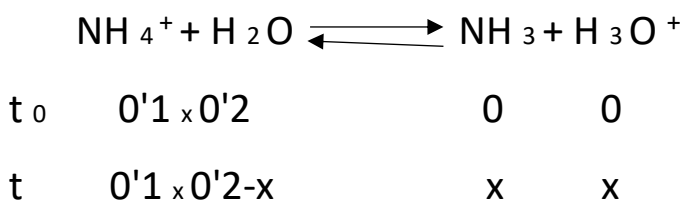


Acid - Base Problem :

I have 0.1 Liters of $[\text{NH}_4^+] = 0.2 \text{ M}$, and on the other hand I add "V" Liters of $[\text{OH}^-]_0 = 0.2 \text{ M}$

and when I finish adding "V" I am left with $[\text{H}_3\text{O}^+]_{\text{final}} = 0.15 \text{ M}$



$$K_a = 5.7 \cdot 10^{-10} = \frac{\left(\frac{x}{0.1}\right)^2}{\frac{0.02-x}{0.1}} \rightarrow x = 1.06 \cdot 10^{-6} \text{ moles} = \text{number moles}$$

initials of H_3O^+

$$\text{N}^\circ. \text{ moles finals of } \text{H}_3\text{O}^+ = 0.15 \times (0.1 + V)$$

Then : $x - 0.15 \times (0.1 + V) = y = \text{n}^\circ \text{ moles that react with everything the } \text{OH}^-$



$$\text{or: } K_w = [\text{H}_3\text{O}^+][\text{OH}^-] \rightarrow [\text{OH}^-] = 10^{-14} / \left(\frac{y}{(0.1+V)}\right) = 0.2$$

$$\text{therefore } y = 1.06 \cdot 10^{-6} - 0.015 + 0.15 \cdot V$$

$$\text{and } 5 \cdot 10^{-14} = \frac{y}{(0.1+V)} \rightarrow y = 5 \cdot 10^{-15} + 5 \cdot 10^{-14} \cdot V$$

$$1.06 \cdot 10^{-6} - 0.015 - 5 \cdot 10^{-15} = V(5 \cdot 10^{-14} - 0.15)$$

$$\rightarrow V = \frac{0.015}{0.15} = 0.1 \text{ liters}$$