**Quiz 3**

# Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work. Where appropriate answers should be boxed for clarity, written to the correct number of significant figures, and, include the proper units.

1. In what volume ratio should you mix 1.0 M solutions of ammonium chloride and ammonia to produce a buffer solution having pH = 9.80? (Kb NH3 = 1.8 × 10-5) (8 points)?

The solution must contain 3.5 mol NH3 for every 1 mol NH4+, but the volume of the solution isn’t critical. Using 1.0 M solutions you need to maintain a volume ratio of 3.5 to 1. One way of preparing the buffer would be to combine 350 mL of 1.0 M NH3 solution with 100 mL of 1.0 M NH4Cl solution.

1. Consider a solution of 1.0 M hydrazoic acid (H3N, Ka = 1.9 × 10-5) (12 points).
   1. Calculate the percent dissociation.

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| --- | --- | --- | --- | --- |
|  | H3N (aq) + | H2O (l) → | H2N- (aq) + | H3O+ (aq) |
| I | 1.0 M | ∞ | 0 M | ~ 0 M |
| C | -x |  | +x | +x |
| E | 1.0 M – x =   1. M – 4.4 × 10-3 M ≈   1.0 M |  | x =  4.4 × 10-3 M | x =  4.4 × 10-3 M |

* 1. What is the percent dissociation in the presence of 0.10 M HCl

0.10 M HCl will dissociate into 0.10 M Cl- and 0.10 H+ or 0.10 H3O+ completely because hydrochloric acid is a strong acid.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | H3N (aq) + | H2O (l) → | H2N- (aq) + | H3O+ (aq) |
| I | 1.0 M | ∞ | 0 M | 0.10 M |
| C | -x |  | +x | +x |
| E | 1. M – x =   1.0 M – 1.9 × 10-4 M ≈  1.0 M |  | x =  1.9 × 10-4 M | 0.10 M + x =  0.10 M – 1.9 × 10-4 M ≈  0.10 M |