# HW04 - Acid/Base Part 2

1 1.5 points

Aqueous ammonia can be used to neutralize sulfuric acid and nitric acid to produce two salts extensively used as fertilizers. They are...

- $(NH_4)_2SO_4$ and $NH_4NO_3$, respectively
- cyanamide and cellulose nitrate, respectively
- $NH_4SO_3$ and $NH_4OH$, respectively
- $NH_4SO_4$ and $NH_4NO_3$, respectively

2 1.5 points

What is the pH of an aqueous solution that is 0.018 M $C_6H_5NH_2$ ($K_b = 4.3 \times 10^{-10}$) and 0.12 M $C_6H_5NH_3Cl$?

- 2.87
- 4.63
- 5.46
- 3.81
- 4.02

3 1.5 points

A buffer solution is made by dissolving 0.45 moles of a weak acid (HA) and 0.33 moles of KOH into 710 mL of solution. What is the pH of this buffer? $K_a = 6 \times 10^{-6}$ for HA.

- 4.78
- 8.34
- 5.66
- 13.23
- 5.22

4 1 point

Which one of the following combinations is NOT a buffer solution?

- HBr and KBr
- HCN and NaCN
- $CH_3COOH$ and $NaCH_3COO$
- $NH_3$ and $(NH_4)_2SO_4$

5 1 point

Which of the following mixtures will be a buffer when dissolved in a liter of water?

- 0.1 mol $Ca(OH)_2$ and 0.3 mol HI
- 0.3 mol NaCl and 0.3 mol HCl
- 0.2 mol HF and 0.1 mol NaOH
- 0.2 mol HBr and 0.1 mol NaOH

6 1.5 points

What is the pH of a solution which is 0.600 M in dimethylamine ($(CH_3)_2NH$) and 0.400 M in dimethylamine hydrochloride ($(CH_3)_2NH_2Cl$)? $K_b$ for dimethylamine = $7.4 \times 10^{-4}$.

- 11.21
- 10.87
- 10.78
- 11.05
- 10.69

7 1.5 points

What would be the final pH if 0.0100 moles of solid NaOH were added to 100mL of a buffer solution containing 0.600 molar formic acid (ionization constant = $1.8 \times 10^{-4}$) and 0.300 M sodium formate?

- 4.05
- 3.65
- 3.84
- 3.44

8 1.5 points

A buffer was prepared by mixing 0.200 moles of ammonia ($K_b = 1.8 \times 10^{-5}$) and 0.200 moles of ammonium chloride to form an aqueous solution with a total volume of 500 mL. 250 mL of the buffer was added to 50.0 mL of 1.00 M HCl. What is the pH of this second solution?

- 8.38
- 8.53
- 8.78
- 9.26
- 9.73
- 8.18

9 1.5 points

A solution is 0.30 M in $NH_3$. What concentration of $NH_4Cl$ would be required to achieve a buffer solution with a final pH of 9.0? $K_b = 1.8 \times 10^{-5}$ for $NH_3$.

- 0.32 M
- 0.45 M
- 0.17 M
- 0.54 M
- 0.10 M

10 1.5 points

Blood contains a buffer of carbonic acid ($H_2CO_3$) and hydrogen carbonate ion ($HCO_3^-$) that keeps the pH at a relatively stable 7.40. What is value of the ratio of $[HCO_3^-]/[H_2CO_3]$ in blood?

$K_{a1} = 4.30 \times 10^{-7}$ for $H_2CO_3$. (Hint: $[CO_3^{2-}] \cong 0$)

- $3.98 \times 10^{-8}$
- 0.0926
- $1.71 \times 10^{-14}$
- 10.8

11 1.5 points

Before you answer this one, PLEASE view and read the gchem section on indicators .

The un-ionized form of an acid indicator is blue and its anion is yellow. The $K_a$ of this indicator is $10^{-5}$. What will be the color of the indicator in a solution of pH 3.0 ?

