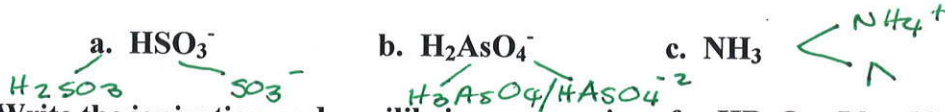


KEY

1. Give the conjugate acid/base pair of the following Bronsted-Lowry amphoteric ions:



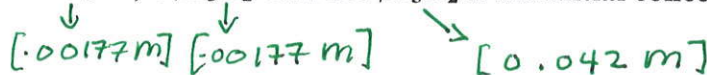
2. Write the ionization and equilibrium expressions for HBrO_2 . Identify the conjugate acid and the conjugate base.



3. A particular sample of vinegar has a pH of 2.9. Assuming acetic acid is the only acid in the vinegar, find the initial concentration of acetic acid in the vinegar.

Handwritten answers: 0.0896 w/o approx, 0.088 w/ approx.

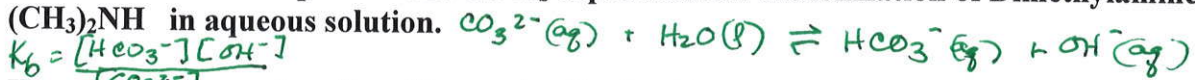
4. The acid dissociation constant for benzoic acid ($\text{HC}_7\text{H}_5\text{O}_2$) is 6.3×10^{-5} . Calculate the equilibrium concentrations of H_3O^+ , $\text{C}_7\text{H}_5\text{O}_2^-$ and $\text{HC}_7\text{H}_5\text{O}_2$ if the initial concentration of $\text{HC}_7\text{H}_5\text{O}_2$ is 0.050 M.



5. Calculate the pH of a 0.500 L solution containing 0.450 mole of the salt NaOCl at 25°C .

Handwritten notes: $K_a \text{HOCl} = 3.0 \times 10^{-8}$, $K_b = 3.33 \times 10^{-7}$ for OCl^- , $\text{pOH} = 3.26$, $\text{pH} = 10.74$, $[\text{OH}^-] = 0.000547 \text{ M}$

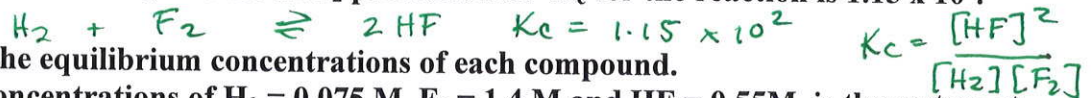
6. Write the chemical equation and the K_b expression for the ionization of Dimethylamine $(\text{CH}_3)_2\text{NH}$ in aqueous solution.



7. How many grams of acetic acid must be dissolved in water to make 250.0 mL of solution that has a pH of 4.2?

Handwritten calculations: Equil. concn Acetic Acid = 0.000282 M, grams Acetic Acid = 0.0042 grams

8. The reaction of 1.00 M H_2 and 2.0 M F_2 produces HF . K_c for the reaction is 1.15×10^2 .



A. Calculate the equilibrium concentrations of each compound.

B. If the concentrations of $\text{H}_2 = 0.075 \text{ M}$, $\text{F}_2 = 1.4 \text{ M}$ and $\text{HF} = 0.55 \text{ M}$, is the system at equilibrium? Why or why not?

Handwritten calculation: $Q = \frac{[0.55]^2}{[0.075][1.4]} = 2.88$, Not @ equil, $K > Q$, Rxn moves forward.

9. Calculate the molar concentration of OH^- ions in a 0.075 M solution of ethylamine. K_b of $\text{C}_2\text{H}_5\text{NH}_2 = 6.4 \times 10^{-4}$. Calculate the pH of this solution.

Handwritten notes: Quadratic bec. Approx Invalid, $\text{pH} = 11.92$

10. K_a for acetic acid (CH_3COOH) is 1.8×10^{-5} while K_a for hypochlorous (HClO) ion is 3.0×10^{-8} .

Handwritten K_b values: $K_b = 5.56 \times 10^{-10}$ (for CH_3COO^-), $K_b = 3.33 \times 10^{-7}$ (for ClO^-)

A. Which acid is the stronger acid? *Acetic Acid*

B. Which is the stronger conjugate base? Acetate ion (CH_3COO^-) or chlorous (ClO^-) ion?

C. Calculate k_b values for CH_3COO^- and ClO^- .

Handwritten K_b values: $K_b = 5.56 \times 10^{-10}$, $K_b = 3.33 \times 10^{-7}$

11. a. Calculate the pH of a 1.50 M solution containing 0.750 mole of HCN and 0.62 mole of KCN .

Handwritten answer: $\text{pH} = 9.23$

b. If 0.015 mole of KOH was added, calculate the pH of the solution.

Handwritten answer: $\text{pH} = 9.25$

c. If 0.015 mole of HBr was added, calculate the pH of the solution.

Handwritten answer: $\text{pH} = 9.21$