Acid-Base and Buffers Conceptual Questions

Concentration (M)	pH of Acid 1	pH of Acid 2	pH of Acid 3	pH of Acid 4
0.010	3.44	2.00	2.92	2.20
0.050	3.09	1.30	2.58	1.73
0.10	2.94	1.00	2.42	1.55
0.50	2.69	0.30	2.08	1.16
1.00	2.44	0.00	1.92	0.98

1) The table above shows the acids of, in no order, chlorous, hydrochloric, lactic, and propanoic acid.

a) Which acid would have the smallest K_a?

b) Which of the four acids listed is Hydrochloric Acid?

c) In the dissociation of 1.0 M solution of acid 1, what species is the most concentrated at equilibrium?

d) If equal volumes of the acids at a concentration of 1.00 M are titrated with a strong base, which will require the greatest volume of base to reach the equivalence point?

2) As the concentration of a weak acid increases, its percent dissociation (increases/decreases/stays the same) and the pH (increases/decreases/stays the same)

3) Which of the following ions will act as a weak base in water?

A) ClO^- B) Cl^- C) NO_3^- D) OH^-

4) Will the following salts form a solution that is acidic, basic, or pH-neutral?

$FeCl_3$ NaF $CaBr_2$ NH_4Br $C_6H_5N_3NO_2$

5) Rank by strength of acid: NaCl, $NaHCO_3$, NH_4Cl, NH_4ClO, NaOH, KOH

6) James adds some solid sodium acetate, $NaC_2H_3O_2$, to aqueous $HC_2H_3O_2$. What will happen to the pH?

HA and HB are both weak acids in water, and HA is a stronger acid than HB. Which of the following correctly ranks the strength of the bases starting with the strongest?

a. $A^- > B^- > H_2O > Cl^-$

b. $B^- > A^- > H_2O > Cl^-$

c. $B^- > A^- > Cl^- > H_2O$

d. $A^- > B^- > Cl^- > H_2O$

7) True or False:

BrO_3^- is a weaker base than BrO_4^-

H_2O is a stronger acid than H_2S

CH_4 is a weaker acid than HF

an aqueous solution of CH_3NH_3Cl is acidic

an aqueous solution of $Cu(ClO_4)_2$ is basic

an aqueous solution of $(CH_3)_3NHNO_2$ is acidic

8) Which is a stronger base? S^{2-} vs Se^{2-} and PO_4^{3-} vs AsO_4^{3-}

9) Which of the anions below would be the strongest base?

$C_7H_5O_2^-$ I^- NO_3^- F^- Cl^-

10) Alex wants to create a buffer for NaF. Which will be the best choice for a buffer solution for this compound?

NaF HCl $K(C_2H_3O_2)$ NH_3 NaOH

11) Given equal volumes of 0.10M HCl and another compound, which will produce a buffer solution?

0.05M NaOH 0.05M NH_4Cl 0.20M NaCl 0.10M NH_3 0.20M CH_3COOH

12) James has a phosphate buffer ($H_2PO_4^-/HPO_4^{2-}$) and records a pH of 8.3. Which of the following will cause the pH of this buffer to increase?

I. Adding a small amount of dilute hydrochloric acid, HCl
II. Adding a small amount of dilute phosphoric acid, H_3PO_4
III. Dissolving a small amount of disodium phosphate, Na_2HPO_4
IV. Dissolving a small amount of monosodium phosphate, NaH_2PO_4
V. Making it more concentrated by removing some water

13) James is having acid reflux, and so Parker suggests he ingests bleach to neutralize stomach acid. If concentrated chlorine bleach has a pH of 13, what is the ratio of concentration of hydronium ions of bleach to that of pure water at room temperature?

14) Phosphate, H_3PO_4 is present in cells. What is the predominant form of phosphate in cells if at a physiological pH of 7.0? pKa_1=2.1 pKa_2=7.21 pKa_3= 12.87

15) Water goes through autoionization as shown below

$$2H_2O_{(l)} \rightleftharpoons H_3O^+_{(aq)} + OH^-_{(aq)}$$

The temperature is raised, and a data table is listed below:

Temperature (C)	pK_w
0	14.9
10	14.5
20	14.2
30	13.8
40	13.5

1) Based on the information, which of the following statements must be true?

a) The dissociation of water is an exothermic process
b) The pH of pure water is 7.00 at any given temperature
c) As the temperature increases the pH pf pure water increases
d) As the temperature increases, the pH of pure water decreases

General Chemistry 233 Quiz 2

Acid-Base and Buffers Calculations

(some values may need to be looked up)

1) After an experiment, Marky finds the concentration of $CO_3^{2}{}_{(aq)}$ to be 0.150M. Ka is 5.6×10^{-11}

Find the pH and pOH

2) A 25.00 mL sample of 0.320 M NaOH analyte was titrated with 0.750 M HI at 25 C.

a). Calculate the initial pH before any titrant was added.

b). Calculate the pH of the solution after 5.00 mL of the titrant was added.

3)Is a pH with a solution of 7.00 acidic, basic, or neutral for a neutral aqueous solution at 37 degrees C given that the K_w for water at this temperature if 2.4×10^{-14}?

4)Determine the pH of a solution that is 0.250 M in HCO_3^-

5)Determine the pH of 0.20 M $NaCHO_2$ solution

6)What is the pH of 2.5 M KI in solution?

General Chemistry 233 Quiz 2

7)What concentration of salt should be used to create a buffer with pH of 10.24 that uses 0.8M methylamine? CH_3NH_2

8) 80.0 mL of a buffer solution contains 0.169 M NH_3 and 0.183 M NH_4Cl. If you add 10.0 mL of 0.100 M HCl, what will be the pH? $K_b = 1.81 \times 10^{-5}$. Assume additive volumes.

9) Blood is buffered by carbonic acid, H_2CO_3 (pKa = 6.1). Assuming that the volume of blood in an adult is 5 liters, what mass of HCl can be neutralized by the buffer before the system reaches a fatal pH of below 7.0?

10)What mass of ammonium chloride should be added to 2.55 L of 0.155 M NH_3 to obtain a buffer with pH of 9.55?

11)A 1.0 liter 1.0M buffer solution (pH = 4.7) using Jamesonnium acid (JH) is mixed with another Jamesonnium buffer solution (pH = 4.55) that is 0.50 liter and 0.5 M. What is the pH of this mixture after 1.0 liter of 0.1M HA strong acid is added? Ka of Jamesonnium is 1.58×10^{-5}