

Chapter 16

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) What is the conjugate acid of NH_3 ? 1) _____
A) NH_3^+ B) NH_4OH C) NH_2^+ D) NH_3 E) NH_4^+
- 2) The conjugate base of HSO_4^- is 2) _____
A) HSO_4^+ B) H_3SO_4^+ C) OH^- D) H_2SO_4 E) SO_4^{2-}
- 3) The conjugate acid of HSO_4^- is 3) _____
A) SO_4^{2-} B) H^+ C) HSO_4^+ D) HSO_3^+ E) H_2SO_4
- 4) What is the conjugate base of OH^- ? 4) _____
A) O^- B) H_2O C) H_3O^+ D) O^{2-} E) O_2
- 5) What is the pH of an aqueous solution at 25.0°C in which $[\text{H}^+]$ is 0.00250 M ? 5) _____
A) -2.60 B) -3.40 C) 2.60 D) 3.40 E) 2.25
- 6) What is the pH of an aqueous solution at 25.0°C in which $[\text{OH}^-]$ is 0.00250 M ? 6) _____
A) +2.60 B) -2.60 C) +11.4 D) -11.4 E) -2.25
- 7) What is the pH of an aqueous solution at 25.0°C that contains $3.98 \times 10^{-9}\text{ M}$ hydronium ion? 7) _____
A) 5.60 B) 7.00 C) 8.40 D) 9.00 E) 3.98
- 8) What is the pH of an aqueous solution at 25.0°C that contains $3.98 \times 10^{-9}\text{ M}$ hydroxide ion? 8) _____
A) 5.60 B) 9.00 C) 7.00 D) 3.98 E) 8.40
- 9) What is the concentration (in M) of hydronium ions in a solution at 25.0°C with $\text{pH} = 4.282$? 9) _____
A) 4.28
B) 5.22×10^{-5}
C) 1.92×10^{-10}
D) 9.71
E) 1.66×10^4

- 10) What is the concentration (in M) of hydroxide ions in a solution at 25.0 °C with pH = 4.282? 10) _____
- A) 9.72
B) 1.66×10^4
C) 5.22×10^{-5}
D) 1.91×10^{-10}
E) 4.28
- 11) Calculate the pOH of a solution at 25.0 °C that contains 1.94×10^{-10} M hydronium ions. 11) _____
- A) 1.94 B) 7.00 C) 9.71 D) 4.29 E) 14.0
- 12) Calculate the concentration (in M) of hydronium ions in a solution at 25.0 °C with a pOH of 4.223. 12) _____
- A) 5.99×10^{-19}
B) 5.98×10^{-5}
C) 1.00×10^{-7}
D) 1.67×10^{-10}
E) 1.67×10^4
- 13) What is the pH of a 0.0150 M aqueous solution of barium hydroxide? 13) _____
- A) 10.4 B) 1.52 C) 12.2 D) 12.5 E) 1.82
- 14) What is the pOH of a 0.0150 M solution of barium hydroxide? 14) _____
- A) 12.2 B) 10.4 C) 1.82 D) 12.5 E) 1.52
- 15) An aqueous solution contains 0.100 M NaOH at 25.0 °C. The pH of the solution is _____. 15) _____
- A) 1.00 B) -1.00 C) 7.00 D) 13.0 E) 0.100
- 16) HZ is a weak acid. An aqueous solution of HZ is prepared by dissolving 0.020 mol of HZ in sufficient water to yield 1.0 L of solution. The pH of the solution was 4.93 at 25.0 °C. The K_a of HZ is _____. 16) _____
- A) 9.9×10^{-2}
B) 1.2×10^{-5}
C) 2.8×10^{-12}
D) 6.9×10^{-9}
E) 1.4×10^{-10}
- 17) The pH of a 0.55 M aqueous solution of hypobromous acid, HBrO, at 25.0 °C is 4.48. What is the value of K_a for HBrO? 17) _____
- A) 1.1×10^{-9} B) 3.3×10^{-5} C) 2.0×10^{-9} D) 3.0×10^4 E) 6.0×10^{-5}

