HW05 - Buffers, Titrations, and Polyprotics

Started: Oct 21 at 9:54am

Quiz Instructions

Question 1	1 pts

When an acid and base neutralize each other, the products are generally water and...

○ a colloid.

○ a salt.

○ a gel.

○ an ion.

Question 2	1 pts

How many moles of $Ca(OH)_2$ are needed to neutralize three moles of HCl?
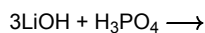
○ 2

○ 1.5

○ 3

○ 1

Question 3	1 pts

An aqueous solution is prepared with 2 moles of HCl and 1 mole of $Ca(OH)_2$. The resulting solution contains mainly...

○ water, Cl^- ions, H^+ ions, and Ca^{2+} ions.

○ water, Cl^- ions, H^+ ions, OH^- ions, and Ca^{2+} ions.

○ water, Cl^- ions, OH^- ions, and Ca^{2+} ions.
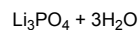
○ water, Cl^- ions, and Ca^{2+} ions.

Question 4	1 pts

Identify the products of the following chemical reaction:

$3LiOH + H_3PO_4 \longrightarrow$

○

$Li_3PO_4 + 3H_2O$

○ $Li_3P + 2H_2O + H_3O_5$

○ $3H^+ + 3O_2 + H_3Li_3$

○ $3LiH + (OH)_3PO_4$

Question 5

1 pts

Identify the products of the following chemical reaction:

$Sr(OH)_2 + 2HNO_3 \longrightarrow$
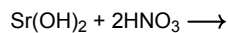
○ $SrNO_3 + H_2O$

○ $SrH_2 + HNO_5$

○ $Sr(NO_3)_2 + 2H_2O$

○ $Sr(NO_2)_2 + 2H_2O_2$

Question 6

1 pts

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

○ NH_4SO_4 and NH_4NO_3, respectively

○ $(NH_4)_2SO_4$ and NH_4NO_3, respectively

○ NH_4SO_3 and NH_4OH, respetively

○ cyanamide and cellulose nitrate, respectively

Question 7

1 pts

Identify the salt that is produced from the acid-base neutralization reaction between potassium hydroxide and acetic acid.

○ potassium formate

○ potassium cyanide

○ potassium amide

○ potassium acetate

Question 8

1 pts

What is the pH of an aqueous solution that is 0.018 M $C_6H_5NH_2$ (K_b = 4.3x10^{-10}) and 0.12 M $C_6H_5NH_3Cl$?

○ 3.81

○ 4.02

○ 2.87

○ 4.63

Question 9   1 pts

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.

○ 8.34

○ 13.23

○ 5.66

○ 5.22

Question 10   1 pts

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

○ HCN and NaCN

○ CH_3COOH and $NaCH_3COO$

○ HBr and KBr

○ NH_3 and $(NH_4)_2SO_4$

Question 11   1 pts

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

○ 0.3 mol NaCl and 0.3 mol HCl

○ 0.1 mol $Ca(OH)_2$ and 0.3 mol HI

○ 0.2 mol HF and 0.1 mol NaOH

○ 0.2 mol HBr and 0.1 mol NaOH

Question 12   1 pts

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 $= 7.4 \times 10^{-4}$.

○ 10.87

○ 11.21

○ 11.05

○ 10.78

Question 13   1 pts

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 = 1.8×10^{-4}) and 0.300 M sodium formate?

○ 3.44

○ 4.05

○ 3.84

○ 3.65

Question 14   1 pts

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?

○ 8.53

○ 8.18

○ 8.38

○ 8.78

Question 15   1 pts

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

○ 0.10 M

○ 0.45 M

○ 0.54 M

Question 16   1 pts

What is the pH at the half-stoichiometric point for the titration of 0.22 M HNO_2(aq) with 0.1 M KOH(aq)? For HNO_2, $K_a = 4.3 \times 10^{-4}$.

○ 3.37

○ 2.01

○ 2.31

○ 7.00

Question 17

1 pts

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

○ 7.00

○ 11.02

○ 10.98

Question 18

1 pts

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?

○ NaOH

○ ClO_2

○ HClO

○ ClO^-

Question 19

1 pts

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.

○ 133 mL

○ 18.8 mL

○ 4.21 mL

Question 20

1 pts

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

○ pH < 7

○ It is impossible to know unless we are given the K_b of the weak base.

○ pH = 0

○ pH > 7

Question 21

1 pts

What is the pH at the equivalence point in the titration of 10.0 mL of 0.35 M unknown acid HZ with 0.200 M NaOH? $K_a = 2.4\times10^{-7}$ for the unknown acid HZ
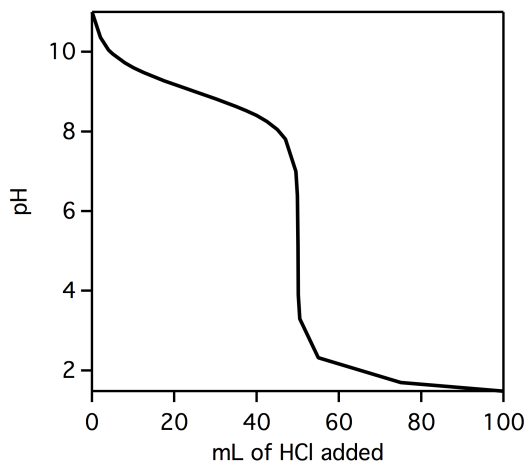
○ 10.1

○ 7.00

○ 9.86

○ 4.14

Question 22

1 pts

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

○ 5

○ 8

○ 9

○ 2

Question 23

1 pts

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

○ a weak base titrated with a strong acid

○ a strong base titrated with a strong acid

○ a strong base titrated with a weak acid

○ a weak base titrated with a weak acid

Question 24   1 pts

The acid form of an indicator is yellow and its anion is blue. The K_a of this indicator is 10^{-5}. What will be the approximate pH range over which this indicator changes color?

○ 4 < pH < 6

○ 3 < pH < 5

○ 5 < pH < 7

○ 6 < pH < 8

Question 25   1 pts

The unionized form of an acid indicator is yellow and its anion is blue. The K_a of this indicator is 10^{-5}. What will be the color of the indicator in a solution of pH 3?

○ blue

○ orange

○ yellow

○ green

Question 26   2 pts

Aspartic acid is a polypeptide side chain found in proteins. The pK_a of aspartic acid is 3.86. If this polypeptide were in an aqueous solution with a pH of 7, the side chain would have what charge?

○ negative

○ positive

○ neutral

○ there is no way to know

Question 27   1 pts

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 the ratio of $[HCO_3^-] / [H_2CO_3]$ in blood? $K_{a1} = 4.30 \times 10^{-7}$ for H_2CO_3. (Hint: Assume $[CO_3^{2-}] = 0$)

○ 0.0926

○ 10.8

○ 1.71 x 10^{-14}

○ 3.98 x 10^{-8}

Question 28

2 pts

H_2SO_4 is a strong acid because the first proton ionizes 100%. The K_a of the second proton is 1.1×10^{-2}. What would be the pH of a solution that is 0.100 M H_2SO_4? Account for the ionization of both protons.

○ 0.963

○ 2.05

○ 1.00

○ 0.955

Not saved   Submit Quiz