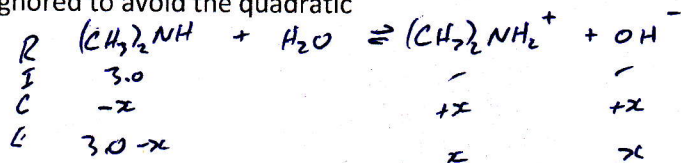


- 3) Consider the weak base Dimethylamine $(\text{CH}_3)_2\text{NH}$. What is the pH of 3.0M dimethylamine? $K_b = 5.9 \times 10^{-4}$. Assume that the amount of Dimethylamine that dissociates is small enough that it can be ignored to avoid the quadratic



$$K_b = \frac{[(\text{CH}_3)_2\text{NH}_2^+][\text{OH}^-]}{(\text{CH}_3)_2\text{NH}}$$

$$5.9 \times 10^{-4} = \frac{x^2}{3.0-x}$$

so small in comparison to 3.0 that $3.0-x \approx 3.0$

$$5.9 \times 10^{-4} = \frac{x^2}{3.0}$$

$$0.042071367 = x = [\text{OH}^-]$$

$$[\text{H}_3\text{O}^+][\text{OH}^-] = K_w$$

$$[\text{H}_3\text{O}^+] = \frac{K_w}{[\text{OH}^-]}$$

$$[\text{H}_3\text{O}^+] = \frac{1.0 \times 10^{-14}}{0.042071367}$$

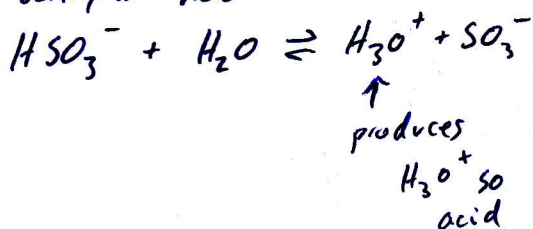
$$[\text{H}_3\text{O}^+] = 2.376913443 \times 10^{-13}$$

$$-\log[\text{H}_3\text{O}^+] = -\log(2.376913443 \times 10^{-13})$$

$$\text{pH} = 12.62$$

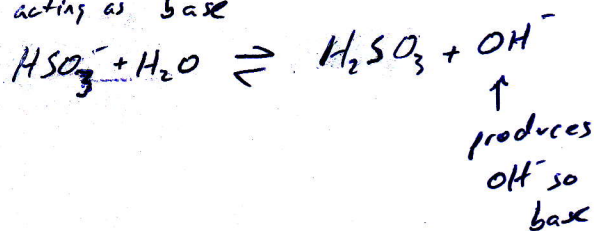
- 4) Will a solution of NaHSO_3 be acidic or basic? Show all calculations that lead to your conclusion.

acting as Acid



$$K_a \text{ HSO}_3^- = 1.0 \times 10^{-7}$$

acting as base



$$K_b \text{ HSO}_3^- \times K_a \text{ H}_2\text{SO}_3 = K_w$$

$$K_b \text{ HSO}_3^- \times 1.5 \times 10^{-2} = 1.00 \times 10^{-14}$$

$$K_b \text{ HSO}_3^- = \frac{1.00 \times 10^{-14}}{1.5 \times 10^{-2}}$$

$$K_b \text{ HSO}_3^- = 6.7 \times 10^{-13}$$

$K_a > K_b$ so solution
will be acidic