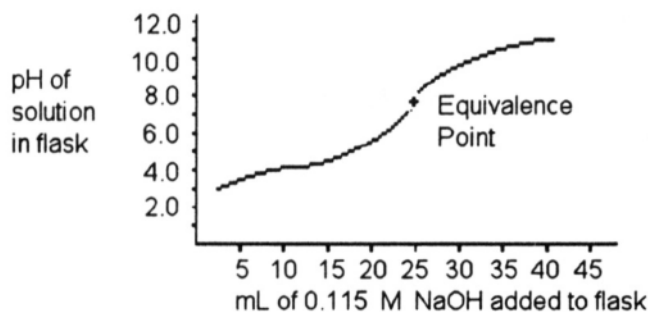


1) Which one of the following pairs cannot be mixed together to form a buffer solution?
 A) HONH_2 , HONH_3Cl B) NaCl , HCl C) RbOH , HF D) KOH , HNO_2
 E) H_2SO_3 , KHSO_3

2) Of the following solutions, which has the greatest buffering capacity?
 A) 0.821 M HF and 0.217 M NaF B) 0.821 M HF and 0.909 M NaF
 C) 0.100 M HF and 0.217 M NaF D) 0.121 M HF and 0.667 M NaF

3) The addition of hydrochloric acid and _____ to water can produce a buffer solution.
 A) $\text{HC}_6\text{H}_5\text{O}$ B) NaOH C) NH_3 D) HNO_3 E) NaNO_3

4) The addition of sodium hydroxide and _____ to water produces a buffer solution.
 A) HCl B) $\text{NaC}_2\text{H}_3\text{O}_2$ C) NaF D) NH_3 E) none of the above



5) A 25.0 mL sample of a solution of an unknown compound is titrated with a 0.115 M NaOH solution. The titration curve above was obtained. The unknown compound is _____.

A) a strong acid B) a strong base C) a weak acid D) a weak base
 E) neither an acid nor a base

Consider the following table of K_{sp} values.

Name	Formula	K_{sp}
Cadmium carbonate	CdCO_3	5.2×10^{-12}
Cadmium hydroxide	$\text{Cd}(\text{OH})_2$	2.5×10^{-14}
Calcium fluoride	CaF_2	3.9×10^{-11}
Silver iodide	AgI	8.3×10^{-17}
Zinc carbonate	ZnCO_3	1.4×10^{-11}

6) Which compound listed below has the greatest molar solubility in water?
 A) CdCO_3 B) $\text{Cd}(\text{OH})_2$ C) AgI D) CaF_2 E) ZnCO_3

7) In which of the following aqueous solutions would you expect AgCl to have the lowest solubility?

- A) pure water B) 0.020 M BaCl₂ C) 0.015 NaCl D) 0.020 AgNO₃
E) 0.020 KCl

8) The K_a of benzoic acid is 6.30×10^{-5} . The pH of a buffer prepared by combining 50.0 mL of 1.00 M potassium benzoate and 50.0 mL of 1.00 M benzoic acid is _____.

- A) 1.705 B) 0.851 C) 3.406 D) 4.201 E) 2.383

9) Calculate the pH of a solution prepared by dissolving 0.150 mol of acetic acid and 0.300 mol of sodium acetate in water sufficient to yield 1.00 L of solution. The K_a of acetic acid is 1.76×10^{-5} .

- A) 2.516 B) 3.892 C) 4.502 D) 10.158 E) 5.056

10) The pH of a solution prepared by dissolving 0.350 mol of solid methylamine hydrochloride (CH₃NH₃Cl) in 1.00 L of 1.10 M methylamine (CH₃NH₂) is _____.

The K_b for methylamine is 4.40×10^{-4} .

- A) 1.66 B) 2.86 C) 10.28 D) 11.14 E) 10.61

11) A 25.0 mL sample of 0.723 M HClO₄ is titrated with a 0.27 M KOH solution. The H₃O⁺ concentration after the addition of 80.0 mL of KOH is _____ M.

