

Answer on Question #41127 - Chemistry – Other

Question:

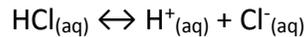
pH values of 0.1 M HCL and 0.1 M CH₃COOH are

Answer:

1. pH equals:

$$\text{pH} = -\lg [\text{H}^+]$$

HCl is a strong acid and it fully dissociates in water:



We see that concentration of HCl equals H⁺ ion concentration. Therefore H⁺ ion concentration is:

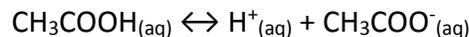
$$[\text{H}^+] = \text{C}(\text{HCl}) = 0.1 \text{ M} = 0.1 \text{ mol/L}$$

pH value of 0.1 M HCl is:

$$\text{pH} = -\lg (0.1) = 1$$

2. Acetic acid CH₃COOH ionizes partially, so we need the pKa or Ka value of acetic acid.

Dissociation of CH₃COOH:



Ka is dissociation constant which is concentration of product/concentration of reactant:

$$K_a = [\text{CH}_3\text{COO}^-] * [\text{H}^+] / [\text{CH}_3\text{COOH}]$$

After partial dissociation, [CH₃COOH] is still approximately 0.1M, and [CH₃COO⁻] = [H⁺].

Ka of CH₃COOH = 1.74 * 10⁻⁵ (from data book). Then H⁺ ion concentration equals:

$$1.74 * 10^{-5} = [\text{H}^+]^2 / 0.1$$

$$[\text{H}^+]^2 = 1.74 * 10^{-5} * 0.1$$

$$[\text{H}^+]^2 = 1.74 * 10^{-6}$$

$$[\text{H}^+] = 1.32 * 10^{-3}$$

pH value of 0.1 M CH₃COOH is:

$$\text{pH} = -\lg (1.32 * 10^{-3}) = 2.88$$

Answer: 1. pH = 1

2. pH = 2.88