Answer on Question #57365 - Chemistry - Physical chemistry
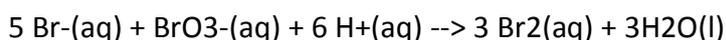
Question:

A study of the reaction of bromide ion with bromate ion under acidic conditions, gave the following data:

reaction time(s) [Br-](mol L-1)

0.0 1.50 x 10-2

90.0 3.49 x 10-3

5 Br-(aq) + BrO3-(aq) + 6 H+(aq) --> 3 Br2(aq) + 3H2O(l)

If the initial concentration of H+(aq) for the experiment is 0.100 mol L-1 and the initial rate is 5.00 x 10-5 M s-1, calculate the concentration of H+(aq) after 20.0 seconds of reaction time, assuming that there is a negligible change in the rate of reaction.

Solution

The expression of average reaction rate for this reaction is:

$$v = -\frac{\Delta[BrO_3^-]}{\Delta t} = -\frac{\Delta[Br^-]}{5\Delta t} = -\frac{\Delta[H^+]}{6\Delta t};$$

$$\Delta[H^+] = -6v\Delta t;$$

$$[H^+] = 0.100 - 6v\Delta t;$$

$$[H^+] = 0.100 - 6 \times 5.00 \times 10^{-5} \times 20 = 0.094 \, M.$$

Answer: 0.094 M.