Chapter 17 Worksheet 1 (Buffers)

Name: UGA ID:

Instructions:

- Please enter your first and last name as it appears on the eLC roster (do not use a nickname).
- Your UGA myID is a combination of letters and numbers (example: mine is wpe28548). **Do not use your 81x number.**
- If you do not have a printer, type your answers in the then upload the worksheet template to Gradescope by Friday, April 2 at 11:59 pm. Write your work on separate sheets of paper, convert to a PDF and upload to eLC.
- If you have a printer download the worksheet, convert it to a PDF and upload to Gradescope by Friday, April 2 at 11:59 pm. You do not need to upload anything to eLC.

1. Which of these solutions **does not** contain a conjugate acid/base pair?

a. 0.10 M NaCN/0.02 M HCN

b. 1.00 M NH_3/0.50 M NH_4Cl

c. 0.50 M HNO_3/0.10 M $LiNO_2$

2. Is the reaction between HF and NH_3 (A) reactant or (B) product favored?

K_a HF = 3.5×10^{-4}

K_b NH_3 = 1.8×10^{-5}

Show your work!

3. Which conjugate acid/base pair could be used to create a pH 3.20 buffer solution with the largest possible buffer capacity?

A. Sulfurous acid/sodium bisulfite pKa=1.92

B. Hydrofluoric acid/sodium fluoride pKa=3.14

C. Nitrous acid/sodium nitrite pKa=3.34

D. Benzoic acid/sodium benzoate pKa=4.20

E. Acetic acid/sodium acetate pKa=4.74

4. Solutions of which of the following compounds could be used to make a buffer solution with sodium dihydrogen phosphate?

A. Phosphoric Acid

B. Hydrochloric acid

C. Sodium hydrogen phosphate

D. Sodium hydroxide

E. Potassium Acetate

5. When each pair of solutions is mixed, which one will not be a buffer?

a. 10.0 mL of 0.1 M NaCN mixed with 5.00 mL of 0.1 M HCl

b. 5.0 mL of 0.1 M NaCN mixed with 5.0 mL of 0.1 M HBr

c. 20.0 mL of 0.2 M NaCN mixed with 25.00 mL of 0.1 M HI

6. What is the pH of a 0.056 *M* acetic acid solution? pKa = 4.74.

What is the pH of a 0.00001 *M* HCl solution?

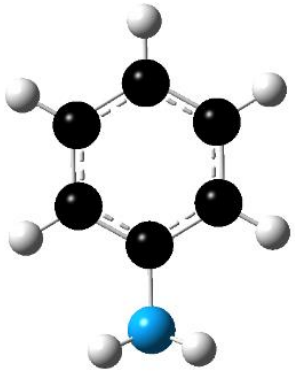
7. A buffer solution containing equimolar amounts of the base, aniline, and the salt of its conjugate acid, aniline hydrochloride, will result in an acidic buffer solution.

A. True

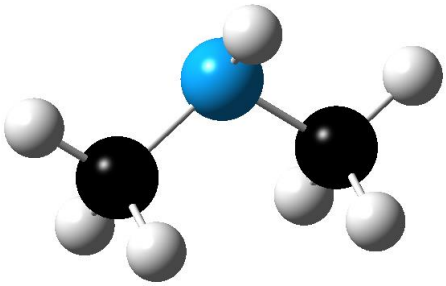
B. False

aniline

$K_b = 4.3 \times 10^{-10}$



8. What is the pH of a buffer solution composed of equimolar amounts of dimethylamine and dimethylammonium chloride? dimethylamine, $K_b = 5.4x10^{-4}$



A. 3.27

B. 4.73

C. 7.00

D. 10.73

E. 14.00

9. A comic book villain is holding you at gun point and is making you drink a sample of acid. He gives you a beaker with 100 mL of a strong acid with pH=5. He also gives you a beaker of a strong base with a pH=10. You can add as much of the strong base to the strong acid as you want, and you must then drink the solution. You'd be best off trying to make the solution neutral before drinking it. How much of the base should you add?

A. 1 mL

B.10 mL

C.100 mL

D.1000 mL

10. Consider a solution that initially contains 0.40 mol fluoride anion and 0.30 mol of hydrogen fluoride. If 0.40 mol of HCl are added to this solution, which of the following statements is **FALSE**?

A. You will still have a buffer solution at the end, since you'll still have significant amounts of both weak base and conjugate weak acid

B. The pH will have shifted to a lower pH

C. You'll essentially have a weak acid solution situation, with 0.7 mol HF at the end.

D. You will no longer have a buffer solution, since all of the weak base will have reacted with the HCl. The buffer capacity was exhausted.

E. none of the above

11. When these substances are mixed, each in 1 liter of water, which would give a basic pH at the end?

A. 1 mole of KOH and 1 mole of HF

B. 1.0 mole of KOH and 1.0 mole of HCl

C. 1 mole of HCl and 1 mole of NH_3

D. 0.5 mole of KOH and 1.0 mole of HCl

12. What reaction occurs as a hydrochloric acid solution is added to a solution containing equal concentrations of acetic acid and sodium acetate?

A. $CH_3COOH + H^+ \leftrightharpoons CH_3COOH_2^+$

B. $2\ CH_3COO^- + 2\ H^+ \leftrightharpoons CH_3COO + H_2$

C. $CH_3COO^- + H^+ \leftrightharpoons CH_3COOH$

D. $CH_3COOH + H^+ \leftrightharpoons CH_3CO^+ + H_2O$

E. $CH_3COOH + HCl \leftrightharpoons CH_3COO^- + H_2Cl^+$