

## ANSWER KEY

## EXTRA PRACTICE: pH &amp; pOH

Name: \_\_\_\_\_

1. What is  $[\text{OH}^-]$  in saturated limewater if  $[\text{H}_3\text{O}^+] = 3.98 \times 10^{-13} \text{M}$ ? Is limewater acidic, basic, or neutral?

$$[\text{OH}^-] = \frac{K_w}{[\text{H}^+]} \rightarrow [\text{OH}^-] = \frac{1.0 \text{E-}14 \text{M}}{3.98 \text{E-}13 \text{M}}$$

$$[\text{OH}^-] = 0.0251 \text{M} \rightarrow [\text{OH}^-] > [\text{H}^+] \therefore \text{Basic}$$

2. What is  $[\text{H}_3\text{O}^+]$  in a wheat flour-and-water solution if  $[\text{OH}^-] = 1.0 \times 10^{-8} \text{M}$ ? Is wheat flour-and-water acidic, basic, or neutral?

$$[\text{H}^+] = \frac{K_w}{[\text{OH}^-]} \rightarrow [\text{H}^+] = \frac{1.0 \text{E-}14 \text{M}}{1.0 \text{E-}8 \text{M}}$$

$$[\text{H}^+] = 1.0 \text{E-}6 \text{M} \rightarrow [\text{H}^+] > [\text{OH}^-] \therefore \text{Acidic}$$

3. What is  $[\text{OH}^-]$  in a potato-and-water solution if  $[\text{H}_3\text{O}^+] = 1.6 \times 10^{-6} \text{M}$ ? Is potato-and-water acidic, basic, or neutral?

$$[\text{OH}^-] = \frac{K_w}{[\text{H}^+]} \rightarrow [\text{OH}^-] = \frac{1.0 \text{E-}14 \text{M}}{1.6 \text{E-}6 \text{M}}$$

$$[\text{OH}^-] = 6.25 \text{E-}9 \text{M} \rightarrow [\text{OH}^-] < [\text{H}^+] \therefore \text{Acidic}$$

4. What is  $[\text{H}_3\text{O}^+]$  in a solution of 0.1M ammonia if  $[\text{OH}^-] = 1.26 \times 10^{-3} \text{M}$ ? Is ammonia acidic, basic, or neutral?

$$[\text{H}^+] = \frac{K_w}{[\text{OH}^-]} \rightarrow [\text{H}^+] = \frac{1.0 \text{E-}14 \text{M}}{1.26 \text{E-}3 \text{M}}$$

$$[\text{H}^+] = 7.94 \text{E-}12 \text{M} \rightarrow [\text{H}^+] < [\text{OH}^-] \therefore \text{Basic}$$

5. What is  $[\text{OH}^-]$  in a pat of butter if  $[\text{H}_3\text{O}^+] = 6.0 \times 10^{-7} \text{M}$ ? Is butter acidic, basic, or neutral?

$$[\text{OH}^-] = \frac{K_w}{[\text{H}^+]} \rightarrow [\text{OH}^-] = \frac{1.0 \text{E-}14 \text{M}}{6.0 \text{E-}7 \text{M}}$$

$$[\text{OH}^-] = 1.67 \text{E-}8 \text{M} \rightarrow [\text{OH}^-] < [\text{H}^+] \therefore \text{Acidic}$$

6. What is  $[\text{H}_3\text{O}^+]$  in canned peaches if  $[\text{OH}^-] = 3.16 \times 10^{-11} \text{M}$ ? Are peaches acidic, basic, or neutral?

$$[\text{H}^+] = \frac{K_w}{[\text{OH}^-]} \rightarrow [\text{H}^+] = \frac{1.0 \text{E-}14 \text{M}}{3.16 \text{E-}11 \text{M}}$$

$$[\text{H}^+] = 3.16 \text{E-}4 \text{M} \rightarrow [\text{H}^+] > [\text{OH}^-] \therefore \text{Acidic}$$

7. What is  $[\text{OH}^-]$  in a sample of 0.1M borax if  $[\text{H}_3\text{O}^+] = 6.31 \times 10^{-10} \text{M}$ ? Is borax acidic, basic, or neutral?

$$[\text{OH}^-] = \frac{K_w}{[\text{H}^+]} \rightarrow [\text{OH}^-] = \frac{1.0 \text{E-}14 \text{M}}{6.31 \text{E-}10 \text{M}}$$

$$[\text{OH}^-] = 1.58 \text{E-}5 \text{M} \rightarrow [\text{OH}^-] > [\text{H}^+] \therefore \text{Basic}$$

8. What is  $[\text{H}_3\text{O}^+]$  in farm fresh eggs if  $[\text{OH}^-] = 6.5 \times 10^{-7} \text{M}$ ? Are eggs acidic, basic, or neutral?

$$[\text{H}^+] = \frac{K_w}{[\text{OH}^-]} \rightarrow [\text{H}^+] = \frac{1.0 \text{E-}14 \text{M}}{6.5 \text{E-}7 \text{M}}$$

$$[\text{H}^+] = 1.54 \text{E-}8 \text{M} \rightarrow [\text{H}^+] < [\text{OH}^-] \therefore \text{Basic}$$

9. What is  $[\text{OH}^-]$  in 0.1M bicarbonate of soda if  $[\text{H}_3\text{O}^+] = 3.98 \times 10^{-9} \text{M}$ ? Is bicarbonate of soda acidic, basic, or neutral?

