Name: _____

Blk: ___ Date: ____

Chemistry 12 : Buffers

PRACTICE EXERCISESS

1. Define a buffer solution.

2. An acidic buffer solution is prepared by mixing a weak _____ and the salt of its _____.

3. A basic buffer solution is prepared by mixing a weak _____ and the salt of its _____.

4. The following table gives some examples of acidic buffer solutions. Fill in the blanks.

Some Examples of Acidic Buffers

Weak Acid	Conjugate Base	Salt of the Conjugate Base
$H_2C_2O_4$		
	$C_6H_5COO^-$	
		KHS
HCN		
	$H_2BO_3^-$	

5. A basic buffer solution is prepared using NH_4I as one of the components. Give the formula for the other compound used.

6. A buffer solution is prepared using C_6H_5OH and NaC_6H_5O. Write an equation showing the equilibrium present in this solution.

7. A small amount of 1 M HNO_3 is added to a buffer solution containing 1 M hydrofluoric acid (HF) and 1 M sodium fluoride (NaF).

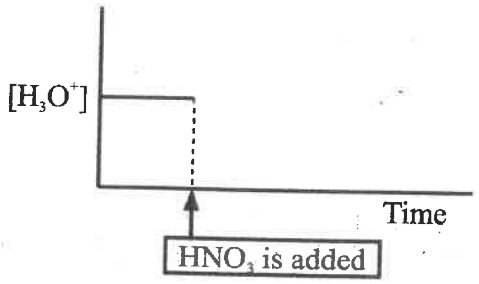
   a) Write an equation that shows the equilibrium present in the buffer solution.

   b) The addition of HNO_3 immediately _____creases the $[H_3O^+]$ and _____creases the pH.

   c) The equilibrium shifts to the _____. As this shift is occurring, _____ reacts with the excess H_3O^+ and the $[H_3O^+]$ gradually _____creases.

d) In the overall process, the final $[H_3O^+]$ is slightly _____er than it was before the HNO_3 was added, and the pH is slightly _____er than it was before the HNO_3 was added.

e) Draw a graph of $[H_3O^+]$ versus time for the process outlined in this question.



8. A small amount of 1 M NaOH is added to a buffer solution containing 1 M nitrous acid (HNO_2) and 1 M potassium nitrite (KNO_2).

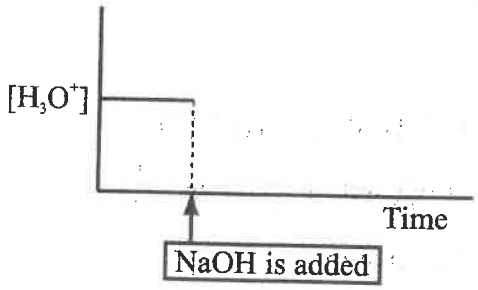
a) Write an equation that shows the equilibrium present in the buffer solution.

b) The addition of NaOH immediately _____creases the $[H_3O^+]$ and _____creases the pH.

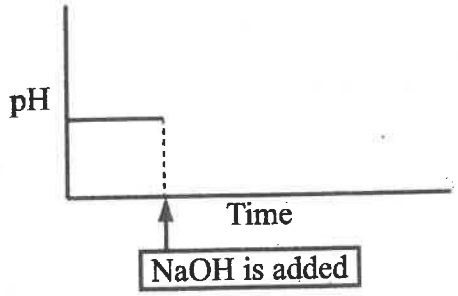
c) The equilibrium shifts to the _____. As this shift is occurring, _____ reacts to produce more H_3O^+, and $[H_3O^+]$ gradually _____creases.

d) In the overall process, the final $[H_3O^+]$ is slightly _____er than it was before the NaOH was added, and the pH is slightly _____er than it was before the NaOH was added.

e) Draw a graph of $[H_3O^+]$ versus time for the process outlined in this question.



f) Draw a graph of pH versus time for the process outlined in this question.



9. The pH of a buffer solution containing 1 M CH_3COOH and 1 M $NaCH_3COO$ is 4.74. If 0.20 moles of HCl are added to 1.0 L of this buffer solution, the resulting pH would **most likely** be

A. 0.70 **B.** 4.56
C. 4.74 **D.** 4.92

10. The pH of a buffer solution containing 1 M CH_3COOH and 1 M $NaCH_3COO$ is 4.74. If 0.20 moles of KOH are added to 1.0 L of this buffer solution, the resulting pH would **most likely** be

A. 4.56 **B.** 4.74
C. 4.92 **D.** 13.30

11. Which of the following set of solutions could be used to prepare a buffer solution?

A. 0.1 M HCl and 0.1 M NaCl **B.** 1 M $KHCO_3$ and 1 M KOH
C. 1 M HNO_2 and 1 M $NaNO_3$ **D.** 1 M $NaHC_2O_4$ and 1 M $H_2C_2O_4$

12. Which of the following solutions could **not** be used as one of the components of a buffer solution?

A. 1 M H_2SO_4 **B.** 1 M $LiHSO_4$
C. 1 M Na_2HPO_4 **D.** 1 M K_2SO_3

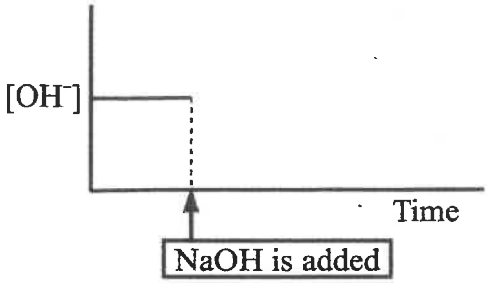
13. A small amount of 1 M NaOH is added to a buffer solution containing 1 M ammonia (NH_3) and 1 M ammonium nitrate (NH_4NO_3).

a) Write an equation that shows the equilibrium present in the buffer solution.

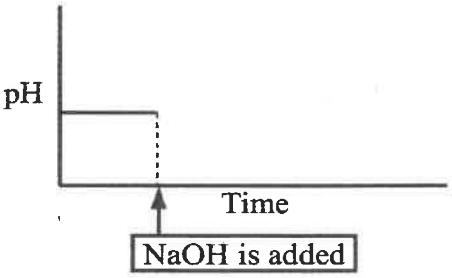
b) The addition of NaOH immediately _____creases [OH^-] and _____creases the pH.

c) The equilibrium shifts to the _____. As this shift is occurring, _____ reacts with the excess OH^-, and [OH^-] gradually _____creases.

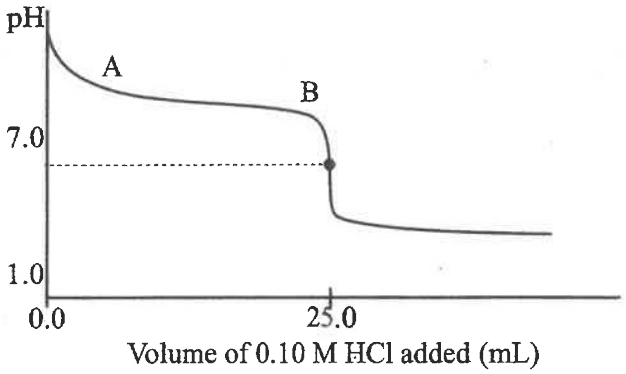
d) Complete the graph showing [OH^-] versus time for the process outlined in this question.



e) Draw a graph of pH versus time for the process outlined in this question.



14. The following titration curve shows the pH when a strong acid is added to a weak base.



a) Explain briefly why the curve levels off slightly between points A and B.

b) Explain why the pH takes a steep drop starting at point B on the graph.