

Acid Unit: K_a , K_b , pH

1. An acid has a $K_a = 5.3 \times 10^{-10}$. Choose a statement that is **TRUE** for this acid.

a	This is a strong dilute acid.
b	The K_b for the conjugate base is 1.1×10^{-4}
c	This acid is a weaker acid than hydrocyanic acid.
d	This acid is a stronger acid than benzoic acid.

2. Unlike other hydrogen halides, HF(aq) is a weak acid. It has special properties that make it an excellent acid for etching glass. The pH of a 2.0×10^{-2} mol/L solution of HF(aq) at 25°C is _____

a	2.49
b	1.70
c	2.40
d	11.52

3. A weak acid has a _____ K_a and its conjugate base has a _____ K_b .

a	Small	Large
b	Small	Small
c	Large	Small
d	Large	Large

4. A weak base has a _____ K_b and its conjugate acid a _____ K_a

a	Small	Small
b	Small	Large
c	Large	Small
d	Large	Large

5. Choose the base and conjugate acid pair that have a K_b of 5.6×10^{-10} _____

a	$C_6H_5COO^-$ and C_6H_5COOH
b	CH_3COO^- and CH_3COOH
c	HSO_3^- and H_2SO_3
d	$HOCCOO^-$ and $HOCCOOH$

6. Choose the base and conjugate acid pair that have a K_b of 2.5×10^{-8} _____

a	$C_6H_6O_6^{2-}(aq)$ and $C_6H_6O_6^-$
b	$C_3H_5O(COO)_3^{3-}(aq)$ and $C_3H_5OCOOH(COO)_2^{2-}(aq)$
c	HF(aq) and $F^-(aq)$
d	HOCl(aq) and $OCl^-(aq)$

7. A solution of hydrocyanic acid has a pH of 4.80. The concentration of the HCN(aq) solution is _____ mol/L

a	0.16
b	0.25
c	0.41
d	0.65

8. A solution of formic acid has a pH of 2.03. The concentration of the HCOOH(aq) solution is _____ mol/L

a	0.49
b	0.0093
c	0.60
d	0.0087

9. A solution of lactic acid has a pH of 2.97. The concentration of the C₂H₅COOH(aq) solution is _____ mol/L

a	1.1×10^{-3}
b	5.3×10^{-3}
c	6.5×10^{-2}
d	9.3×10^{-3}

10. A solution of oxalic acid has a pH of 0.58. The concentration of the HO₂CCOOH(aq) solution is _____ mol/L

a	0.26
b	1.5
c	1.1
d	0.75

11. A student sampled four different acids, each at 0.10 mol/L and recorded the following observations.

Acid	Volume (mL)	pH	Conductivity
I	25.0	4.50	Poor
II	25.0	3.25	Poor
III	25.0	1.50	Good
IV	25.0	5.50	Poor

The acid that would be expected to have the lowest K_a value would be _____

a	I
b	II
c	III
d	IV

12. As the pH of a solution increases, the

a	$[\text{OH}^-(\text{aq})]$ decreases
b	$[\text{H}_3\text{O}^+(\text{aq})]$ decreases
c	solution becomes more acidic
d	conductivity must decrease

13. If a base is added to a neutral aqueous solution, _____

a	$[\text{OH}^-(\text{aq})]$ will decrease
b	$[\text{H}_3\text{O}^+(\text{aq})]$ will decrease
c	pH of the solution will decrease
d	Protons will be donated to another substance in the solution.

14. The pH of a 0.10 mol/L solution of benzoic acid ($\text{C}_6\text{H}_5\text{COOH}(\text{aq})$) is _____.

a	2.30
b	1.00
c	1.40
d	2.61

15. The pH of a 0.10 mol/L solution of ascorbic acid ($\text{H}_2\text{C}_6\text{H}_6\text{O}_6(\text{aq})$) is _____.

a	4.04
b	2.53
c	2.03
d	2.43

16. The pH of a 0.10 mol/L solution of formic acid ($\text{HCOOH}(\text{aq})$) is _____.

a	2.41
b	3.74
c	2.38
d	2.13

17. The pH of a 0.10 mol/L solution of carbonic acid ($\text{H}_2\text{CO}_3(\text{aq})$) is _____.

a	3.67
b	6.35
c	2.94
d	3.70

18. The $[\text{H}_3\text{O}^+(\text{aq})]$ in 100 mL of 0.10 mol/L $\text{HF}(\text{aq})$ at 25 °C is _____ mol/L

a	0.0076
b	0.076
c	0.010
d	0.10

19. The $[\text{H}_3\text{O}^+(\text{aq})]$ in 100 mL of 0.10 mol/L $\text{HNO}_2(\text{aq})$ at 25 °C is _____ mol/L

a	0.024
b	0.010
c	0.0072
d	0.10

20. The $[\text{H}_3\text{O}^+(\text{aq})]$ in 100 mL of 0.10 mol/L $\text{H}_2\text{CO}_3(\text{aq})$ at 25 °C is _____ mol/L

a	2.1×10^{-4}
b	4.5×10^{-7}
c	1.0×10^{-1}
d	6.7×10^{-4}

21. The $[\text{H}_3\text{O}^+(\text{aq})]$ in 100 mL of 0.10 mol/L $\text{C}_6\text{H}_5\text{COOH}(\text{aq})$ at 25 °C is _____ mol/L

a	1.2×10^{-3}
b	7.9×10^{-3}
c	1.0×10^{-1}
d	2.5×10^{-3}

22. Predict which 0.10 mol/L solution would have the lowest pH.

a	$\text{NaHSO}_4(\text{aq})$
b	$\text{HNO}_3(\text{aq})$
c	$\text{HOOC}\text{COOH}(\text{aq})$
d	$\text{NaHSO}_3(\text{aq})$

