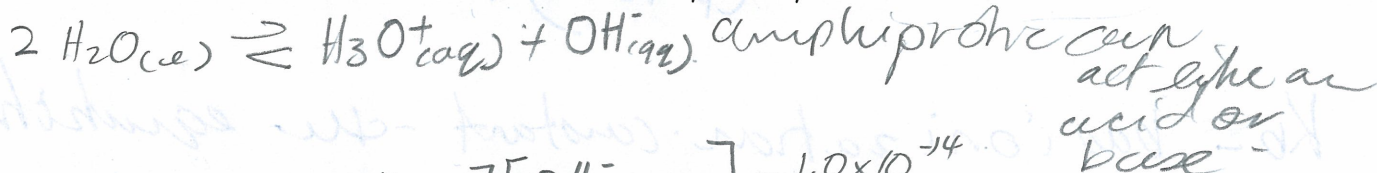


8.2 Calculations- The Relationship between K_w , K_a and K_b

Derive auto ionization of water From Bronsted- Lowry Theory :



$K_w =$ always must equal $[\text{H}^+_{(aq)}][\text{OH}^-_{(aq)}] = 1.0 \times 10^{-14}$

K_a and K_b relationship $K_w = K_a K_b$ (acid/base)

A neutral solution, relationship between $[\text{H}^+_{(aq)}] = [\text{OH}^-_{(aq)}]$

An acidic solution

$$[\text{H}^+_{(aq)}] > [\text{OH}^-]$$

A basic solution

$$[\text{OH}^-_{(aq)}] > [\text{H}^+]$$

Do and apply p. 502, # 1- 2

$$\text{Standards} = 1.0 \times 10^{-14} = [\text{H}^+][\text{OH}^-]$$

pH and pOH

Define: pH (p. 502) ; pOH (p. 502)

Given pH = 6.8 ; find pOH

$$\text{pH} + \text{pOH} = 14 \quad \therefore \quad \begin{aligned} \text{pOH} + 6 &= 14 \\ \text{pOH} &= 14 - 6 = 8 \end{aligned}$$

This supports $\text{pH} + \text{pOH} = -\log K_w$

$$[\text{OH}^-][\text{H}^+] = K_w$$

Use pH to determine the formula for H^+ concentration:

Convert $\text{pH} = -\log [\text{H}^+]$

$$10^{-\text{pH}} = [\text{H}^+]$$

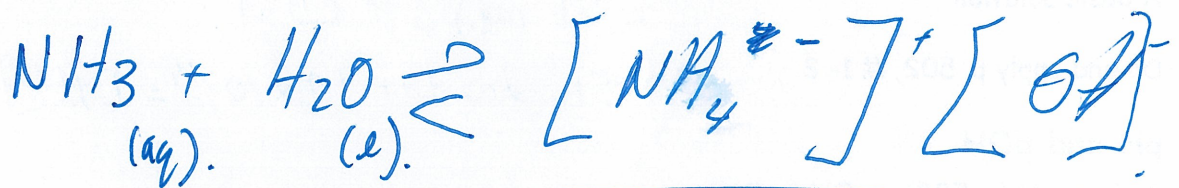
$\text{pOH} = -\log [\text{OH}^-]$

$$10^{-\text{pOH}} = [\text{OH}^-]$$

Do and apply: p. 508, # 1-4

K_w ion-product constant for water - the equilibrium constant for the autoionization of water. (p. 100).

K_b = base ionization constant - the equilibrium constant for the ionization of a base; also called the base dissociation (p. 498).



$$K_b = 1.8 \times 10^{-5} = [\text{NH}_4^+]^+ [\text{OH}^-]^-$$