

## A Look at Solving Weak Acid-Base Equilibria Problems

What is the difference between a weak acid and a strong acid?

Steps for solving problems:

1.

2.

3.

4.

a.

b.

5.

6.

Concentration effects on extent of acid dissociation:

As the initial acid concentration \_\_\_\_\_, the percent dissociation of the acid \_\_\_\_\_.

\_\_\_\_\_ of HA dissociated  $\neq$  \_\_\_\_\_ of HA dissociated.

This is because:

### Weak Acid Problems

1. Phenylacetic acid ( $C_6H_5CH_2COOH$ , simplified HPAC) builds up in the blood of persons with phenylketonuria, an inherited disorder that, if untreated, causes mental retardation and death. A study of the acid shows that the pH of 0.12 M HPAC is 2.62. What is the  $K_a$  of phenylacetic acid?

2. The conjugate acid of ammonia is  $NH_4^+$ , a weak acid. If a 0.2 M  $NH_4Cl$  solution has a pH of 5.0, what is the  $K_a$  of  $NH_4^+$ ?

3. Propanoic acid ( $\text{CH}_3\text{CH}_2\text{COOH}$ , simplified HPr) is a carboxylic acid whose salts are used to retard mold growth in foods. What is the  $[\text{H}_3\text{O}^+]$  of 0.10 M HPr ( $K_a=1.3 \times 10^{-5}$ )?

4. Cyanic acid (HOCN) is an extremely acrid, unstable substance. What is the  $[\text{H}_3\text{O}^+]$  and pH of 0.10 M HOCN ( $K_a = 3.5 \times 10^{-4}$ )?

### Weak Base Problems

5. Dimethylamine,  $(\text{CH}_3)_2\text{NH}$ , a key intermediate in detergent manufacture, has a  $K_b$  of  $5.9 \times 10^{-4}$ . What is the pH of 1.5 M  $(\text{CH}_3)_2\text{NH}$ ?

6. Pyridine,  $\text{C}_5\text{H}_5\text{N}$ , plays a major role in organic syntheses as a solvent and base. It has a  $pK_b$  of 8.77. What is the pH of 0.10 M pyridine?

7. Sodium acetate,  $\text{CH}_3\text{COONa}$  (abbreviated NaAc), has applications in photographic development and textile dyeing. What is the pH of 0.25 M NaAc?  $K_a$  of acetic acid (HAc) =  $1.8 \times 10^{-5}$