Dougherty Valley HS Chemistry - AP
Acid Base – Extra Practice

Worksheet #6*

Name: **Period:** **Seat#:**

Directions: Any worksheet that is labeled with an * means it is suggested extra practice. We do not always have time to assign every possible worksheet that would be good practice for you to do. You can do this worksheet when you have extra time, when you finish something early, or to help you study for a quiz or a test. If and when you choose to do this Extra Practice worksheet, please do the work on binder paper. You will include this paper stapled into your Rainbow Packet when you turn it in, even if you didn't do any of this. We want to make sure we keep it where it belongs so you can do it later if you want to (or need to). If you did the work on binder paper you can include that in your Rainbow Packet after this worksheet. If we end up with extra class time then portions of this may turn into required work. If that happens you will be told which problems are turned into required. Remember there is tons of other extra practice on the class website…and the entire internet! See me if you need help finding practice on a topic you are struggling with.

$$pK_a = -\log(K_a) \qquad K_a = \frac{[H^+][A^-]}{[HA]} \qquad [H^+] = \frac{K_a[A^-]}{[HA]}$$

$$pH = pK_a + log\left(\frac{[salt\ form]}{[acid\ form]}\right) \qquad pOH = pK_b + log\left(\frac{[salt\ form]}{[base\ form]}\right)$$

Some Ka and Kb values to use for these problems

Remember the values can be slightly different so always use the ones given to you. Sometimes the values are even made up by random number generating function in the problem generator! Also remember these problems are annoying because a tiny bit of rounding somewhere can make your answer look pretty different!

Acetic acid	Ka = 1.8×10^{-5}
Anisic acid	Ka = 3.8×10^{-5}
Ammonia	Kb = 1.77×10^{-5}
Nicotine (a base)	Ka = 3.16×10^{-9}
Methylamine	Kb = 4.38×10^{-4}

1) A buffer is prepared containing 0.800 M acetic acid and 1.00 M sodium acetate. What is its pH? *4.849*

2) A buffer is prepared containing 0.700 M anisic acid and 0.300 M sodium anisate. What is its pH? *4.103*

3) A buffer is prepared containing 1.00 M nicotine and 1.00 M nicotine hydrochloride. What is its pH? *8.50*

4) Aspirin has a pKa of 3.4.
What is the ratio of A^- to HA in:

- **a.** the blood (pH = 7.4) *10^4 = 10000 = $[A^-]/[HA]$*
- **b.** the stomach (pH = 1.4) *10^{-2} = 0.01 = $[A^-]/[HA]$*

***General comment about the solutions**: You have to find the ratio between A^- and HA so the concentrations are not needed*

5) A solution containing 50.00 mL of 0.1800 M NH_3 ($K_b = 1.77 \times 10^{-5}$) is being titrated with 0.3600 M HCl. Calculate the pH:

- **a.** initially *11.252*
- **b.** After the addition of 5.00 mL of HCl *9.850*
- **c.** After the addition of a total volume of 12.50 mL HCl *9.248*
- **d.** After the addition of a total volume of 25.00 mL of HCl *5.084*
- **e.** After the addition of 26.00 mL of HCl *2.324*

6) Calculate the ratio of CH_3NH_2 to CH_3NH_3Cl required to create a buffer with pH = 10.14 *base/acid ratio = 0.313*

7) A buffer is prepared containing 1.00 molar anisic acid and 1.00 molar sodium anisate. What is its pH? *4.471*

8) A buffer is prepared containing 0.800 molar ammonia and 1.00 molar ammonium chloride. What is its pH? *9.151*

9) A buffer is prepared containing 0.700 molar nicotine and 0.300 molar nicotine hydrochloride. What is its pH? *8.389*

10) You need to produce a buffer solution that has a pH of 5.27. You already have a solution that contains 10.0 mmol (millimoles) of acetic acid. How many millimoles of sodium acetate will you need to add to this solution? The pK_a of acetic acid is 4.75. *33.1 millimoles of sodium acetate*

11) 1.00 L of a solution containing 0.0500 mole of HAc and 0.100 mole of NaAc is prepared. Ignore the autoionization of water for the purposes of this problem - for part B only. The K_a of HAc equals 1.77 x 10^{-5}

- **a.** Calculate the numerical value of the reaction quotient, Q for the initial condition. *$Q_a = 2.00 \times 10^{-7}$*
- **b.** Which way will the reaction shift?
- **c.** Calculate to 3 significant digits the pH of this solution *pH = 5.053*

12) Fifty percent of a weak acid is in an ionized form in a solution with pH of 5.000, what is the pKa value for the weak acid? *pH = pKa*