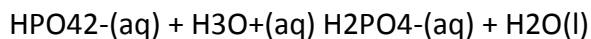


Answer on Question #63367, Chemistry / General Chemistry

The pH of a 0.0745 M solution of a weak acid is 2.706. What is the K_a of the acid?

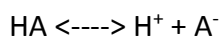
What is K_{eq} for the following reaction:



Some possibly useful equilibrium constants are: 0.0070, 6.3×10^{-8} , and 4.8×10^{-13} , for the K_{a1} , K_{a2} , and K_{a3} of phosphoric acid.

Solution:

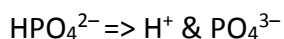
$$[\text{H}^+] = 10^{-2.706} = 0.001968 \text{ M}$$



$$[\text{H}^+] = [\text{A}^-] = 0.001968 \text{ M}$$

$$[\text{HA}] = 0.0745 - 0.001968 = 0.0725 \text{ M}$$

$$K_a = \frac{(0.001968)^2}{0.0725} = 5.30 \times 10^{-5}$$



$$K_{a3} = \frac{[\text{H}^+][\text{PO}_4^{3-}]}{[\text{HPO}_4^{2-}]}$$

$$\text{Whose } K_{a3} = 4.8 \times 10^{-13}$$

The reverse of the ionization of water

$$K_w = \frac{[\text{H}_2\text{O}]}{[\text{H}^+][\text{OH}^-]}$$

$$\text{Whose } K_w = 1 \times 10^{-14}$$

So

$$K_{eq} = K_{a3} / K_w$$

$$K_{eq} = 4.8 \times 10^{-13} / 1 \times 10^{-14}$$

$$K_{eq} = 48$$

Answer: 5.30×10^{-5} and 48