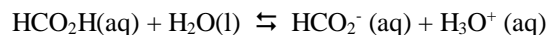


ANSWER TO "TRY YOURSELF" PROBLEM FROM STUDY SECTION 9.1

Try Yourself 9.1

- a) You have a 0.30 M solution of formic acid (HCO_2H). Calculate the pH of the formic acid solution. K_a for formic acid = 1.8×10^{-4} at 25°C .
- b) You add enough sodium formate (NaHCO_2) to make the solution 0.10 M in the salt. Calculate the pH of the solution after adding the salt.

Answer to a:



	$[\text{HCO}_2\text{H}]$	$[\text{HCO}_2^-]$	$[\text{H}_3\text{O}^+]$
I (M)	0.30	0	0
C (M)	-x	+x	+x
E (M)	$0.30 - x$	x	x

Replace the equilibrium concentrations into the equilibrium constant expression for K_a

$$K_a = 1.8 \times 10^{-4} = x^2 / 0.3 - x$$

$$x = [\text{H}_3\text{O}^+] = 7.35 \times 10^{-3} \text{ M}$$

$$\text{pH} = -\log 7.35 \times 10^{-3} = \underline{2.13}$$

Answer to b:

Common ion = HCO_2^-

	$[\text{HCO}_2\text{H}]$	$[\text{HCO}_2^-]$	$[\text{H}_3\text{O}^+]$
I (M)	0.30	0.1	0
C (M)	-x	+x	+x
E (M)	$0.30 - x$	$0.1 + x$	x

Replace equilibrium concentrations into equilibrium constant expression for K_a

$$K_a = 1.8 \times 10^{-4} = (0.1)x / 0.3$$

$$x = [\text{H}_3\text{O}^+] = 5.40 \times 10^{-4} \text{ M}$$

$$\text{pH} = -\log 5.40 \times 10^{-4} = \underline{3.27}$$