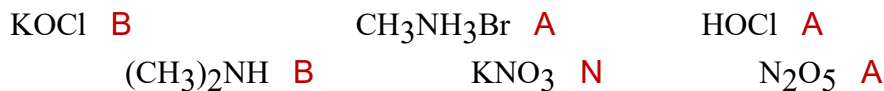


Chem 10123, Quiz 3

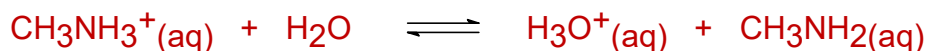
February 12, 2020

Answer Key

1. (4 points) For each of the following substances, indicate whether it would be acidic (A), basic (B), or neutral (N) in aqueous solution.



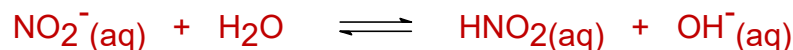
2. (2 points) Regarding the CH₃NH₃Br(aq) solution above, write the **balanced net ionic equation** for the essential **equilibrium reaction** that accounts for your answer.



3. Barium nitrite, Ba(NO₂)₂ (molar mass = 229.35) dissolves in water to yield a **basic** solution.

- (a) (3 points) Why is the solution basic? Explain in 30 words or less and write the **balanced net ionic equation** that accounts for this fact.

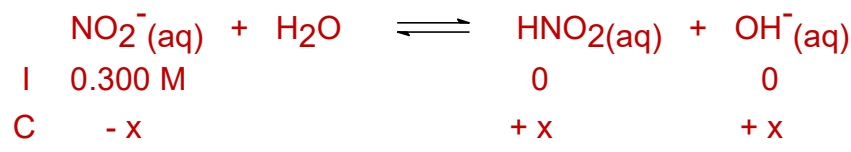
Nitrite ion NO₂⁻ is the conjugate base of a weak acid HNO₂. Thus, NO₂⁻ functions as a weak base by reacting with H₂O to form the conjugate acid and OH⁻ ion as follows.



- (b) (3 points) **SHOW ALL WORK.** Determine the mass of Ba(NO₂)₂ that is required to prepare 300.0 mL of 0.150 M Ba(NO₂)₂.

$$(0.3000 \text{ L}) (0.150 \text{ mole Ba(NO}_2)_2 / \text{L}) (229.35 \text{ g/mole}) = 10.3 \text{ g Ba(NO}_2)_2$$

- (c) (8 points) **SHOW ALL WORK. Clearly state and justify any assumptions that you may make.** Determine the pH of this 0.150 M Ba(NO₂)₂ solution. (For HNO₂, pK_a = 3.34)
 (= 0.300 M NO₂⁻)



$$K_b = K_w / K_a = 10^{-14} / 10^{-3.34} = 2.19 \times 10^{-11}$$

$$K_b = [\text{HNO}_2][\text{OH}^-] / [\text{NO}_2^-]$$

$$2.19 \times 10^{-11} = x^2 / (0.300 - x) \quad (\text{since } K_b \text{ is very small, assume } x \ll 0.300)$$

$$2.19 \times 10^{-11} \approx x^2 / (0.300)$$

$$x = [\text{OH}^-] \approx 2.562 \times 10^{-6} \quad (\text{assumption is OK!})$$

$$\text{pOH} = -\log(2.562 \times 10^{-6}) = 5.59$$

$$\text{pH} = 14.00 - \text{pOH} = 14.00 - 5.59 = 8.41 \quad (\text{a basic solution!})$$