23. In a 0.10 mol/L HCOOH(aq) solution, the species present in highest concentration is

a	HCOOH(aq)
b	$\text{HCOO}^-(\text{aq})$
c	$\text{H}_3\text{O}^+(\text{aq})$
d	$\text{OH}^-(\text{aq})$

24. Consider the list of 0.10 mol/L solutions given below. The weakest electrolyte from this list would be _____

a	HCl(aq)
b	NaCl(aq)
c	HOCl(aq)
d	$\text{HNO}_2(\text{aq})$

25. A 0.100 mol/L of an unknown acid has a pH of 2.95.

Based on this information, the K_a for the unknown acid is _____

a	7.9×10^{-10}
b	8.7×10^{-12}
c	1.3×10^{-5}
d	1.1×10^{-3}

26. Which concentration of HCl(aq) would yield the same pH as 0.10 mol/L $\text{CH}_3\text{COOH(aq)}$?

a	1.3 mol/L
b	0.10 mol/L
c	0.013 mol/L
d	0.0013 mol/L

27. The K_b for the ion $\text{HCOO}^-(\text{aq})$ is _____

a	1.8×10^{-11}
b	1.8×10^{-4}
c	6.7×10^{-11}
d	5.6×10^{-11}

28. The K_b for the ion $\text{HSO}_3^-(\text{aq})$ is _____

a	1.4×10^{-2}
b	7.1×10^{-13}
c	6.3×10^{-8}
d	1.6×10^{-7}

29. The K_b for the ion $\text{HCO}_3^-(\text{aq})$ is _____

a	2.1×10^{-4}
b	4.5×10^{-7}
c	2.2×10^{-8}
d	4.7×10^{-11}

30. The K_b for the ion $\text{HPO}_4^{2-}(\text{aq})$ is _____

a	1.6×10^{-7}
b	4.8×10^{-13}
c	2.1×10^{-2}
d	6.2×10^{-8}

31. The K_b for the ion $\text{HOCCO}^-(\text{aq})$ is _____

a	1.8×10^{-13}
b	5.6×10^{-2}
c	1.5×10^{-4}
d	7.1×10^{-11}

32. The K_b and conjugate acid for $\text{CN}^-(\text{aq})$ will be _____ and _____

a	6.2×10^{-10}	$\text{CN}^-(\text{aq})$
b	6.2×10^{-10}	$\text{HCN}(\text{aq})$
c	1.6×10^{-5}	$\text{HCN}(\text{aq})$
d	1.6×10^{-5}	$\text{CN}^-(\text{aq})$

33. The K_a and conjugate base for $\text{NH}_4^+(\text{aq})$ will be _____ and _____

a	5.6×10^{-10}	$\text{NH}_3(\text{aq})$
b	1.8×10^{-5}	$\text{NH}_3(\text{aq})$
c	5.6×10^{-10}	$\text{NH}^+(\text{aq})$
d	1.8×10^{-5}	$\text{NH}^{2+}(\text{aq})$

34. The K_a and conjugate base for $\text{HSO}_3^-(\text{aq})$ will be _____ and _____

a	1.4×10^{-2}	$\text{H}_2\text{SO}_3(\text{aq})$
b	1.6×10^{-7}	$\text{SO}_3^{2-}(\text{aq})$
c	7.1×10^{-13}	$\text{H}_2\text{SO}_3(\text{aq})$
d	6.3×10^{-8}	$\text{SO}_3^{2-}(\text{aq})$

35. The K_a and conjugate base for $\text{HOCCOO}^-(\text{aq})$ will be _____ and _____

a	6.7×10^{-11}	$\text{OCCOO}^{2-}(\text{aq})$
b	5.6×10^{-2}	$\text{HOCCOOH}(\text{aq})$
c	1.5×10^{-4}	$\text{OCCOO}^{2-}(\text{aq})$
d	1.8×10^{-13}	$\text{HOCCOOH}(\text{aq})$

36. An unknown acid with a concentration of $1.2 \times 10^{-1} \text{ mol/L}$, has a pH of 2.50. the value of the K_a for this acid is _____

a	3.6×10^{-1}
b	8.6×10^{-5}
c	8.3×10^{-5}
d	4.8×10^{-5}

37. A 2.5 mol/L solution of lactic acid dissociates at 25°C. the pH of this acid will be ____

a	1.93
b	1.73
c	-0.40
d	1.50

38. An unknown concentration of carbonic acid has a pH of 4.20 The concentration of the acid will be _____ mol/L

a	7.1×10^{-3}
b	6.3×10^{-5}
c	8.9×10^{-3}
d	4.0×10^{-3}

39. A 0.10 mol/L solution of acetic acid dissociates at 25°C. Its pH is ____

a	2.88
b	3.74
C	4.74
d	1.00

40. A 0.10 mol/L solution of phosphoric acid dissociates at 25°C. Its pH is ____

a	1.50
b	2.16
c	3.16
d	1.64

Solutions:

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