Answer on the question #61140, Chemistry / Other
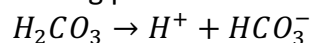
Question:

Calculate the pH for the following solutions of weak acids and bases, make sure you know if you are dealing with an acid or a base.

0.051 M H2CO3 (Ka = 4.5 * 10-7) pH

Solution:

H2CO3 is an acid, it dissociates, producing proton:
$$H_2CO_3 \rightarrow H^+ + HCO_3^-$$
The equilibrium constant of this reaction is:
$$K_a = \frac{[H^+][HCO_3^-]}{[H_2CO_3]},$$
where the values in square brackets are concentrations of particles. As $[H^+]$ is equal to $[HCO_3^-]$, we can write:
$$[H^+]^2 = K_a \cdot [H_2CO_3] = 4.5 \cdot 10^{-7} \cdot 0.051 = 0.23 \cdot 10^{-7}$$
Then, pH of the solution is:
$$pH = -\log([H^+]) = -0.5 \cdot \log(0.23 \cdot 10^{-7}) = 3.82$$

Answer: pH of the solution is 3.82