

1. Fill in the blanks accordingly. (/5)

- a) In a 4.0×10^{-1} M HCl sol'n, what is
 i) $[H^+] = \dots\dots\dots$ ii) **pH** = $\dots\dots\dots$
- b) In a 1.0×10^{-3} M H_2SO_4 sol'n, what is
 i) $[H^+] = \dots\dots\dots$ ii) **pH** = $\dots\dots\dots$
- c) In a 1.0×10^{-1} M NaOH sol'n, what is
 i) $[OH^-] = \dots\dots\dots$ ii) **pOH** = $\dots\dots\dots$ **pH** = $\dots\dots\dots$
- d) In a 1.5×10^{-4} M $Ba(OH)_2$ sol'n, what is
 i) $[OH^-] = \dots\dots\dots$ ii) **pOH** = $\dots\dots\dots$ **pH** = $\dots\dots\dots$

2. a) Write the equation for the ionization of water. $\dots\dots\dots$
 b) If you add acid, does the water eq'm move left or right ? $\dots\dots\dots$
 c) What would happen to $[OH^-]$ if you add acid to water ? $\dots\dots\dots$
 d) What would happen to $[H^+]$ if you add base to water ? $\dots\dots\dots$ (/4)

3. a) A soft drink has a $[H^+] = 1.4 \times 10^{-5}$ M. What is the pH? (/1)
 b) If 38 mL of 0.002M HCl are added to 40 mL 0.0018 M NaOH, what is the pH of the mixture? (/3)
 c) a solution was made with 0.837 g $Ba(OH)_2$ in 100 mL. What is the pOH & pH of this solution? (/3)
 d) A solution of $Ca(OH)_2$ has a pH of 11.6. What is the concentration of this $Ca(OH)_2$ solution? (/2)

4. A **0.10 M** sol'n of $HC_2H_2ClO_2$ (chloroacetic acid) is **11%** ionized. What is the **Ka** for this acid? (/4)

5. a) Calculate the Ka value for an acid if the pH of a 0.05 M sol'n is 2 (/2)
 b) Calculate the Ka value for an acid if the pH of a 0.20 M sol'n is 4. (/2)

6. Codeine (a weak base) has a **Kb = 1.6×10^{-6}** . What is the **pH** of a **0.02 M** solution of codeine? (/4)

7. What is the **pH** of of a solution containing **0.15 M** $HC_2H_3O_2$ and **0.25 M** $NaC_2H_3O_2$? (/3)
 How much will this pH change if 0.05 moles of HCl is added to 1 L of this buffer? (/3)
 How much will this pH change if 50 mL 0.10 M NaOH is added to 500 mL of this buffer? (/3)

8. How many **grams** of sodium formate ($NaCOOH$) would have to be dissolved in 1.0 L of **0.12M** Formic acid ($HCOOH$) to make a buffer with a **pH = 3.80**? (/3)

9. For each i) complete the eq'n ii) identify the acid-base pairs (/10)

- a) $NH_4^+ + F^- \rightleftharpoons \dots\dots\dots$
 b) $C_6H_5COOH + CH_3COO^- \rightleftharpoons \dots\dots\dots$
 c) $H_2PO_4^- + CN^- \rightleftharpoons \dots\dots\dots$
 d) $H_2CO_3 + CO_3^{2-} \rightleftharpoons \dots\dots\dots$
 e) $CH_2ClCOOH + CCl_3COO^- \rightleftharpoons \dots\dots\dots$

10. Some people take Vitamin C (Ascorbic acid) in doses as large as 6.0 g per 250 mL. What would the pH be of this drink ? ($K_a (H_2C_6 H_6O_6) = 6.8 \times 10^{-5}$) (/4)

11. A buffer is prepared by dissolving 15.0 g of acetic acid and 25.0 g of sodium acetate in 750 mL of water.

- a) What is the pH of this buffer? (/3)
 b) What would the pH be if 25 mL of 0.40 M HCl were added to this buffer? (/3)

12. For the titration of 10.0 mL of 0.10M NH_3 with 0.10M HCl, calculate the pH:

- a) before titration (/3)
 b) with the addition of 5.0 mL of HCl (/3)
 c) at the equivalence point (/4)

13. Select an appropriate indicator for question #12. (/1)

Application Questions

15. Do question Pg 546 #15 (/10)

16. The human body uses buffer systems to regulate pH of blood and other systems. Research and explain the processes around the **one** of the following buffer systems. Be sure to include a chemical equation for the system. (5)

- Carbon dioxide system
- Carbonic acid system
- Bicarbonate system
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**** if you are ambitious, you may do them all for bonus marks. (bonus questions still worth 5 each!)**