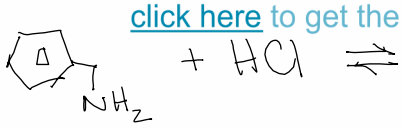

$pK_a = 9.35$

$B + H^+ \rightleftharpoons BH^+$ $\quad pH = pK_a + \log \frac{[B]}{[BH^+]}$

acid added: $0.05 \frac{mol}{L} \times 0.012L = 6 \times 10^{-4}$ moles BH^+

moles B remaining $= 1.59 \times 10^{-3}$ moles $- 6 \times 10^{-4}$ moles $BH^+ = 9.9 \times 10^{-4}$ moles B

$pH = 9.35 + \log \frac{9.9 \times 10^{-4} \text{ moles B}}{6 \times 10^{-4} \text{ moles } BH^+} \Rightarrow pH = 9.567$

$\frac{1}{2} V_{eq} \rightarrow pH = pK_a = 9.35$

V_{eq} moles acid = moles base $= 1.59 \times 10^{-3}$ moles

$BH^+ \rightleftharpoons B + H^+$ $\quad K_a = \frac{[B][H^+]}{[BH^+]} = 4.47 \times 10^{-10} = \frac{x^2}{F' - x}$

$F' = 1.59 \times 10^{-3} \text{ moles} \times \frac{1}{31.8mL + 50mL} \times \frac{1000mL}{L} = 0.0194 \frac{mol}{L}$ BASE

assume $F' >> x$ $\quad x = 2.95 \times 10^{-6} = [H^+]$

$pH = 5.53$

3.2 mL of excess H^+

$M_1V_1 = M_2V_2$

$[H^+] = 0.05 \frac{mol}{L} \cdot \frac{3.2mL}{85mL} = 1.88 \times 10^{-3} M$

$pH = 2.73$