

Weak Acids and Bases Worksheet

Organic Chemistry Tutor

1. What is the pH of a 0.75 M $\text{HC}_2\text{H}_3\text{O}_2$ solution?
 $K_a = 1.8 \times 10^{-5}$.

3. What is the pH of a 0.40 M NH_4Cl solution?
 K_b of NH_3 is 1.8×10^{-5} .

2. What is the pH of a 0.25 M NH_3 solution?
 $K_b = 1.8 \times 10^{-5}$.

4. What is the pH of a 1.5 M NaF solution?
 K_a of HF is 7.2×10^{-4} .

5. Calculate the percent ionization of a solution of 0.75 M HF. $K_a = 7.2 \times 10^{-4}$.

7. A 0.25M solution of a weak acid is 4.2% dissociated. What is the K_a of the acid?

6. Calculate the percent dissociation of a 1.5 M NH_3 solution. $K_b = 1.8 \times 10^{-5}$.

8. An acid is 3.0% dissociated and the pH of the solution is 2.9. What is the initial concentration of the acid?

9. The percent dissociation of an acid is 30% and its equilibrium concentration is 0.45 M. What is the K_a of the weak acid?

11. The pH of a 0.75 M weak base is 10.4. What is the K_b of the weak base?

10. The pH of a 0.5 M weak acid (HA) is 3.21. What is the K_a of the acid?

12. The pH of a 0.45 M NaX salt solution is 9.26. What is the K_a of the weak acid HX?

13. Which of the following is the weakest acid?

- A. HF ($K_a = 7.2 \times 10^{-4}$)
- B. $\text{HC}_2\text{H}_3\text{O}_2$ ($K_a = 1.8 \times 10^{-5}$)
- C. HNO_2 ($K_a = 4.0 \times 10^{-4}$)
- D. HCN ($K_a = 6.2 \times 10^{-10}$)
- E. HClO ($K_a = 3.5 \times 10^{-8}$)

14. A 0.0015 M aqueous solution of a certain compound has a pH of 2.82. Which of the following answer choices best describes this compound?

- A. Strong Acid
- B. Strong Base
- C. Weak Acid
- D. Weak Base
- E. Neutral Salt

15. Which of the following substances when dissolved in water will produce a solution with the highest pH? (Feel free to consult a table of K_a values)

- A. 0.1 M NaBr
- B. 0.1 M NaF
- C. 0.1 M FeCl_3
- D. 0.1 M NH_4NO_3
- E. 0.1 M NaCN

16. Describe each of the following compounds as acidic, basic, or neutral. Feel free to consult a table of K_a values.

- I. NH_4CN
- II. NH_4F
- III. $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$

17. What is the pH of a solution containing 1.0 M HF and 1.0 M HCN? The values for HF and HCN are 7.2×10^{-4} and 6.2×10^{-10} respectively.

19. What mass of HCN should be dissolved in enough water to form a 300 mL solution with a pH of 5.254? ($K_a = 6.2 \times 10^{-10}$)

18. What is the pH of a solution containing 0.05 M HCl and 0.5 M $\text{HC}_2\text{H}_3\text{O}_2$? The K_a value for $\text{HC}_2\text{H}_3\text{O}_2$ is 1.8×10^{-5} .

Answers:

1. pH = 2.43
2. pH = 11.3
3. pH = 4.83
4. pH = 8.66
5. 3.1%
6. 0.35%
7. $K_a = 4.6 \times 10^{-4}$
8. $[HA]_0 = 0.042 \text{ M}$
9. $K_a = 8.27 \times 10^{-2}$
10. $K_a = 7.61 \times 10^{-7}$
11. $K_b = 8.4 \times 10^{-8}$
12. $K_a = 1.36 \times 10^{-5}$
13. D
14. A
15. E
16. $\text{NH}_4\text{CN} = \text{Basic}$, $\text{NH}_4\text{F} = \text{Acidic}$, and $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 = \text{Neutral}$
17. pH = 1.58
18. pH = 1.3
19. 0.41g