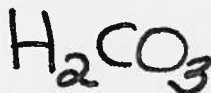


Assume all solutions are aqueous at 25°C. $K_w = 1.0 \times 10^{-14}$

1. What is the conjugate acid of HCO_3^{1-} ? (5 pts)



2. Which of the following is a WEAK acid? Circle your choice. (5 pts)

- a) HClO_4 b) H_2SO_4 c) HI **d) HCO_2H** e) HNO_3

3. Which of the following is NOT a conjugate acid-base pair? (5 pts)

- a) $\text{NH}_4^+/\text{NH}_3$ **b) $\text{H}_3\text{O}^+/\text{OH}^-$** c) $\text{H}_2\text{SO}_3/\text{HSO}_3^-$

d) $\text{HC}_2\text{H}_3\text{O}_2 / \text{C}_2\text{H}_3\text{O}_2^-$

e) All of the above are conjugate acid-base pairs.

4. Which of the following is TRUE? (5 pts)

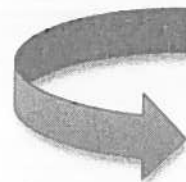
a) A neutral solution contains $[\text{H}_2\text{O}] = [\text{H}_3\text{O}^+]$

b) A neutral solution does not contain any H_3O^+ or OH^-

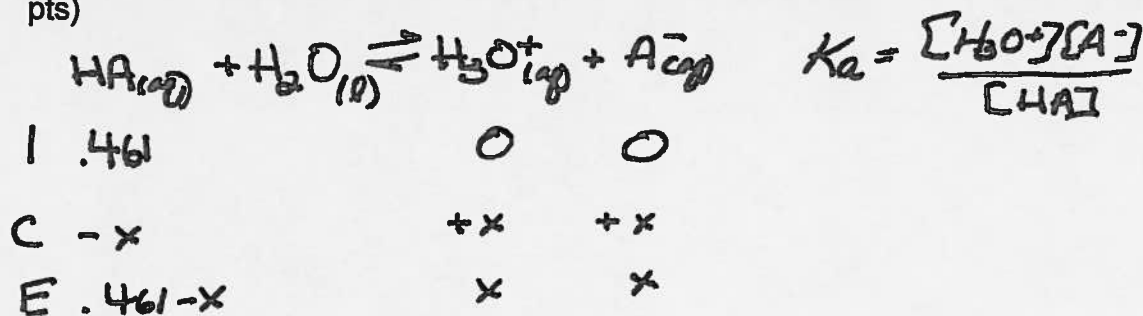
c) An acidic solution has $[\text{H}_3\text{O}^+] > [\text{OH}^-]$

d) A basic solution does not contain H_3O^+

e) None of the above statements is true.



5. Determine the pH of a 0.461 M $\overset{\text{HA}}{\text{C}_6\text{H}_5\text{CO}_2\text{H}}$ solution if the K_a of $\text{C}_6\text{H}_5\text{CO}_2\text{H}$ is 6.5×10^{-5} . Show your method, including any assumptions, an I.C.E. table, etc. (10 pts)



$$\frac{(x)(x)}{.461-x} = 6.5 \times 10^{-5}$$

assume x is small
 bc K is small; $.461-x \approx .461$

$$x^2 = 6.5 \times 10^{-5} (.461)$$

$$x^2 = 3.0 \times 10^{-5}$$

$$x = 5.5 \times 10^{-3}$$

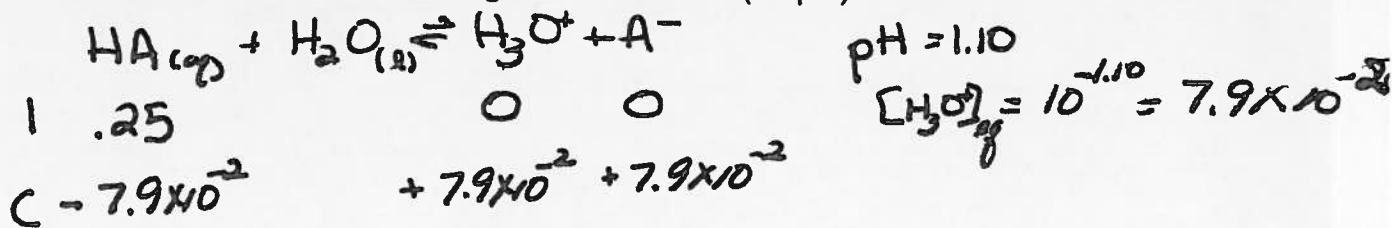
check
 $.461 - 5.5 \times 10^{-3}$
 $= .46$ (to 2 sig figs)

$$[\text{H}_3\text{O}^+] = 5.5 \times 10^{-3}$$

$$\text{pH} = -\log \quad = 2.26$$

Answer: pH = 2.26

6. A 0.25M solution of a monoprotic acid has a pH of 1.10. Calculate the K_a for the acid. Clearly show your method, including an I.C.E. table. (10 pts)



$$K_a = \frac{[\text{H}_3\text{O}^+][\text{A}^-]}{[\text{HA}]} = \frac{(7.9 \times 10^{-2})(7.9 \times 10^{-2})}{.17} = 3.7 \times 10^{-2}$$

Answer: $K_a = \underline{3.7 \times 10^{-2}}$