K_b

K_b

K_b – dissociation constant for weak bases

$NH_3 + H_2O \Longleftrightarrow NH_4^+ + OH^-$

The $\boxed{}$ K_b, the stronger the base.

The $\boxed{}$ K_b, the weaker the base.

K_b

Similar to K_a values, pK_b values can be calculated.

The larger the pK_b value, the weaker the base and the smaller the pK_b, the stronger the base.

K_b

How are K_a and K_b related?

K_b

RECALL: Equilibrium Law

When chemical equilibria are added together, the equilibrium constants are multiplied together.

$$K_{eq\ final\ rxn} = K_{eq\ rxn\ 1} \times K_{eq\ rxn\ 2}$$

K_b Calculations

Two types of calculations may also be completed:

1) Calculate the values of K_b and pK_b from the pH of a solution of a weak base of known initial concentration.

2) Calculate the pH of a solution where pK_b and initial concentration are known.

K_b

Example 1

Methylamine, CH_3NH_2, is one of several substances that give herring brine its pungent odor. In 0.100 M CH_3NH_2, the pH is 11.80. What is the K_b of methylamine?

.: K_b is 4.24×10^{-4}

K_b

Example 2

$C_{17}H_{19}NO_3$ Morphine is an alkaloid (an alkaline compound obtained from plants), which is a weak base. The pH of 0.010 M morphine is 10.10. Calculate K_b and pK_b morphine.

K_b

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.: $pK_b = 5.8$, $k_b = 1.6 \times 10^{-6}$

K_b

Example 3

Calculate the values of pH, pOH and $[OH^-]$ of a 0.20 M solution of ammonia. K_b of ammonia is 1.8×10^{-5}

.: pH = 11.3, pOH = 2.7, $[OH^-] = 1.9 \times 10^{-3}$M

The characteristic taste of tonic water is due to the addition of quinine. Quinine is a naturally occurring compound that is also used to treat malaria. The base dissociation constant, K_b, for quinine is 3.3×10^{-6}. Calculate $[OH^-]$ and the pH of a 1.7×10^{-3} mol/L solution of quinine.