

Discussion Quiz #6(Take home)

Your Name: _____

TF's name: _____ Discussion Day/Time: _____

Remember: Zero tolerance policy for academic dishonesty.

1. Consider four acids, HA, HB, HC and HD. Answer the questions below regarding their strength.

a. (1 point) The pH of a 0.001 M solution of HB is measured as 3.0. What is the percent (%) dissociation of HB?

$$\text{pH}=3 \text{ then } [\text{H}_3\text{O}^+]=0.001\text{M} \quad (\%) \text{ dissociation}=\frac{[\text{H}_3\text{O}^+]}{[\text{HB}]_{\text{initial}}}\cdot 100\% = 100\%$$

R or W

This means that HB is a strong acid and its conjugate base is so weak it is weaker than water.

b. (1 point) The acid HD reacts 10.% in water. What is the pH of a 5.0×10^{-4} M solution of HD?

$$\text{If } 10\% \text{ dissociates } [\text{H}_3\text{O}^+]_{\text{formed}}= 5.0 \cdot 10^{-4} \cdot 0.1\text{M}=5.0 \cdot 10^{-5}\text{M}$$

$$\text{pH}=-\log(5.0 \cdot 10^{-5})=4.30 \quad \textbf{R or W}$$

c. (1 point) An equal volume of 0.001 M solution of C^- (the conjugate base of HC) is mixed with the solution in part (a) and the final pH is measured as 7.0. What is the pH of a 0.002 M solution of HC?

Based on the information we can conclude that C^- is a strong Base that reacts 100% that means it's conjugate acid so weak it is weaker than water hence it will not change pH of water.

$$\text{pH}= 7.0$$

R or W

d. (1 point) Acid HA reacts 50.%. What starting concentration would be required to obtain an HA solution of pH 4.7?

$$\text{pH}= 4.7 \quad [\text{H}_3\text{O}^+]= 10^{-4.6}=2 \cdot 10^{-5} \text{M} \quad [\text{HA}]= 2 \cdot 2 \cdot 10^{-5} =4 \cdot 10^{-5}\text{M}$$

R or W

e. (1 points) Rank in **increasing base** strength A^- , B^- , C^- , and D^- .

$$\text{B}^- < \text{A}^- < \text{D}^- < \text{C}^-$$

R or W

2. (2points) At 25 °C an aqueous solution of an acid HA has pH = 3. Circle all of the following that must be true.

The acid is a strong acid

The acid is a weak acid

The conjugate base is strong

$K_a > K_w$ 1point

$K_a \approx K_w$

$K_a < K_w$

$[H_3O^+] > [OH^-]$ 1point

$[H_3O^+] \approx [OH^-]$

$[H_3O^+] < [OH^-]$

$[HA] > [A^-]$

$[HA] \approx [A^-]$

$[HA] < [A^-]$

$[HA] > [H_3O^+]$

$[HA] \approx [H_3O^+]$

$[HA] < [H_3O^+]$

3. (1 points) The solution of 0.2M NaD has a pH of 10.3 what is a K for this reaction.

$$K=2*10^{-7}$$

R or W

4. (2 point) Calculate the pH of a solution made by dissolving 0.8 mol of barium hydroxide in 400 mL of water at 25 °C.

$$[Ba(OH)_2]=0.8mol/0.4L=2M$$

$$[OH^-]=4M$$

$$pOH= -0.6$$

$$pH=14.6$$

5. (2 points extra credit) At 99 °C, a 0.02 M solution of a weak base has a pOH of 4.0. The K_a of the conjugate acid of the base in that solution is 2×10^{-6} . What is the value of K_w at 99 °C?

$$K_b=5*10^{-7} \text{ Using the ICE table ; } K_w=1*10^{-12}$$

1point

1point

1point off for sig figs for the whole quiz