- 18) A 0.15 M aqueous solution of the weak acid HA at 25.0 °C has a pH of 5.35. The value of K_a for HA is _____. 18) _____
- A) 3.0×10^{-5}
 B) 3.3×10^4
 C) 7.1×10^{-9}
 D) 1.4×10^{-10}
 E) 1.8×10^{-5}
- 19) The K_a of hypochlorous acid (HClO) is 3.00×10^{-8} at 25.0 °C. Calculate the pH of a 0.0385 M hypochlorous acid solution. 19) _____
- A) 8.94 B) 4.47 C) 7.52 D) 1.41 E) -1.41
- 20) The K_a of hypochlorous acid (HClO) is 3.00×10^{-8} . What is the pH at 25.0 °C of an aqueous solution that is 0.0200 M in HClO? 20) _____
- A) +2.45 B) -2.45 C) -9.22 D) +9.22 E) +4.61
- 21) The K_a of hydrofluoric acid (HF) at 25.0 °C is 6.8×10^{-4} . What is the pH of a 0.35 M aqueous solution of HF? 21) _____
- A) 12 B) 3.6 C) 1.8 D) 0.46 E) 3.2
- 22) The K_a of hydrazoic acid (HN₃) is 1.9×10^{-5} at 25.0 °C. What is the pH of a 0.35 M aqueous solution of HN₃? 22) _____
- A) 2.4 B) 11 C) 5.2 D) -2.4 E) 2.6
- 23) The acid-dissociation constants of sulfurous acid (H₂SO₃) are $K_{a1} = 1.7 \times 10^{-2}$ and $K_{a2} = 6.4 \times 10^{-8}$ at 25.0 °C. Calculate the pH of a 0.163 M aqueous solution of sulfurous acid. 23) _____
- A) 1.8 B) 1.3 C) 1.4 D) 4.5 E) 7.2
- 24) The acid-dissociation constants of phosphoric acid (H₃PO₄) are $K_{a1} = 7.5 \times 10^{-3}$, $K_{a2} = 6.2 \times 10^{-8}$, and $K_{a3} = 4.2 \times 10^{-13}$ at 25.0 °C. What is the pH of a 2.5 M aqueous solution of phosphoric acid? 24) _____
- A) 0.87 B) 0.13 C) 1.8 D) 2.5 E) 0.40

- 25) The acid-dissociation constants of phosphoric acid (H_3PO_4) are $K_{a1} = 7.5 \times 10^{-3}$, $K_{a2} = 6.2 \times 10^{-8}$, and $K_{a3} = 4.2 \times 10^{-13}$ at 25.0°C . What is the molar concentration of phosphate ion in a 2.5 M aqueous solution of phosphoric acid? 25) _____
- A) 0.13
 B) 2.5×10^{-5}
 C) 8.2×10^{-9}
 D) 9.1×10^{-5}
 E) 2.0×10^{-19}
- 26) The acid-dissociation constant for chlorous acid, HClO_2 , at 25.0°C is 1.0×10^{-2} . Calculate the concentration of H^+ if the initial concentration of acid is 0.10 M. 26) _____
- A) 1.0×10^{-3} B) 1.0×10^{-2} C) 3.7×10^{-2} D) 2.7×10^{-2} E) 3.2×10^{-2}
- 27) The pH of a 0.10 M solution of a weak base is 9.82. What is the K_b for this base? 27) _____
- A) 2.1×10^{-4} B) 4.3×10^{-8} C) 6.6×10^{-4} D) 2.0×10^{-5} E) 8.8×10^{-8}
- 28) Calculate the pH of a 0.500 M aqueous solution of NH_3 . The K_b of NH_3 is 1.77×10^{-5} . 28) _____
- A) 11.5 B) 2.52 C) 5.05 D) 3.01 E) 8.95
- 29) Determine the pH of a 0.35 M aqueous solution of CH_3NH_2 (methylamine). The K_b of methylamine is 4.4×10^{-4} . 29) _____
- A) 10 B) 13 C) 1.9 D) 3.8 E) 12
- 30) An aqueous solution contains 0.050 M of methylamine. The concentration of hydroxide ion in this solution is _____ M. K_b for methylamine is 4.4×10^{-4} . 30) _____
- A) 4.7×10^{-3}
 B) 2.2×10^{-5}
 C) 4.5×10^{-3}
 D) 0.050
 E) -4.9×10^{-3}
- 31) The acid-dissociation constant, K_a , for gallic acid is 4.57×10^{-3} . What is the base-dissociation constant, K_b , for the gallate ion? 31) _____
- A) 7.81×10^{-6}
 B) 4.57×10^{-3}
 C) 2.19×10^2
 D) 2.19×10^{-12}
 E) 5.43×10^{-5}