- yellow-green
- blue
- green
- yellow
- blue-green

12 1.5 points

What is the pH at the half-stoichiometric point for the titration of 0.22 M $HNO_2$ (aq) with 0.10 M KOH(aq)? $K_a$ for $HNO_2$ = $4.3 \times 10^{-4}$

- ◯ 2.01
- ◯ 2.31
- ◯ 7.00
- ◯ 3.37

13 1.5 points

For the titration of 50.0 mL of 0.020 M aqueous salicylic acid with 0.020 M KOH (aq), calculate the pH after the addition of 55.0 mL of the base. For salicylic acid, $pK_a$ = 2.97

- ◯ 11.26
- ◯ 11.02
- ◯ 7.00
- ◯ 10.98

14 1.5 points

Consider the titration of 50.0 mL of 0.0200 M HClO(aq) with 0.100 M NaOH(aq). What is the formula of the main species in the solution after the addition of 10.0 mL of base?

- ◯ $ClO_2$
- ◯ HClO
- ◯ $ClO^-$
- ◯ NaOH

15 1.5 points

50.0 mL of 0.0018 M aniline (a weak base) is titrated with 0.0048 M $HNO_3$. How many mL of the acid are required to reach the equivalence point?

- ◯ This is a bad titration as $HNO_3$ is not a strong acid.
- ◯ 4.21 mL
- ◯ 133.33 mL
- ◯ 18.75 mL
- ◯ 25.55 mL

16 1 point

When we titrate a weak base with a strong acid, the pH at the equivalence point will be...

- ◯ pH > 7
- ◯ pH = 0
- ◯ pH < 7
- ◯ It is impossible to know unless we are given the $K_b$ of the weak base.

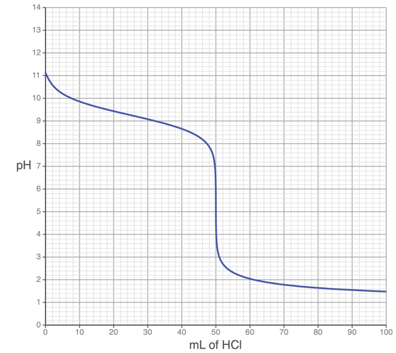
17 1.5 points

What is the pH at the equivalence point in the titration of 10.0 mL of 0.35 M HZ ($K_a$ = $2.4 \times 10^{-7}$) with 0.200 M NaOH?

- ◯ 4.14
- ◯ 9.86
- ◯ 7.00
- ◯ 10.1

18 1.5 points

What is the pH at the equivalence point of the titration pictures below?




- ◯ 5
- ◯ 9
- ◯ 8
- ◯ 2

19 1.5 points

Look at the titration diagram in the question above. What type of titration is occurring?

- ◯ a weak base titrated with a weak acid
- ◯ a strong base titrated with a strong acid
- ◯ a strong base titrated with a weak acid
- ◯ a weak base titrated with a strong acid

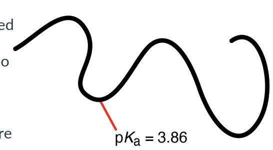
20 1.5 points

The acid form of an indicator is yellow and its anion is red. The $K_a$ of this indicator is $10^{-6}$. What will be the approximate pH range over which this indicator changes color?

- ◯ 4 < pH < 6
- ◯ 4 < pH < 9
- ◯ 5 < pH < 7
- ◯ 6 < pH < 8

21 1.5 points

Aspartic acid is an amino acid which is one of many used as the building blocks of polypeptide chains. Polypeptide chains in the body are proteins. Each amino acid is unique in their side-chains which can be acidic, basic, polar, or non-polar. Aspartic acid's side chain is acidic - it's a carboxylic acid with a $pK_a$= 3.86. Let's assume we have a protein dissolved in water and we are focusing only on the aspartic acid part. The diagram here shows a long protein chain (the black curvy line) with the aspartic acid residue highlighted with its $pK_a$ value.




What is the **charge** on this aspartic acid side chain in a solution with a neutral pH?

- ◯ positive
- ◯ there is no way to know
- ◯ negative
- ◯ neutral