

Chapter 15 Pool Questions

- Which of the following statements does not accurately describe a characteristic property of an Arrhenius acid?
 - An Arrhenius acid is a substance that increases the concentration of hydronium ion in water.
 - An Arrhenius acid reacts with a base to produce a salt and water.
 - An Arrhenius acid turns red litmus blue.
 - An Arrhenius acid tastes sour.
 - An Arrhenius acid neutralizes a base.

- Which of the following statements is incorrect?
 - An Arrhenius base is an electron-pair acceptor.
 - An Arrhenius acid increases the concentration of hydronium ion.
 - A Brønsted–Lowry base is a proton acceptor.
 - A Brønsted–Lowry acid is a proton donor.
 - Acids tend to be sour, and bases tend to be bitter.

- Which of the following species is not capable of acting as an Arrhenius acid?
 - H_2SO_3
 - HSO_3^-
 - SO_3^{2-}
 - H_2O
 - H_3O^+

- What is a conjugate acid–base pair for the following equilibrium?
$$\text{H}_2\text{O}(l) + \text{HPO}_4^{2-}(aq) \rightleftharpoons \text{H}_2\text{PO}_4^-(aq) + \text{OH}^-(aq)$$
 - H_2O is an acid and OH^- is its conjugate base.
 - H_2O is an acid and HPO_4^{2-} is its conjugate base.
 - HPO_4^{2-} is an acid and OH^- is its conjugate base.
 - HPO_4^{2-} is an acid and H_2PO_4^- is its conjugate base.
 - HPO_4^{2-} is an acid and H_2O is its conjugate base.

- What is the conjugate base of $\text{H}_2\text{PO}_4^-(aq)$?
 - H_3O^+
 - H_3PO_4
 - HPO_4^{2-}
 - H_3P
 - PO_4^{3-}

6. Which of the following species cannot act as a Lewis base?
- S^{2-}
 - SH^-
 - Al^{3+}
 - H_2O
 - H_2S
7. Which of the following species cannot act as a Lewis acid?
- K^+
 - Mg^{2+}
 - Al^{3+}
 - H^+
 - H^-
8. The acid strength decreases in the series $HBr > HSO_4^- > CH_3COOH > HCN > HCO_3^-$. Which of the following is the strongest base?
- CO_3^{2-}
 - CN^-
 - CH_3COO^-
 - SO_4^{2-}
 - Br^-
9. Which is the Bronsted strongest acid?
- BH_3
 - CH_4
 - NH_3
 - H_2O
 - HF
10. Rank H_3PO_4 , $H_2PO_4^-$, and HPO_4^{2-} in order of increasing acid strength.
- $H_3PO_4 < H_2PO_4^- < HPO_4^{2-}$
 - $H_2PO_4^- < HPO_4^{2-} < H_3PO_4$
 - $HPO_4^{2-} < H_2PO_4^- < H_3PO_4$
 - $H_2PO_4^- < H_3PO_4 < HPO_4^{2-}$
 - $HPO_4^{2-} < H_3PO_4 < H_2PO_4^-$
11. The ionization constant of water at a temperature above $25^\circ C$ is 3.3×10^{-14} . What is the pH of pure water at this temperature?
- $$2H_2O(l) \rightleftharpoons H_3O^+(aq) + OH^-(aq)$$
- 13.52
 - 6.74
 - 7.00
 - 7.74
 - 5.54

12. What is the equilibrium concentration of amide ion (NH_2^-) in liquid ammonia at 25°C ? ("am" = dissolved in ammonia)
 $2\text{NH}_3(l) \rightleftharpoons \text{NH}_4^+(am) + \text{NH}_2^-(am); K_c = 1.8 \times 10^{-24}$ at 25°C
- $3.6 \times 10^{-24} M$
 - $1.8 \times 10^{-24} M$
 - $9.0 \times 10^{-25} M$
 - $2.6 \times 10^{-12} M$
 - $1.3 \times 10^{-12} M$
13. A solution has a hydroxide-ion concentration of $7.48 \times 10^{-5} M$. What is its hydronium-ion concentration?
 $[K_w = 1 \times 10^{-14}]$
- $1.00 \times 10^{-7} M$
 - $1.34 \times 10^{-10} M$
 - $7.48 \times 10^{-5} M$
 - $7.48 \times 10^{-19} M$
 - $1.00 \times 10^{-14} M$
14. What is the hydronium-ion concentration of a $0.0025 M \text{Ba}(\text{OH})_2$ solution?
- $2.0 \times 10^{-12} M$
 - $5.0 \times 10^{-3} M$
 - $2.5 \times 10^{-3} M$
 - $4.0 \times 10^{-12} M$
 - $1.0 \times 10^{-7} M$
15. Which of the following expressions is not equivalent to pH?
- $\log \frac{1}{[\text{H}^+(\text{aq})]}$
 - $14.0 - \text{pOH}$
 - $-\log [\text{H}^+(\text{aq})]$
 - $-\log \frac{K_w}{[\text{OH}^-]}$
 - $-\log K_w$
16. A solution in which the pOH is 12.5 would be described as
- very acidic.
 - slightly acidic.
 - neutral.
 - very basic.
 - slightly basic.
17. What is the pOH of a $0.047 M \text{HI}$ solution?
- 15.33
 - 1.33
 - 10.94
 - 12.67
 - 3.06