- 32) The base-dissociation constant, K_b , for pyridine, C_5H_5N , is 1.4×10^{-9} . The acid-dissociation constant, K_a , for the pyridinium ion, $C_5H_5NH^+$, is _____. 32) _____
- A) 7.1×10^{-4}
B) 1.0×10^{-7}
C) 7.1×10^{-6}
D) 1.4×10^{-23}
E) 1.4×10^{-5}
- 33) The K_a for HCN is 4.9×10^{-10} . What is the value of K_b for CN^- ? 33) _____
- A) 4.9×10^{-24}
B) 2.0×10^{-5}
C) 2.0×10^9
D) 4.0×10^{-6}
E) 4.9×10^4
- 34) K_a for HF is 7.0×10^{-4} . K_b for the fluoride ion is _____. 34) _____
- A) 7.0×10^{-4}
B) 1.4×10^{-11}
C) 1.4×10^3
D) 2.0×10^{-8}
E) 7.0×10^{-18}
- 35) Calculate the pOH of a 0.0827 M aqueous sodium cyanide solution at 25.0 °C. K_b for CN^- is 4.9×10^{-10} . 35) _____
- A) 5.2 B) 8.8 C) 10 D) 9.3 E) 1.1
- 36) Determine the pH of a 0.15 M aqueous solution of KF. For hydrofluoric acid, $K_a = 7.0 \times 10^{-4}$. 36) _____
- A) 5.8 B) 2.3 C) 6.6 D) 12 E) 8.2
- 37) Calculate the pH of 0.726 M anilinium hydrochloride ($C_6H_5NH_3Cl$) solution in water, given that K_b for aniline is 3.83×10^{-4} . 37) _____
- A) 1.77 B) 12.2 C) 8.64 D) 12.4 E) 5.36
- 38) K_b for NH_3 is 1.8×10^{-5} . What is the pH of a 0.35 M aqueous solution of NH_4Cl at 25.0 °C? 38) _____
- A) 9.1 B) 11 C) 4.3 D) 4.9 E) 9.7

- 39) The K_a for formic acid (HCO_2H) is 1.8×10^{-4} . What is the pH of a 0.35 M aqueous solution of sodium formate (NaHCO_2)? 39) _____
- A) 5.4 B) 11 C) 3.3 D) 8.6 E) 4.2
- 40) K_a for HCN is 4.9×10^{-10} . What is the pH of a 0.068 M aqueous solution of sodium cyanide? 40) _____
- A) 2.9 B) 0.74 C) 7.0 D) 13 E) 11
- 41) K_a for HX is 7.5×10^{-12} . What is the pH of a 0.15 M aqueous solution of NaX? 41) _____
- A) 7.9 B) 6.0 C) 1.9 D) 12 E) 8.0
- 42) The pH of a 0.15 M aqueous solution of NaZ (the sodium salt of HZ) is 10.7. What is the K_a for HZ? 42) _____
- A) 1.6×10^{-6}
B) 1.3×10^{-12}
C) 6.0×10^{-9}
D) 3.3×10^{-8}
E) 8.9×10^{-4}

Answer Key

Testname: CHAPTER 16. PRACTICE QUESTIONS

- 1) E
- 2) E
- 3) E
- 4) D
- 5) C
- 6) C
- 7) C
- 8) A
- 9) B
- 10) D
- 11) D
- 12) D
- 13) D
- 14) E
- 15) D
- 16) D
- 17) C
- 18) D
- 19) B
- 20) E
- 21) C
- 22) E
- 23) C
- 24) A
- 25) E
- 26) D
- 27) B
- 28) A
- 29) E
- 30) C
- 31) D
- 32) C
- 33) B
- 34) B
- 35) A
- 36) E
- 37) E
- 38) D
- 39) D
- 40) E
- 41) D
- 42) C