This print-out should have 20 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 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 $C_6H_5NH_3Cl$?

1. 4.63

2. 3.81

3. 9.37

4. 5.46

5. 8.54

6. 10.19

7. 4.02

8. 2.87

002 10.0 points

A buffer solution is made by dissolving 0.45 moles of a weak acid (HA) and 0.23 moles of KOH into 750 mL of solution. What is the pH of this buffer? $K_a = 2.6 \times 10^{-6}$ for HA.

Answer in units of pH

003 10.0 points

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

1. HCN and NaCN

2. NH_3 and $(NH_4)_2SO_4$

3. CH_3COOH and $NaCH_3COO$

4. HBr and KBr

5. NH_3 and NH_4Br

004 10.0 points

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

1. 0.1 mol $Ca(OH)_2$ and 0.3 mol HI

2. 0.3 mol NaCl and 0.3 mol HCl

3. 0.4 mol NH_3 and 0.4 mol HCl

4. 0.2 mol HBr and 0.1 mol NaOH

5. 0.2 mol HF and 0.1 mol NaOH

005 10.0 points

What is the equilibrium pH of a solution which is initially mixed at 0.200 M in formic acid and 0.00500 M in formate ion? $K_a = 1.8 \times 10^{-4}$ for formic acid.

1. 2.14

2. None of the other answers is correct

3. 11.86

4. 4.35

5. 2.40

6. 5.34

006 10.0 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 $\left((CH_3)_2NH_2^+Cl^-\right)$? K_b for dimethylamine = 7.4×10^{-4}.

1. 11.05

2. 10.69

3. 10.78

4. 11.21

5. 2.95

6. 3.31

7. 10.87

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007 10.0 points

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

1. 3.44

2. 4.05

3. 3.84

4. None of these

5. 3.65

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008 10.0 points

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

1. 9.35

2. 8.38

3. 7.87

4. 8.53

5. 8.18

6. 8.78

7. 9.73

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009 10.0 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.

1. 0.10 M

2. 0.30 M

3. 0.45 M

4. 0.20 M

5. 0.54 M

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010 10.0 points

What is the pH at the half-stoichiometric point for the titration of 0.22 M HNO_2(aq) with 0.01 M KOH(aq)? For HNO_2, $K_a = 4.3 \times 10^{-4}$.

1. 3.37

2. 2.01

3. 7.00

4. 2.16

5. 2.31

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011 10.0 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 KOH(aq). For salycylic acid, $pK_a = 2.97$.

1. 10.98

2. 11.26

3. 12.30

4. 7.00

5. 12.02

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012 10.0 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?

1. $HClO_2$

2. ClO_2

3. ClOH

4. NaOH

5. ClO^-

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013 10.0 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?

1. 133 mL

2. 18.8 mL

3. Need to know the K_b of aniline.

4. Bad titration since HNO_3 is not a strong acid.

5. 4.21 mL

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014 10.0 points

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

1. pH > 7.

2. pH < 7.

3. pH $= 7$.

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015 10.0 points

What is the pH at the equivalence point in the titration of 10.0 mL of 0.31 M HZ with 0.200 M NaOH? $K_a = 3.4 \times 10^{-7}$ for HZ.

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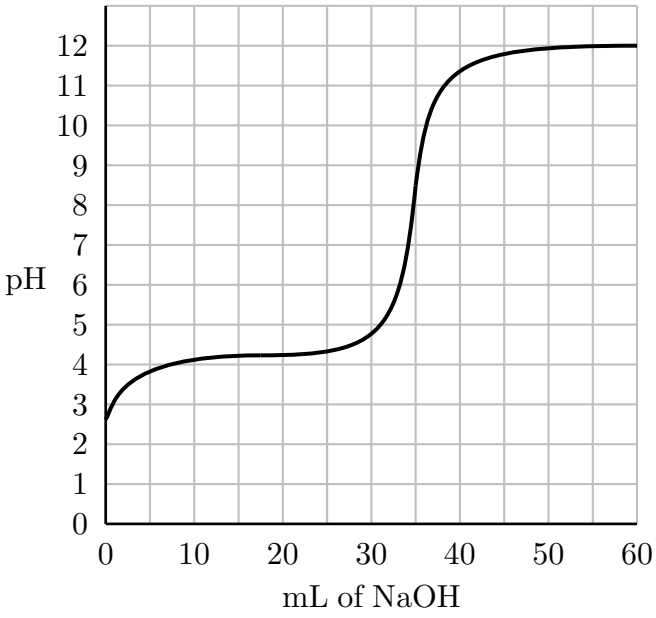
016 (part 1 of 2) 10.0 points

Titration Curve



What is the pH at the equivalence point of this titration?

1. 4.23

2. 8.49

3. 6.36

4. 10.25

5. 2.62

6. 5.08

7. 3.43

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017 (part 2 of 2) 10.0 points

What is the pK_a of this acid?

1. 6.36

2. 3.43

3. 5.08

4. 10.25

5. 2.62

6. 8.49

7. 4.23

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018 10.0 points

The acid form of an indicator is yellow and its anion is blue. The K_a of this indicator is 1×10^{-5}. What will be the approximate pH range over which this indicator changes color?

1. $9 < \text{pH} < 11$

2. $5 < \text{pH} < 7$

3. $4 < \text{pH} < 6$

4. $8 < \text{pH} < 10$

5. $3 < \text{pH} < 5$

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019 10.0 points

The un-ionized 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?

1. green

2. red

3. blue

4. yellow

5. orange

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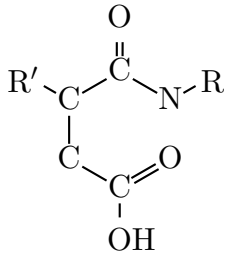
020 10.0 points



This is a structure of an aspartic acid sidechain on a polypeptide. The pK_a of aspartic acid is 3.86. If this polypeptide were in an aqueous solution with a pH of 7, the sidechain would have what charge?

1. negative

2. neutral

3. positive

4. no way to know