

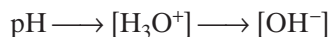
SAMPLE PROBLEM EFor more help, go to the *Math Tutor* at the end of this chapter.

The pH of a solution is measured and determined to be 7.52.

- a. What is the hydronium ion concentration? c. Is the solution acidic or basic?
 b. What is the hydroxide ion concentration?

SOLUTION**1 ANALYZE**

Given: pH of the solution = 7.52

Unknown: a. $[\text{H}_3\text{O}^+]$ b. $[\text{OH}^-]$ c. Is the solution acidic or basic?**2 PLAN**

This problem is very similar to previous pH problems. You will need to substitute values into the $\text{pH} = -\log [\text{H}_3\text{O}^+]$ equation and use a calculator. Once the $[\text{H}_3\text{O}^+]$ is determined, the ion-product constant $[\text{H}_3\text{O}^+][\text{OH}^-] = 1.0 \times 10^{-14}$ may be used to calculate $[\text{OH}^-]$.

3 COMPUTE

a. $\text{pH} = -\log [\text{H}_3\text{O}^+]$

$\log [\text{H}_3\text{O}^+] = -\text{pH}$

$[\text{H}_3\text{O}^+] = \text{antilog}(-\text{pH}) = \text{antilog}(-7.52) = 1.0 \times 10^{-7.52} = 3.0 \times 10^{-8} \text{ M } \text{H}_3\text{O}^+$

On most calculators, this is entered in one of the following two ways.

$$\boxed{7} \boxed{.} \boxed{5} \boxed{2} \boxed{+/-} \boxed{2^{\text{nd}}} \boxed{10^x} \quad \text{or} \quad \boxed{7} \boxed{.} \boxed{5} \boxed{2} \boxed{+/-} \boxed{2^{\text{nd}}} \boxed{\text{LOG}}$$

b. $[\text{H}_3\text{O}^+][\text{OH}^-] = 1.0 \times 10^{-14}$

$$[\text{OH}^-] = \frac{1.0 \times 10^{-14}}{[\text{H}_3\text{O}^+]}$$

$$= \frac{1.0 \times 10^{-14}}{3.0 \times 10^{-8}} = 3.3 \times 10^{-7} \text{ M } \text{OH}^-$$

- c. A pH of 7.52 is slightly greater than a pH of 7. This means that the solution is slightly basic.

4 EVALUATE

Because the solution is slightly basic, a hydroxide ion concentration slightly larger than 10^{-7} M is predicted. A hydronium ion concentration slightly less than 10^{-7} M is also predicted. The answers agree with these predictions.

PRACTICE

Answers in Appendix E

- The pH of a solution is determined to be 5.0. What is the hydronium ion concentration of this solution?
- The pH of a solution is determined to be 12.0. What is the hydronium ion concentration of this solution?
- The pH of an aqueous solution is measured as 1.50. Calculate the $[\text{H}_3\text{O}^+]$ and the $[\text{OH}^-]$.
- The pH of an aqueous solution is 3.67. Determine $[\text{H}_3\text{O}^+]$.

extension

Go to **go.hrw.com** for more practice problems that ask you to calculate hydronium ion concentration.



Keyword: HC6ABTX