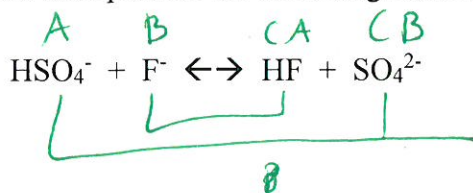


Chapter 14 Review Worksheet

Name: Key

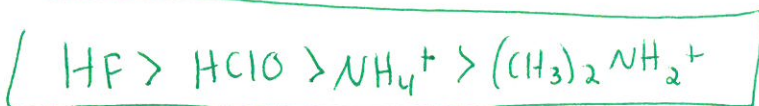
1. Identify the conjugate acid-base pairs in the following reaction: Label A, B, CA, CB.



2. Rank the following acids in terms of their strength (strongest to weakest).

Acid	K_a	K_b
2 HClO	2.9×10^{-8}	--
1 HF	6.6×10^{-4}	--
3 NH_4^+	-- 5.6×10^{-10}	1.8×10^{-5}
4 $(\text{CH}_3)_2\text{NH}_2^+$	-- 1.7×10^{-11}	5.9×10^{-4}

$\frac{K_w}{K_b} = K_a$



3. Identify the stronger acid in each pair and explain your choice.

a. HCl or HBr
 Br is larger so weaker bond = ↑ acidity
 Cl is more EN, so ↑ polarity = stronger bond

b. HNO₃ or HNO₂
 more terminal O's pull e⁻ away from H-O bond, ↑ acid

4. A detergent solution has a pH of 11.13 at 25°C. What is the [OH⁻] in the solution?

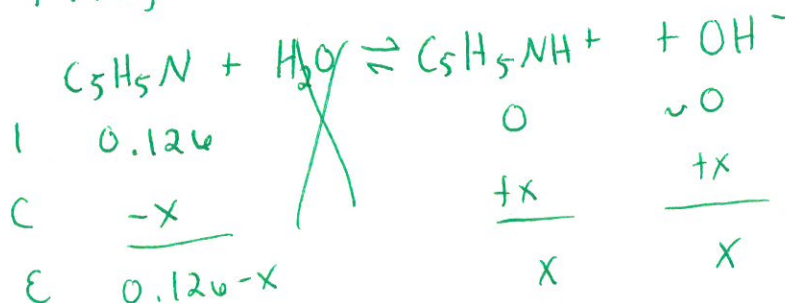
pH = 11.13 at 25°C. [OH⁻] = ?

~~pH = 11.13~~
~~[H⁺] = 7.4 × 10⁻¹² M~~

14 - pH = pOH
 pOH = 2.87
 $10^{-2.87} = [\text{OH}^-] = 1.3 \times 10^{-3} \text{ M}$

5. Pyridine, C₅H₅N, ($K_b = 1.5 \times 10^{-9}$) is an organic base, used in the synthesis of vitamins, drugs, and fungicides. Calculate the pH of an aqueous solution, having 1.25 grams of pyridine in 125 mL solution.

$$\frac{1.25 \text{ g P}}{0.125 \text{ L}} \times \frac{\text{mol}}{79.11 \text{ g}} = 0.126 \text{ M P}$$



$$K_b = \frac{x^2}{0.126 - x} = 1.5 \times 10^{-9}$$

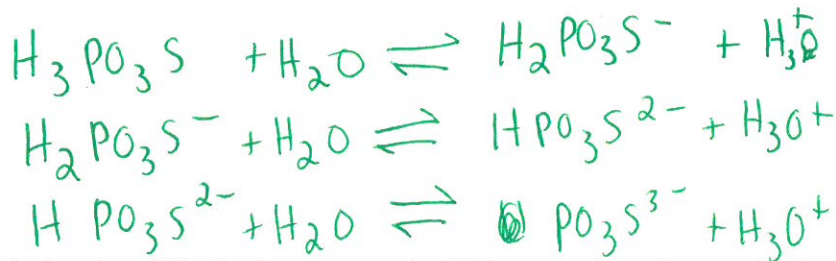
$$x = 1.4 \times 10^{-5} \text{ M}$$

assump. is good.

