

Acids & Bases: Worksheet #2
Weak Acid Problems (2009)

1. What is the $[H^+]$ of a 0.25 M solution of benzoic acid, $HC_7H_5O_2$? $K_a = 6.46 \times 10^{-5}$

$$[H_3O^+] = 0.00399 \text{ M}$$

2. Hydrocyanic acid, HCN , has a K_a of 4.93×10^{-10} . Calculate the pH and $[H^+]$ of a 0.100 M solution of hydrocyanic acid.

$$[H_3O^+] = 7.02 \times 10^{-6} \text{ M}$$
$$\text{pH} = 5.154$$

3. Nitrous acid, HNO_2 , has a K_a of 7.1×10^{-4} . What are the $[H^+]$, $[NO_2^{1-}]$, $[OH^{1-}]$ in 0.50 M HNO_2 ?

$$[H_3O^+] = 0.018 \text{ M}$$
$$[NO_2^{1-}] = 0.018 \text{ M}$$
$$[OH^{1-}] = 5.6 \times 10^{-13} \text{ M}$$

4. Lactic acid ($\text{HC}_3\text{H}_5\text{O}_3$) is a monoprotic acid. A 0.10 M solution of lactic acid has a pH of 2.44. Calculate the K_a for lactic acid.

$$K_a = 1.3 \times 10^{-4}$$

5. Acetic acid, $\text{HC}_2\text{H}_3\text{O}_2$, has a $K_a = 1.78 \times 10^{-5}$.
- Determine the pH of a 0.100 M solution.
 - What percentage of acetic acid is ionized?

$$\begin{aligned} [\text{H}_3\text{O}^+] &= 0.00133 \text{ M} \\ \text{pH} &= 2.876 \\ &1.33\% \text{ ionized} \end{aligned}$$

6. A 0.100 M solution of a certain monoprotic acid (HA) is 11.0% ionized. Using this information, calculate the equilibrium concentrations of $[\text{A}^{1-}]$, $[\text{H}^+]$, $[\text{HA}]$, and the K_a for this acid.

$$\begin{aligned} [\text{H}_3\text{O}^+] &= 0.011 \text{ M} \\ [\text{A}^{1-}] &= 0.011 \text{ M} \\ [\text{HA}] &= 0.089 \text{ M} \\ K_a &= 1.36 \times 10^{-3} \end{aligned}$$