18. What is the pH of the final solution when 25 mL of 0.021 M HCl has been added to 35 mL of 0.037 M HCl at 25°C?
- a) 1.9
 - b) 1.5
 - c) 3.5
 - d) 3.3
 - e) 2.7
19. At 25°C, what is the pH of a 10.0 M HNO₃ solution?
- a) -1.0
 - b) 0.0
 - c) 1.0
 - d) 10.0
 - e) 14.0
20. What pH should a solution have if its pH is about the same as that of vinegar?
- a) about 1
 - b) about 3
 - c) about 6
 - d) about 8
 - e) about 11
21. A solution has a pH value of 3.36. What is the pOH for this solution?
- a) 10.64
 - b) 4.17
 - c) 7.00
 - d) 3.36
 - e) 4.37
22. Which solution has the highest pH?
- a) 0.1 M HCl
 - b) 0.1 M Ba(OH)₂
 - c) 0.1 M NH₃
 - d) 0.1 M CH₃COOH
 - e) 0.1 M NaOH
23. What is the pH of a 0.0041 M Ba(OH)₂ solution?
- a) 2.09
 - b) 11.61
 - c) 2.39
 - d) 9.20
 - e) 11.91

24. A solution has a hydronium-ion concentration of 0.0080 M . What is its pOH?
- 4.83
 - 2.10
 - 16.10
 - 11.90
 - 9.17
25. What is the pOH of a 0.024 M HNO_3 solution?
- 15.62
 - 1.62
 - 12.38
 - 10.27
 - 3.73
26. What is the pOH of a solution prepared by dissolving 0.578 g of $\text{KOH}(s)$ in 6.00 L of water?
- 2.765
 - 12.013
 - 1.987
 - 7.000
 - 11.235
27. Which of the following solutions has the highest hydroxide-ion concentration?
- 0.1 M HCl
 - $0.1\text{ M H}_2\text{SO}_4$
 - a buffer solution with $\text{pH} = 5$
 - a buffer solution with $\text{pOH} = 12$
 - pure water
28. The pOH of a solution is 5.30 . What is its hydronium-ion concentration?
- 5.30 M
 - $5.0 \times 10^{-6}\text{ M}$
 - $2.0 \times 10^{-9}\text{ M}$
 - $5.0 \times 10^{-3}\text{ M}$
 - $2.0 \times 10^5\text{ M}$
29. What is the hydroxide-ion concentration in a solution formed by combining $200.\text{ mL}$ of 0.16 M HCl with $300.\text{ mL}$ of 0.091 M NaOH at 25°C ?
- $$\text{HCl}(aq) + \text{NaOH}(aq) \rightarrow \text{NaCl}(aq) + \text{H}_2\text{O}(l)$$
- $1.1 \times 10^{-12}\text{ M}$
 - $1.6 \times 10^{-13}\text{ M}$
 - $1.0 \times 10^{-7}\text{ M}$
 - 0.055 M
 - 0.091 M

30. Which solution would cause blue litmus to turn red?

- a) a solution of pH 10
- b) a solution of pOH 4
- c) a solution of 0.10 *M* NaOH
- d) a solution of 0.01 *M* NH₃
- e) a solution of 0.005 *M* CH₃COOH

ANSWERS

Question	Answer
1	c
2	a
3	c
4	a
5	c
6	c
7	e
8	a
9	e
10	c
11	b
12	e
13	b
14	a
15	e
16	a
17	d
18	b
19	a
20	b
21	a
22	b
23	e
24	d
25	c
26	a
27	e
28	c
29	a
30	e