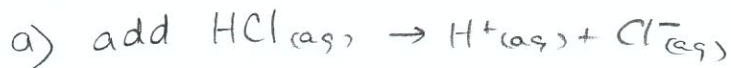


## Buffers

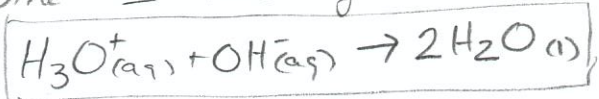


the proton from HCl will combine with the conjugate base  $\text{F}^-_{(aq)}$ , shifting the rxn to the left to consume the added  $\text{H}^+_{(aq)}$

- \* as long as only a small amount of  $\text{H}^+_{(aq)}$  is added, pH remains relatively constant
- \* if a large amount of  $\text{H}^+$  is added and all of the conjugate base,  $\text{F}^-_{(aq)}$ , is consumed pH will decrease

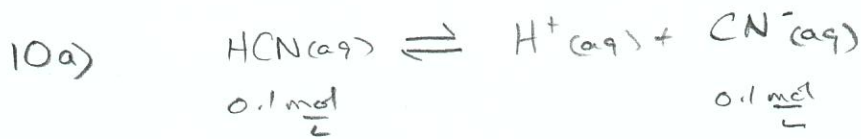


the hydroxide would combine w the hydronium to produce  $\text{H}_2\text{O}$



more of the acid will ionize to produce more  $\text{H}_3\text{O}^+_{(aq)}$

- \* if a small amount of NaOH is added the  $\text{H}_3\text{O}^+$  removed can be replaced and pH will remain relatively constant
- \* if a large amount of NaOH is added, all of the acid will ionize and will not be able to replace the lost  $\text{H}_3\text{O}^+_{(aq)}$ ; pH will increase



→ buffered system as a weak acid is combined with its anion, its conjugate base



→ combined a strong base with its cation  
 → not a buffered system



→ combine a weak base with its conjugate acid  
 ( $\text{NH}_3$ ) ( $\text{NH}_4^+$ )

→ buffered system



→ both are strong bases

→ not a buffered system



→ only the conjugate base of a weak acid, no weak acid

→ not a buffered system



see question 9



$$0.10 \frac{\text{mol}}{\text{L}}$$

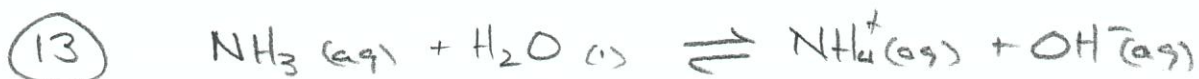


$$0.10 \frac{\text{mol}}{\text{L}}$$

$\text{HClO}_4$  is a strong acid, does not form a buffered system.

since it ionizes completely  $[\text{H}^+] = [\text{HClO}_4] = 0.1 \frac{\text{mol}}{\text{L}}$

$$\text{pH} = 1.00$$



$$\text{pOH} = \text{p}K_B + \log \frac{[\text{NH}_4^+]}{[\text{NH}_3]}$$

$$K_B = 1.8 \times 10^{-5}$$

$$9.00 = -\log(1.8 \times 10^{-5}) + \log \frac{[\text{NH}_4^+]}{[\text{NH}_3]}$$

$$\log \frac{[\text{NH}_4^+]}{[\text{NH}_3]} = 9.00 - 4.745 = 4.255$$

$$\frac{[\text{NH}_4^+]}{[\text{NH}_3]} = 10^{-4.255} = 5.56 \times 10^{-5}$$