[OH⁻] = x = $1.4 \times 10^{-5} \text{ M}$

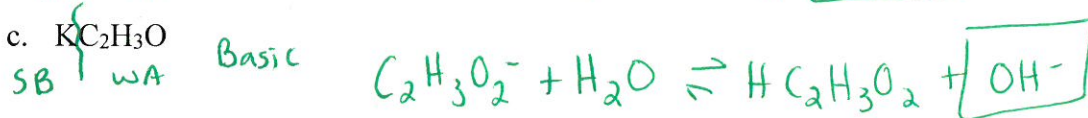
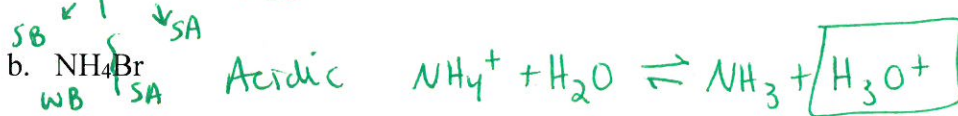
pOH = $-\log(1.4 \times 10^{-5}) = 4.86$
 pH = 14 - 4.86 = 9.14 = pH

6. Write the ionization equations for H_3PO_3S , thiophosphoric acid. Which ionization would have the largest K_a ? Why?



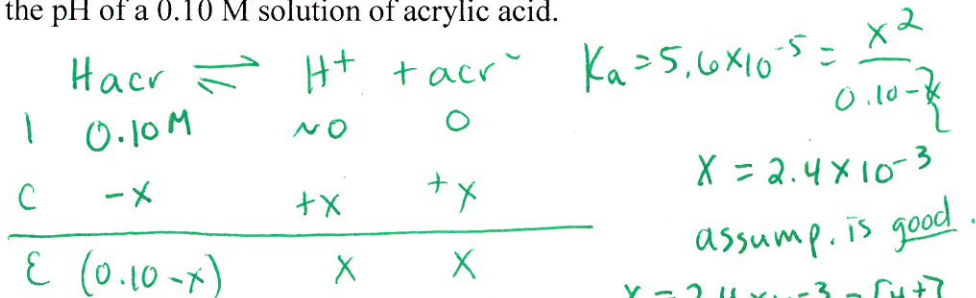
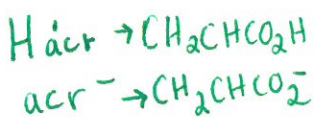
1st ionization would have biggest K_a . Others are anions, so H^+ sticks more.

7. Predict whether each solution is acidic, basic, or neutral. Write equations for any hydrolysis reactions that occur.



8. Acrylic acid (CH_2CHCO_2H) is a precursor for many important plastics. K_a for acrylic acid is 5.6×10^{-5} .

- a. Calculate the pH of a 0.10 M solution of acrylic acid.



$x = 2.4 \times 10^{-3}$
 Assump. is good.

$x = 2.4 \times 10^{-3} M = [H^+]$

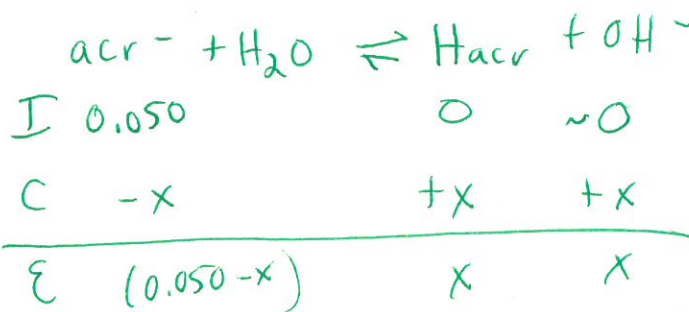
- b. Calculate the percent dissociation of a 0.10 M solution of acrylic acid.

$\frac{[H^+]}{[H_{acr}]_0} \times 100 = \frac{2.4 \times 10^{-3}}{0.10} \times 100 = 2.4\%$

$pH = -\log(2.4 \times 10^{-3})$
 $pH = 2.62$

- c. Calculate the pH of a 0.050 M solution of sodium acrylate: ($NaC_3H_3O_2$).

acr^- is a weak base and the major source of OH^- .



$K_b = \frac{K_w}{K_a} = \frac{1.0 \times 10^{-14}}{5.6 \times 10^{-5}} = 1.8 \times 10^{-10}$

$x = [OH^-] = 3.0 \times 10^{-6} M$

$K_b = \frac{x^2}{(0.050 - x)} = 1.8 \times 10^{-10}$

$x = 3.0 \times 10^{-6}$
 Assump. is good.

$pOH = 5.52$
 $pH = 8.48$