and 600 ml of 14.5 M ammonia that has been diluted to 1.0 L? (molar mass of ammonium chloride 53.49 g/mol)

$\frac{70\ g \mid 1\ mol}{53.49\ g} = 1.31\ mol\ NH_4Cl / 1L = 1.31\ M$

$\frac{14.5\ M}{L} \mid \frac{.60\ L}{} = 8.7\ mol\ NH_3 / 1L = 8.7\ M$

$pH = -\log 5.6 \times 10^{-10} + \log \frac{8.7}{1.3}$

$pH = 10.08$

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5. How does the pH of 400 mL of 0.20 M ammonia and 0.30 M ammonium chloride change when 100 mL of 0.05 M NaOH is added to the solution?

$\frac{.2\ M}{L} \mid .4L = 0.08\ mol\ NH_3$, $\frac{.3}{.4} = .12\ mol\ NH_4^+$

$\frac{.05}{.1} = .005\ mol\ NaOH$

$NH_4^+ + OH^- \rightarrow NH_3 + H_2O$

	NH_4^+	OH^-	NH_3
	.12	.005	.08
	−.005	−.005	+.005
	.115		.085

$pH = -\log 5.6\times10^{-10} + \log \frac{.085}{.115}$

$pH = 9.12$

6. How does the pH of 400 mL of 0.20 M ammonia and 0.30 M ammonium chloride change when 100 mL of 0.05 M HCl is added to the solution?

$\frac{.2\ M}{L} \mid .4L = 0.08\ mol\ NH_3$, $\frac{.3}{.4} = .12\ mol\ NH_4^+$

$\frac{.05}{.1} = .005\ mol\ HCl$

$NH_3 + H^+ \rightarrow NH_4^+$

	NH_3	H^+	NH_4^+
	.08	.005	.12
	−.005	−.005	+.005
	.075		.125

$pH = -\log 5.6\times10^{-10} + \log \frac{.075}{.125}$

$pH = 9.03$

7. What is the ratio of acetate ion to acetic acid in a 0.2 M acetic acid /sodium acetate buffer that has a pH of 4.6?

$4.6 = -\log 1.8\times10^{-5} + \log R$

$R = \frac{.717}{1}$ $\frac{.1434}{.2}$

8. What is the pH of an acetic acid buffer that has an acetate ion to acetic acid ratio of 0.1?

$-\log 1.8\times10^{-5} + \log .1$

$pH = 3.74$

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9. What is the pH of an acetic acid buffer that has an acetate ion to acetic acid ratio of 0.01?

$pH = -\log 1.8\times10^{-5} + \log .01$

2.74

10. What is the pH of a buffer that contains 0.39 M acetic acid and 0.78 M sodium acetate?

$pH = -\log 1.8\times10^{-5} + \log \frac{.78}{.39}$

$pH = 5.05$

11. Using table A5-1, (Page A22) which acid would you choose to create a buffer solution at a pH of 9.2?

$10^{-9.2} = 6.3\times10^{-10}$

Hydrocyanic

K_a 6.2×10^{-10}

$9.2 = -\log 6.2\times10^{-10} + \log R$

$R = .98$

12. Using table A5-1, (Page A22) which acid would you choose to create a buffer solution at a pH of 3.5?

$10^{-3.5} = 3.16\times10^{-4}$

Nitrous K_a 4×10^{-4}

$3.5 = -\log 4\times10^{-4} + \log R$ $R = 1.26$