Hw5A-Chapter17

Due: 7:30am on Saturday, March 16, 2019

You will receive no credit for items you complete after the assignment is due. Grading Policy

Give It Some Thought 17.2 Custom

Part A

Which of these conjugate acid-base pairs will *not* function as a buffer?

ANSWER:

- and
- and
- and

± pH of a Buffer Solution

Solutions that contain a weak acid, , and its conjugate base, , are called *buffer solutions* because they resist drastic changes in . When a solution contains a weak acid and its conjugate base or a weak base and its conjugate acid, it will be a buffer solution. For buffers containing a weak acid, the principal reaction is

Unbuffered, a weak acid would ionize and the net reaction would proceed forward to reach equilibrium. However, when a significant amount of conjugate base is already present, the extent of the net reaction forward is diminished. Thus, equilibrium concentrations of and are approximately equal to their initial concentrations.

Visualizing buffers

You can visualize a buffer solution containing approximately equal concentrations of and in action using the following equation, where is the equilibrium constant:

When the concentrations of and are relatively large, the addition of a small amount of acid or base changes their concentration negligibly. The result is that the ratio maintains a value approximately equal to 1, and the is approximately equal to the value under buffer conditions.

Part A

Calculate the of the solution made by adding 0.50 of and 0.30 of to 1.00 of water. The value of for is .

Express your answer numerically using two decimal places.

You did not open hints for this part.

ANSWER:

=

Problem 17.21 Custom

Part A

Calculate the of a buffer that is 0.12 in lactic acid and 0.11 in sodium lactate.

Express your answer using two decimal places.

ANSWER:

=

Give It Some Thought 17.4

The values for nitrous acid and hypochlorous acid are and , respectively.

Part A

Which one would be more suitable for use in a solution buffered at = 7.0?

ANSWER:

Part B Complete previous part(s)

± pH Changes in Buffers

When a solution contains a weak acid and its conjugate base or a weak base and its conjugate acid, it will be a buffer solution. Buffers resist change in pH following the addition of acid or base. A buffer solution prepared from a weak acid () and its conjugate base () is represented as

The buffer will follow Le Châtelier's principle. If acid is added, the reaction shifts to consume the added , forming more . When base is added, the base will react with , reducing its concentration. The reaction then shifts to replace through the dissociation of into and . In both instances, tends to remain constant.

The pH of a buffer is calculated by using the Henderson-Hasselbalch equation:

Part A

What is the pH of a buffer prepared by adding 0.809 of the weak acid to 0.608 of in 2.00 of solution? The dissociation constant of is .

Express the pH numerically to three decimal places.

You did not open hints for this part.

ANSWER:

=

Part B

What is the after 0.150 of is added to the buffer from Part A? Assume no volume change on the addition of the acid.

Express the pH numerically to three decimal places.

You did not open hints for this part.

ANSWER:

=

Part C

What is the after 0.195 of is added to the buffer from Part A? Assume no volume change on the addition of the base.

Express the pH numerically to three decimal places.

You did not open hints for this part.

ANSWER:

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Problem 17.28 with feedback

A buffer contains 0.10 of propionic acid () and 0.19 of sodium propionate () in 1.20 .

You may want to reference (Page) Section 17.2 while completing this problem.

Part A

What is the of this buffer?

Express the pH to two decimal places.

ANSWER:

=

Part B