$$[\text{OH}^-] = \frac{K_w}{[\text{H}^+]} \rightarrow [\text{OH}^-] = \frac{1.0 \text{E-}14 \text{M}}{3.98 \text{E-}9 \text{M}}$$

$$[\text{OH}^-] = 2.51 \text{E-}6 \text{M} \rightarrow [\text{OH}^-] > [\text{H}^+] \therefore \text{Basic}$$

10. During the course of the day, human saliva varies between being acidic and basic. What is  $[\text{H}_3\text{O}^+]$  in "morning" saliva if  $[\text{OH}^-] = 3.16 \times 10^{-8} \text{M}$ ? Is saliva at this point acidic, basic, or neutral?

$$[\text{H}^+] = \frac{K_w}{[\text{OH}^-]} \rightarrow [\text{H}^+] = \frac{1.0 \text{E-}14 \text{M}}{3.16 \text{E-}8 \text{M}}$$

$$[\text{H}^+] = 3.16 \text{E-}7 \text{M} \rightarrow [\text{H}^+] > [\text{OH}^-] \therefore \text{Acidic}$$

11. Analysis of maple syrup reveals that  $[\text{OH}^-]$  is  $5.0 \times 10^{-8}\text{M}$ . What is the pH of the syrup and is it acidic, basic, or neutral?

$$\textcircled{1} \text{pOH} = -\log [5.0 \times 10^{-8}\text{M}]$$
$$\text{pOH} = 7.30$$

$$\textcircled{2} \text{pH} = 14 - 7.30$$

$$\text{pH} = 6.70 \rightarrow \text{Acidic}$$

12. In a sample of bananas and water,  $[\text{H}_3\text{O}^+]$  is found to be  $2.51 \times 10^{-5}\text{M}$ . What is the pH of the sample and is it acidic, basic, or neutral?

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

$$\text{pH} = -\log [2.51 \times 10^{-5}\text{M}]$$

$$\text{pH} = 4.60 \rightarrow \text{Acidic}$$

13. A sample of vinegar is found to have  $[\text{OH}^-] = 7.94 \times 10^{-12}\text{M}$ . What is the pH of the vinegar and is it acidic, basic, or neutral?

$$\textcircled{1} \text{pOH} = -\log [7.94 \times 10^{-12}\text{M}]$$

$$\text{pOH} = 11.1$$

$$\textcircled{2} \text{pH} = 14 - 11.1$$

$$\text{pH} = 2.90 \rightarrow \text{Acidic}$$

14. A sample of human blood plasma is found to have  $[\text{H}_3\text{O}^+] = 3.72 \times 10^{-8}\text{M}$ . What is the pH of the plasma and is it acidic, basic, or neutral?

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

$$\text{pH} = -\log [3.72 \times 10^{-8}\text{M}]$$

$$\text{pH} = 7.43 \rightarrow \text{Basic}$$

15. In a sample of saturated magnesia,  $[\text{OH}^-] = 3.22 \times 10^{-4}\text{M}$ . What is the pH of the magnesia and is it acidic, basic, or neutral?

$$\textcircled{1} \text{pOH} = -\log [3.22 \times 10^{-4}\text{M}]$$

$$\text{pOH} = 3.49$$

$$\textcircled{2} \text{pH} = 14 - 3.49$$

$$\text{pH} = 10.5 \rightarrow \text{Basic}$$

16. Crushed tomatoes are found to have  $[\text{H}_3\text{O}^+]$  of  $6.2 \times 10^{-5}\text{M}$ . What is the pH of the tomatoes and is it acidic, basic, or neutral?

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

$$\text{pH} = -\log [6.2 \times 10^{-5}\text{M}]$$

$$\text{pH} = 4.21 \rightarrow \text{Acidic}$$

17. A saturated solution of calcium carbonate has  $[\text{OH}^-]$  of  $2.44 \times 10^{-4}\text{M}$ . What is the pH of the solution and is it acidic, basic, or neutral?

$$\textcircled{1} \text{pOH} = -\log [2.44 \times 10^{-4}\text{M}]$$

$$\text{pOH} = 3.61$$

$$\textcircled{2} \text{pH} = 14 - 3.61$$

$$\text{pH} = 10.4 \rightarrow \text{Basic}$$

18. The  $[\text{H}_3\text{O}^+]$  in a urine specimen is measured to be  $6.3 \times 10^{-6}\text{M}$ . What is the pH of the specimen and is it acidic, basic, or neutral?

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

$$\text{pH} = -\log [6.3 \times 10^{-6}\text{M}]$$

$$\text{pH} = 5.20 \rightarrow \text{Acidic}$$

19. What is the pH of sour dill pickles if  $[\text{OH}^-] = 1.6 \times 10^{-10}\text{M}$ ? Is it acidic, basic, or neutral?

$$\textcircled{1} \text{pOH} = -\log [1.6 \times 10^{-10}\text{M}]$$

$$\text{pOH} = 9.80$$

$$\textcircled{2} \text{pH} = 14 - 9.80$$

$$\text{pH} = 4.20 \rightarrow \text{Acidic}$$

20. The  $[\text{OH}^-]$  of a popular soft drink is measured and found to be  $4.11 \times 10^{-9}\text{M}$ . What is the pH of the soft drink and is it acidic, basic, or neutral?

$$\textcircled{1} \text{pOH} = -\log [4.11 \times 10^{-9}\text{M}]$$

$$\text{pOH} = 8.39$$

$$\textcircled{2} \text{pH} = 14 - 8.39$$

$$\text{pH} = 5.61 \rightarrow \text{Acidic}$$