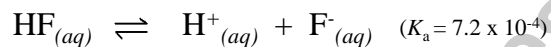


## Acids and Bases 14.5

pH for Weak Acids  
Polyprotic Acids

### Ex1) Calculating pH for a Weak Acid Solution

Ex1) Find the pH of a 2.5 M solution of HF.



Step 1. Find  $[\text{H}^+]$  by using an ICE chart.

	[HF]	[H <sup>+</sup> ]	[F <sup>-</sup> ]
I			
C			
E			

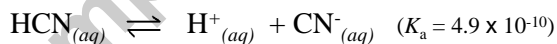
### Ex1) Calculating pH for a Weak Acid Solution (cont.)

### Ex1) Calculating pH for a Weak Acid Solution (cont.)

Step 2. Find the pH using your calculated value for  $[\text{H}^+]$ .

### Ex2) Calculating pH for a Weak Acid Solution

Ex2) Find the pH of a 1.5 M HCN solution.



Step 1. Find  $[\text{H}^+]$  with an ICE chart

	[HCN]	[H <sup>+</sup> ]	[CN <sup>-</sup> ]
I			
C			
E			

### Ex2) Calculating pH for a Weak Acid Solution (cont.)

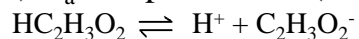
Step 2. Find the pH with  $[\text{H}^+]$

Ex3)  $K_a$  and pH with % Dissociation

Ex 3) Acetic acid,  $\text{HC}_2\text{H}_3\text{O}_2$ , experiences 0.767% dissociation in a 0.300 M solution at 25°C. Find  $K_a$  for acetic acid at 25°C and the pH of the solution.

Step 1. Find  $K_a$

	$[\text{HC}_2\text{H}_3\text{O}_2]$	$[\text{H}^+]$	$[\text{C}_2\text{H}_3\text{O}_2^-]$
I			
C			
E			

Ex3)  $K_a$  and pH with % (cont.)

Step 2. Find pH

## Polyprotic Acids

Polyprotic acids can donate more than one  $\text{H}^+$  in a solution.

e.g.  $\text{H}_2\text{SO}_4$  and  $\text{H}_2\text{CO}_3$

↑                      ↑  
Sulfuric acid      Carbonic Acid

## Polyprotic Acids

Polyprotic acids have a different  $K_a$  value for each possible dissociation.



## Polyprotic Acids

$$(K_{a1} = 4.3 \times 10^{-7}) \gg (K_{a2} = 5.6 \times 10^{-11})$$

Always use  $K_{a1}$  to calculate  $[\text{H}^+]$  and pH.

- Most of the  $\text{H}^+$  ions come from the first dissociation.
- The  $\text{H}^+$  ions from the first dissociation drive the equilibrium(s) for the other dissociations to the left.