- A) 0.4 B) 1×10^{-7} C) 0.7 D) 3×10^{-13} E) 4×10^{-2}

12) The pH of a solution prepared by mixing 50.0 mL of 0.125 M KOH and 50.0 mL of 0.125 M HCl is _____. A) 6.29 B) 7.00 C) 8.11 D) 5.78 E) 0.00

13) The concentration of iodide ions in a saturated solution of lead (II) iodide is _____ M. The solubility product constant of PbI₂ is 1.4×10^{-8} .

- A) 3.8×10^{-4} B) 3.0×10^{-3} C) 1.5×10^{-3} D) 3.5×10^{-9} E) 1.4×10^{-8}

14) The solubility of lead (II) chloride (PbCl₂) is 1.6×10^{-2} M. What is the K_{sp} of PbCl₂? A) 5.0×10^{-4} B) 4.1×10^{-6} C) 3.1×10^{-7} D) 1.6×10^{-5} E) 1.6×10^{-2}

15) Calculate the maximum concentration (in M) of silver ions (Ag⁺) in a solution that contains 0.025 M of CO₃²⁻. The K_{sp} of Ag₂CO₃ is 8.1×10^{-12} .

- A) 1.8×10^{-5} B) 1.4×10^{-6} C) 2.8×10^{-6} D) 3.2×10^{-10} E) 8.1×10^{-12}

16) Calculate the percent ionization of formic acid (HCO₂H) in a solution that is 0.219 M in formic acid. The K_a of formic acid is 1.77×10^{-4} .

- A) 3.94×10^{-5} B) 0.0180 C) 2.84 D) 0.280 E) 12.2

17) Calculate the pH of a solution that is 0.210 M in nitrous acid (HNO_2) and 0.290 M in potassium nitrite (KNO_2). The acid dissociation constant of nitrous acid is 4.50×10^{-4} .
A) 3.487 B) 3.210 C) 13.86 D) 10.51 E) 4.562

18) Consider a solution containing 0.100 M fluoride ions and 0.126 M hydrogen fluoride. The concentration of fluoride ions after the addition of 4.00 mL of 0.0100 M HCl to 25.0 mL of this solution is _____ M. (DIFFICULT!)
A) 0.0862 B) 0.0876 C) 0.0980 D) 0.0848 E) 0.00253

19) Calculate the pH of a solution prepared by dissolving 0.850 mol of NH_3 and 0.350 mol of NH_4Cl in water sufficient to yield 1.00 L of solution. The K_b of ammonia is 1.77×10^{-5} .
A) 5.137 B) 4.367 C) 9.633 D) 8.781 E) 8.863

20) A 25.0 mL sample of 0.150 M hydrazoic acid is titrated with a 0.150 M NaOH solution. What is the pH at the equivalence point?
The K_a of hydrazoic acid is 4.50×10^{-4} .
A) 11.72 B) 9.28 C) 4.72 D) 7.00 E) 8.80

21) A 25.0-mL sample of 0.150 M butanoic acid is titrated with a 0.150 M NaOH solution. What is the pH before any base is added? The K_a of butanoic acid is 1.5×10^{-5} .
A) 2.83 B) 1.5×10^{-3}
C) 4.82 D) 4.00
E) 1.0×10^4

22) A 25.0 mL sample of 0.150 M hypochlorous acid is titrated with a 0.150 M NaOH solution. What is the pH after 26.0 mL of base is added? The K_a of hypochlorous acid is 3.0×10^{-8} .
A) 2.54
B) 11.47
C) 7.00
D) 7.51
E) 7.54

23) A 25.0-mL sample of 0.150 M hydrazoic acid is titrated with a 0.150 M NaOH solution. What is the pH after 13.3 mL of base is added?
The K_a of hydrazoic acid is 1.9×10^{-5} .
A) 4.45
B) 1.34
C) 3.03
D) 4.78
E) 4.66

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