

Examples: One strong and one weak

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Solution: The total volume is 65 mL so the final Concentrations are:

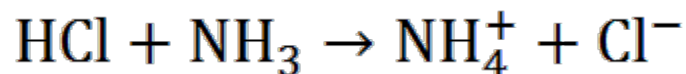
$$[\text{HCl}] = 25/65(0.40 \text{ M}) = 0.154 \text{ M}$$

$$[\text{NH}_3] = 40/65(0.30 \text{ M}) = 0.184 \text{ M}$$

In this case the $[\text{HCl}] < [\text{NH}_3]$ so this will make a buffer. Assume that the strong acid reacts completely then at equilibrium we have:

$$[\text{NH}_3] = 0.184 - 0.154 \text{ M} = 0.03 \text{ M} \text{ and } [\text{NH}_4^+] = 0.154 \text{ M}$$

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$$\text{pH} = \text{pK}_a + \log_{10} \left(\frac{[\text{NH}_3]}{[\text{NH}_4^+]}\right)$$

$$\text{pH} = 9.4 + \log_{10} \left(\frac{0.03}{0.154} \right)$$

$$\text{pH} = 8.68$$