20 points Acid Base Boot Camp Due September 3, 2014

Show your work for every problem. Put your answers for each problem on the answer page, indicate what type of problem it is and the equation(s) you used. This is the cover page for your assignment. Types of Reactions: Strong acids, Weak Acids, Weak Bases, Titration, Addition of strong acid or strong base to a buffer, Preparing buffers

Constants you need to use (use only these values:

Acetic acid, Ka = 1.76×10^{-5} NaH_2PO_4, Ka = 1.58×10^{-7}

H_3PO_4, Ka = 7.5×10^{-3} Na_2HPO_4, Ka = 4.8×10^{-13}

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1. What is the pH of a solution that is made by adding 15 mL of 0.3M HCl to 100 mL of water?
2. What is the pH of a solution that is made by adding 30 mL of 0.1M HCl to 150 mL of water?
3. What is the pH of a solution that is made by adding 1 mL of 0.1 M HCl to 500 mL of water?
4. What is the pH of a solution that is made by adding 30 mL of 0.1 M NaOH to 300 mL of water?
5. What is the pH of a solution that is made by adding 40 mL of 0.3M NaOH to 300 mL of water?
6. What is the pH of 10 mL of 0.12M acetic acid?
7. What is the pH of 60 mL of 0.12M acetic acid?
8. What is the pH of 60 mL of 0.025M acetic acid?
9. What is the pH of 100 mL of 0.12M potassium acetate solution?
10. What is the pH of a solution made by adding 30.2g of potassium acetate to 100 mL of distilled water.
11. What is the pH after 5 mL of 0.13 M NaOH has been added to 50 mL of 0.26M acetic acid?
12. What is the pH after 10 mL of 0.13 M NaOH has been added to 30 mL of 0.26M acetic acid?
13. What is the pH after 30 mL of 0.13 M NaOH has been added to 30 mL of 0.26M acetic acid?
14. What is the pH after 60 mL of 0.13 M NaOH has been added to 30 mL of 0.26M acetic acid?
15. What is the pH after 65 mL of 0.13 M NaOH has been added to 30 mL of 0.26M acetic acid?
16. A flask contains 300 mL of 0.13 M phosphate buffer that has a pH of 7.3. What volume of 0.3M HCl should be added to drop the pH to 6.7.
17. A flask contains 300 mL of 0.13 M phosphate buffer that has a pH of 7.3. What volume of 0.3 MHCl should be added to drop the pH to 6.6.
18. A flask contains 100 mL of 0.14 M phosphate buffer that has a pH of 7.3. What volume of 0.3 M HCl should be added to drop the pH to 6.8.
19. A flask contains 600 mL of 0.16 M phosphate buffer that has a pH of 7.4. What volume of 0.3 M HCl should be added to drop the pH to 6.6.
20. A flask contains 400 mL of 0.6 M phosphate buffer that has a pH of 7.6. What volume of 0.1 M HCl should be added to drop the pH to 7.1.
21. A flask contains 300 mL of 0.1 M phosphate buffer that has a pH of 7.0. What volume of 0.1M NaOH should be added to increase the pH to 7.6.
22. A flask contains 300 mL of 0.15 M phosphate buffer that has a pH of 7.1. What volume of 0.06MNaOH should be added to increase the pH to 7.6.
23. A flask contains 500 mL of 0.06 M phosphate buffer that has a pH of 7.3. What volume of 0.06M NaOH should be added to increase the pH to 8.3.
24. A flask contains 100 mL of 0.12 M phosphate buffer that has a pH of 7.3. Whatvolume of

0.3M NaOH should be added to increase the pH to 7.6.
25. A flask contains 30 mL of 0.16 M phosphate buffer that has a pH of 7.2. What volume of 0.06M NaOH should be added to increase the pH to 7.4.
26. A flask contains 100 mL of 0.06 M phosphate buffer that has a pH of 7.0. What volume of 0.01M NaOH should be added to increase the pH to 7.6.
27. What is the pH if 6 mL of 0.12M HCl is added to 300 mL of a 0.1 M phosphate buffer that has a starting pH of 7.3.
28. What is the pH if 10 mL of 0.16M HCl is added to 300 mL of a 0.016M phosphate buffer that has a starting pH of 7.6.
29. What is the pH if 30 mL of 0.3 M HCl is added to 300mL of a 0.1 M phosphate buffer that has a starting pH of 6.8.
30. What is the pH of a buffer if 6.0 grams of sodium hydrogen phosphate and 3.2 g of sodium dihydrogen phosphate are added to 200 ml of distilled water?
31. What is the pH of a buffer if 33.2 grams of sodium hydrogen phosphate and 10.5 g of sodium dihydrogen phosphate are added to 300 ml of distilled water? What is the molarity of phosphate ion in this buffer?
32. What is the pH of a buffer if 6.6 grams of sodium hydrogen phosphate and 13.3 g of sodium dihydrogen phosphate are added to 300 ml of distilled water? What is the molarity of phosphate ion in this buffer?
33. How many grams of sodium hydrogen phosphate and sodium dihydrogen phosphate are needed to make 300 mL of a 0.13 M phosphate buffer with a pH of 7.0.
34. How many grams of sodium hydrogen phosphate and sodium dihydrogen phosphate are needed to make 200 mL of a 0.15 M phosphate buffer with a pH of 7.4.
35. How many grams of sodium hydrogen phosphate and sodium dihydrogen phosphate are needed to make a liter of 0.16 M phosphate buffer with a pH of 6.8.

What is the major species? Structures must be correct, show one correct resonance form for each.
36. At pH 3 draw the form of phosphate that predominates.
37. At pH 7 draw the form of acetic acid that predominates.
38. At pH 5 draw the form of acetic acid that predominates.
39. At pH 14 draw the form of phosphate that predominates.
40. At pH 0 draw the form of phosphate that predominates.

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Neatly write in your answers on this sheet. Attach this sheet to the pages that show all of your work.

Answer, including units Type of Question and Equation used

Problem Number	Answer, including units, when appropriate	Type of Question	Equation(s) used
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