

Buffers Keep the Balance

Data Table 1. Model Carbonate Blood Buffer

Table 1	Test Tube Number					
	1	2	3	4	5	6
Solution	Carbonic Acid (Reference)	Model Carbonate Blood Buffer	Water (Control)	Model Carbonate Blood Buffer	Water (Control)	Sodium Bicarbonate (Reference)
Bromthymol blue indicator color						
Initial pH value						
Number of drops of HCl required to convert solutions 2 and 3 to yellow (acid reference color)	NA			NA	NA	NA
Number of drops of NaOH required to convert solutions 4 and 5 to blue (base reference color)	NA	NA	NA			NA

Data Table 2. Effect of HCl on Biological Phosphate Buffers

	Estimated pH (pH paper)	Universal Indicator Color			
		Initial	After 1 drop of HCl	After 5 drops of HCl	After 10 drops of HCl
Water (control)				NA	NA
Phosphate Buffer A					
Phosphate Buffer B					

Data Table 3. Effect of NaOH on Biological Phosphate Buffers

	Estimated pH (pH paper)	Universal Indicator Color			
		Initial	After 1 drop of NaOH	After 5 drops of NaOH	After 10 drops of HCl
Water (control)				NA	NA
Phosphate Buffer A					
Phosphate Buffer B					

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Post-Lab Questions

1. Compare the measured pH value for the model carbonate blood buffer to
 - a. the expected pH of an ideal carbonic acid–bicarbonate buffer, and
 - b. the actual pH of the carbonic acid–bicarbonate buffer system present in the blood.

2. Based on the pH comparisons in Question #1, which solution, the model carbonate blood buffer or an actual blood buffer, is more likely to contain a greater proportion of the carbonic acid component of the buffer compared to the bicarbonate component? Explain your reasoning.

3. What are the effects of adding even a small amount of HCl or NaOH on the pH value of the control solution (water)? Compare this to the effect of adding HCl or NaOH to the model carbonate blood buffer.

4. Which phosphate buffer solution in Part B corresponds to the composition of an ideal buffer solution? Compare its measured pH value with the calculated pH of the ideal buffer solution.

5. Use the universal indicator color chart to compare the observed pH changes for phosphate buffers A and B and the control solution (water) upon addition of HCl and NaOH. Were phosphate buffers A and B equally effective in resisting pH changes upon addition of either HCl or NaOH?

6. Do the results in Data Tables 2 and 3 confirm that the ideal buffer is optimally effective upon addition of either HCl or NaOH?