Name: Date: Period:

Part III: Determining Buffer Components for a Desired pH

Buffer Challenge: Determine which buffer components from the list should be used for each scenario described below.

Step 1: Use the K_a values to calculate the pH. (HINT: Use the equation from the notes.)

Step 2: Choose the appropriate acid for each scenario based on the calculated pH values. Then match the conjugate base to the chosen acid.

Step 3: Use stoichiometry to calculate how many grams of salt need to be added to 100 mL of the aqueous solution of its conjugate to create a 1:1 ratio.

Table 1: Buffer Components for Creating Buffer Solutions

Acids	Bases
0.10 M acetic acid (CH_3COOH) ➢ $K_a = 1.8 \times 10^{-5}$	0.10 M ammonia (NH_3)
Ammonium chloride (NH_4Cl) ➢ K_a of $NH_4^+ = 5.7 \times 10^{-10}$	Sodium dihydrogen citrate ($NaH_2C_6H_5O_7$)
0.10 M citric acid ($H_3C_6H_5O_7$) ➢ $K_a = 7.1 \times 10^{-4}$	Sodium acetate ($NaCH_3COO$)
0.10 M sodium dihydrogen phosphate (NaH_2PO_4) ➢ K_a of $H_2PO_4^- = 6.3 \times 10^{-8}$	Sodium hydrogen phosphate (Na_2HPO_4)

pH of acetic acid solution: _____

pH of ammonium chloride: _____

pH of citric acid solution: _____

pH of sodium dihydrogen phosphate solution: _____

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Scenario 1: Prepare a buffer for an antibiological agent which is designed for use in the human body. This buffer should have a pH of 7.2 ± 0.5 with the ability to stay within one pH unit of this target when strong acid or base is added.

Acid: _____ Base: _____

$$\frac{100\ mL}{1} \times \frac{1\ L}{1000\ mL} \times \frac{0.10\ mol}{1\ L} \times \frac{mol}{mol} \times \frac{g}{1\ mol} =$$

Mass of salt to be added =

Scenario 2: Prepare a buffer for an antifungal agent which is designed for use against a fungus that attacks food sources that grow in *acidic* soil. This buffer should have a pH of 4.7 ± 0.5 with the ability to stay within one pH unit of this target when strong acid or base is added.

Acid: _____ Base: _____

$$\frac{100\ mL}{1} \times \_\_\_\_\_ \times \_\_\_\_\_ \times \_\_\_\_\_ \times \_\_\_\_\_ =$$

Mass of salt to be added =

Scenario 3: Prepare a buffer for an antifungal agent which is designed for use against a fungus that attacks food sources in *basic* soil. This buffer should have a pH of 9.2 ± 0.5 with the ability to stay within one pH unit of this target when strong acid or base is added.

Acid: _____ Base: _____

$$\frac{100\ mL}{1} \times \qquad =$$

Mass of salt to be added =

Scenario 4: Prepare a buffer for an antiviral agent which is designed for use against a strain of virus that attacks drug-producing bacteria that survive and grow in acidic environments. This buffer should have a pH of 3.1 ± 0.5 with the ability to stay within one pH unit of this target when strong acid or base is added.

Acid: _____ Base: _____

Mass of salt to be added =