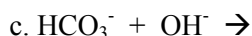
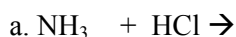


Be sure to show all your work. You will need a separate sheet for writing answers and showing work

1. Write the net ionic equation for each proton-transfer reaction using fishhook arrows to show the flow of electrons pairs in each reaction. In addition, write Lewis structures for all starting materials and products. Label the original acid and conjugate base; the original base and the conjugate acid.



2. For each pair, select the stronger acid

- Pyruvic acid (pK_a 2.49) or lactic acid (pK_a 3.85)
- Citric acid (pK_{a1} 3.08) or phosphoric acid (pK_{a1} 2.10)
- Nicotinic acid (niacin, K_a 1.4×10^{-5}) or acetylsalicylic acid (aspirin, K_a 3.3×10^{-4})
- Phenol (K_a 1.12×10^{-10}) or boric acid (K_a 7.24×10^{-10})

3. Gastric juice, a digestive fluid produced in the stomach, contains hydrochloric acid. Milk of magnesia (magnesium hydroxide) in an aqueous suspension is used to neutralize excess stomach acid. Write a complete balanced chemical equation for the neutralization reaction, and identify the acid-base pairs.

4. The ionization product of water is dependent upon temperature. The K_w value @ 60 °C is 9.614×10^{-14} . Calculate the $[\text{H}_3\text{O}^+]$, $[\text{OH}^-]$, pH, and pOH for pure water @ 60 °C.

5. Human blood has a pH of approximately 6.6. Find the hydronium and hydroxide concentrations. Assume the sample is @ 25 °C ($K_w = 1 \times 10^{-14}$)

6. Calculate the pH:

- A solution containing 50 mL of 1 M HCl and 15 mL of 3 M NaOH.
- A solution containing 200 mL of 1 M CH_3COOH and 10 mL of 6 M NaOH.

7. Given a solution with a pH of 4.30, find the hydronium concentration. The hydroxide concentration.

8. How many grams of NaOH must be added to 200 mL of water to give a solution a pH of 11.5?

9. Calculate the pH of a 0.100 M H_2S solution. The K_a of H_2S is 1.0×10^{-7} .

10. For the acetate buffer: ($K_a = 1.74 \times 10^{-5}$)

- Find the pH when the buffer contains 100 mL of acetic acid and 100 mL of sodium acetate.
- Find the pH when 100 mL of 0.1 M HCl is added to the buffer from 10a.

11. How many moles of sodium acetate and how many moles of acetic acid are needed to prepare 1 liter of 0.1 M solution having a pH of 5.0?

12. Calculate the ratio of $[\text{NH}_3]/[\text{NH}_4^+]$ at a pH of 8.3 when the pK_a of NH_4^+ is 9.3

13. A solution containing 0.01 M Glycine is at a pH of 8.5. Calculate the concentration of the Zwitterion. (Hint: you will need to know the pI and pK_a values for Glycine)