

AP Unit 8 Test Review

#1.) What will change the pH of a buffer?

- ✗ I) 2x (acid and conjugate base) ← Nope: didn't affect HA:A⁻ ratio
- ✗ II) 2x H₂O ←
- ✓ III) Add small amount of strong acid or strong base] Yep: changed HA:A⁻ ratio.

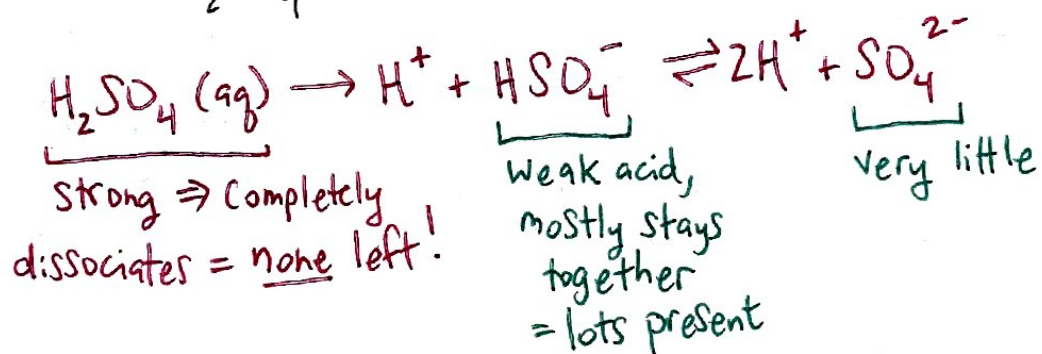
#2.) 0.75 M Weak acid, $K_a = 6.6 \times 10^{-5} \Rightarrow \% \text{ ion. ?}$

$$K_a = \frac{x^2}{[HA]} = \frac{x^2}{0.75} = 6.6 \times 10^{-5}$$

$$\Rightarrow x = [H_3O^+] = \sqrt{(0.75)(6.6 \times 10^{-5})} = 0.0070 \text{ M}$$

$$\% \text{ Ion.} = \frac{[H_3O^+]}{[HA]} \times 100 = \frac{0.0070}{0.75} \times 100 = \boxed{0.94\%}$$

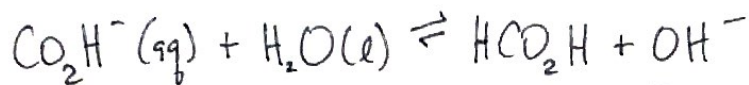
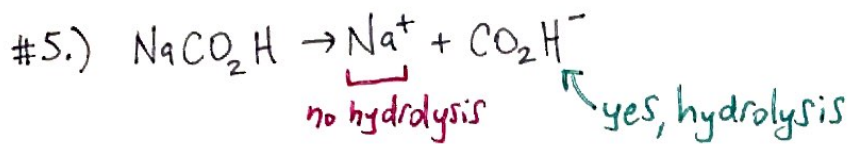
#3.) 0.25 M H₂SO₄ \Rightarrow [ion] ↓ = ?



#4.) Best buffer combo for pH = 9.24?

\Rightarrow want $pK_a \approx \text{pH} = 9.24$

$$\Rightarrow K_a = 10^{-9.24} = \boxed{5.8 \times 10^{-10}} \leftarrow \text{closest to } K_a = 5.7 \times 10^{-8}$$



$$K_b = \frac{K_w}{K_a} = \frac{1 \text{E-}14}{1.8 \text{E-}4} = \boxed{5.6 \times 10^{-11}}$$

#6.) $M_1 V_1 = M_2 V_2$

$$(0.3 \text{ M})(250 \text{ mL}) = M_2 (500 \text{ mL}) \Rightarrow M_2 = \frac{(0.3)(250)}{500} = 0.15 \text{ M} = [\text{KOH}] = [\text{OH}^-]$$

$$\text{pOH} = -\log [\text{OH}^-] = -\log (0.15) = 0.82$$

$$\Rightarrow \text{pH} = 14 - 0.82 = \boxed{13.18}$$

#7.) pure H_2O , $\text{pH} = 7.35$

$$\Rightarrow [\text{H}_3\text{O}^+] = [\text{OH}^-] = 10^{-\text{pH}} = 10^{-7.35} = \boxed{4.5 \times 10^{-8} \text{ M}}$$

#8.) 1:1 buffer $\Rightarrow \text{pH} = \text{p}K_a = 6.2$

*Add acid $\Rightarrow \uparrow \text{HA}, \downarrow \text{A}^- \Rightarrow \downarrow \text{pH}$

#9.) 0.10 M weak acid, $\text{pH} = 3 \Rightarrow$ what acid?

$$[\text{H}_3\text{O}^+] = 10^{-\text{pH}} \approx 10^{-3} = x \quad \left\{ \begin{array}{l} K_a = \frac{x^2}{[\text{HA}]} = \frac{(10^{-3})^2}{0.10} = \boxed{1 \times 10^{-5}} \end{array} \right. \leftarrow \text{closest to } 1.9 \times 10^{-5}$$

#10.) \downarrow % Ion?

$$\frac{0.75 \text{ mol}}{0.500 \text{ L}} = 1.5 \text{ M HBr} \text{ or } 1.5 \text{ M HCN}$$

$$\frac{0.75 \text{ mol}}{0.250 \text{ L}} = 3.0 \text{ M HBr} \text{ or } \boxed{3.0 \text{ M HCN}}$$

Strong acid = 100% ionization!

for weak acids/bases,

\uparrow concentration = \downarrow % ionization