CONCEPT: Ka AND Kb

As you might already realize, there are relatively few strong acids. The great majority of acids are weak acids.

Consider a weak monoprotic acid, HA, and its ionization in water:

$$HA\ (aq) + H_2O\ (l) \rightleftharpoons A^-\ (aq) + H_3O^+\ (aq)$$

The equilibrium expression for this ionization would be:

$$K_a = \frac{\text{Products}}{\text{Reactants}} =$$

Where K_a represents the _____ and it measures the strength of weak acids.

When looking at weak bases we don't use K_a, but instead _____, which represents the _____.

- The relationship between K_a and K_b can be expressed with the following equation:

$$K_W = K_a \cdot K_b$$

In general, the _____ the K_a the stronger the acid and the _____ the concentration of H^+.

In general, the _____ the pK_a the stronger the acid and the _____ the concentration of H^+.

PRACTICE: If the K_b of NH_3 is 1.76×10^{-5}, determine the acid dissociation constant of its conjugate acid.

EXAMPLE: Knowing that HF has a higher K_a value than CH_3COOH, determine, if possible, in which direction the following equilibrium lies.

$$HF\ (aq) + CH_3COO^-\ (aq) \rightleftharpoons F^-\ (aq) + CH_3COOH\ (aq)$$

a) Equilibrium lies to the left

b) Equilibrium lies to the right

c) Equilibrium is equal and balanced

d) Not enough information given

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PRACTICE: Which Bronsted-Lowry base has the greatest concentration of hydroxide ions?

a) $C_2H_8N_2$ ($K_b = 8.3 \times 10^{-5}$)

b) C_5H_5N ($K_b = 1.7 \times 10^{-9}$)

c) $(CH_3)_3N$ ($K_b = 1.0 \times 10^{-6}$)

d) $C_3H_7NH_2$ ($K_b = 3.5 \times 10^{-4}$)

e) $C_6H_5NH_2$ ($K_b = 3.9 \times 10^{-10}$)

PRACTICE: Which Bronsted-Lowry acid has the weakest conjugate base?

a) HCNO ($K_a = 2.0 \times 10^{-4}$)

b) HF ($K_a = 3.5 \times 10^{-4}$)

c) HN_3 ($K_a = 2.5 \times 10^{-5}$)

d) H_2CO_3 ($K_a = 4.3 \times 10^{-7}$)