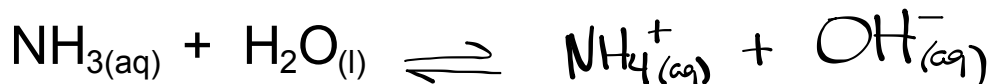


Weak Bases

Weak bases react with water to form the hydroxide ion and conjugate acid of the base.



base dissociation constant

$$K_b = \frac{[\text{NH}_4^+(\text{aq})][\text{OH}^-(\text{aq})]}{[\text{NH}_3(\text{aq})]}, \quad [\text{NH}_4^+(\text{aq})] = [\text{OH}^-(\text{aq})]$$

$$K_b = \frac{[\text{OH}^-(\text{aq})]^2}{[\text{NH}_3(\text{aq})]}$$

$$K_a K_b = K_w$$

$$K_b = \frac{K_w}{K_a} = \frac{1.0 \times 10^{-14}}{5.8 \times 10^{-10}}$$

$$K_b = 1.72 \times 10^{-5}$$

Calculate the pH of a 0.221 mol/L solution of $\text{NH}_3(\text{aq})$ at equilibrium.

$$[\text{OH}^-(\text{aq})] = \sqrt{K_b [\text{NH}_3(\text{aq})]}$$

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

$$[\text{OH}^-(\text{aq})] = \sqrt{(1.72 \times 10^{-5})(0.221)}$$

$$\text{pOH} = 2.710$$

$$[\text{OH}^-(\text{aq})] = 1.95 \times 10^{-3} \text{ M}$$

$$\text{pH} + \text{pOH} = 14.000$$

$$\text{pH} = 14.000 - 2.710$$

$$\boxed{\text{pH} = 11.290}$$

$$K_a K_b = K_w$$

Worksheet