

Not present	Not passing	Barely passing	Passing	Very Good	Excellent	
0	10	12	14	16	20	20 points: Make a buffer 1. This buffer is biochemically relevant. There is a literature source that uses this buffer at this pH and concentration. 2. This buffer has the pH indicated. 3. This buffer has the buffering capacity associated with the starting pH and molarity.
0	7.5	8	10.5	12	15	15 points: Theory of Buffers 1. There is a complete description of what buffers are and how they work. 2. There are complete sentences in well organized paragraphs
0	10	12	14	16	20	20 points: SOP, Standard Operating Procedure 1. There are complete, detailed steps for making a buffer. 2. Safety precautions that must be observed are included and any warnings from MSDS are included.
0	10	12	14	16	20	20 points: Design an experiment to prove that you made the buffer 1. There is a description of the fundamental scientific reason(s) why the experiment is being conducted. 2. There is a description of the general type of data that was collected. 3. The data is neat and organized. 4. The calculations are neat and organized. 5. There are sample calculations for error analysis. 6. There are complete sentences in well organized paragraphs.
0	10	12	14	16	20	20 points: Design an experiment to show the buffering capacity (both acid and base) of your buffer 1. There is a description of the fundamental scientific reason(s) why the experiment is being conducted. 2. There is a description of the general type of data that was collected. 3. The data is neat and organized. 4. The calculations are neat and organized. 5. There are sample calculations for error analysis. 6. There are complete sentences in well organized paragraphs.
0	1	2	3	4	5	5 points: There is one source from the refereed literature (2 points) that has been properly cited in the text (1 point) and there is complete bibliographic information in the Reference Section. (2 points) *Primary sources have data that was generated by the authors of the paper.

Instructions:

1. Make a buffer
2. Write complete detailed (SOP, Standard Operating Procedure) instructions for making your buffer
3. Design an experiment to prove that you made the buffer
4. Design an experiment to show the buffering capacity (both acid and base) of your buffer
5. Write a lab report that includes the theory of buffers, your SOP, and details of the two experiments you designed (methods, data, results, conclusion.)