

HW03 - Acids and Bases

1 4 points

In the forward reaction
 $\text{HCN} + \text{H}_2\text{O} \rightleftharpoons \text{CN}^- + \text{H}_3\text{O}^+$,
the Bronsted-Lowry acid is...

- CN^-
- H_3O^+
- H_2O
- HCN

2 4 points

According to the Bronsted-Lowry concept of acids and bases, which of the following statements about a base is NOT true?

- A base will share one of its electron pairs to bind H^+ .
- A base must contain a hydroxide group.
- A base reacts with an acid to form a salt.
- If a base is strong, then its conjugate acid will be relatively weaker.

3 4 points

A strong acid (or base) is one which...

- dissolves metals.
- dissociates completely in aqueous solution.
- reacts with a salt to form water.
- should only be used when wearing goggles and gloves.

4 4 points

Which of the following substances is a strong acid?

- HSO_3
- HF
- H_2CO_3
- H_3PO_4
- H_2SO_4

5 4 points

What is $[\text{OH}^-]$ in a 0.0050 M HCl solution?

- $1.0 \times 10^{-7} \text{ M}$
- 6.6×10^{-5}
- 1.0 M
- $2.0 \times 10^{12} \text{ M}$

6 4 points

What is the pH of a 0.1 M $\text{Ba}(\text{OH})_2$ aqueous solution?

- 13.30
- 8.70
- 9.98
- 1.33

7 4 points

Which pH represents a solution with 1000 times higher $[\text{OH}^-]$ than a solution with a pH of 5?

- pH = 6
- pH = 4
- pH = 8
- pH = 7

8 4 points

Which of the following is true in pure water at any temperature?

- pH = 7.0
- $[\text{H}_3\text{O}^+][\text{OH}^-] = 1.0 \times 10^{-14}$
- $[\text{H}_3\text{O}^+] = [\text{OH}^-]$

9 4 points

What is $[\text{H}_3\text{O}^+]$ when $[\text{OH}^-] = 3.3 \times 10^{-9} \text{ M}$?

- $1.0 \times 10^{-7} \text{ M}$
- $3.0 \times 10^{-6} \text{ M}$
- $3.3 \times 10^{-9} \text{ M}$
- $3.3 \times 10^{-5} \text{ M}$

10 4 points

What is the pH of a solution that contains 11.7g of NaCl for every 200 mL of solution?

- 1.0×10^{-7}
- 9.00
- 7.00
- 10^{-1}

11 4 points

Which of the following substances is a weak acid?

- HClO_3
- H_2SO_4
- HI
- H_2CO_3
- HClO_4
- HCl
- HNO_3
- HBr

12 4 points

HCN is classified as a weak acid in water. This means that it produces...

- a relatively small fraction of the maximum number of possible hydronium ions.
- no hydronium ions.
- 100% of the maximum number of possible hydronium ions.
- a relatively large fraction of the maximum number of possible hydronium ions.

13 4 points

Which is NOT a conjugate acid-base pair, respectively?

- $\text{H}_2\text{O} : \text{OH}^-$
- $\text{SO}_4^{2-} : \text{HSO}_4^-$
- $\text{H}_3\text{O}^+ : \text{H}_2\text{O}$
- $\text{HCN} : \text{CN}^-$

14 4 points

What is the conjugate acid of NO_3^- ?

- NO_3^{2-}
- NH_3
- NO_2^-
- HNO_3

15 4 points

The conjugate base of H_2SO_4 is:

- H_3SO_4^+
- HSO_4
- SO_4^{2-}
- HSO_4^-

16 4 points

Assume that five weak acids, identified only by numbers (1, 2, 3, 4, and 5) have the following ionization constants:

A1 - $K_a = 1.0 \times 10^{-3}$

A2 - $K_a = 3.0 \times 10^{-5}$

A3 - $K_a = 2.6 \times 10^{-7}$

A4 - $K_a = 4.0 \times 10^{-9}$

A5 - $K_a = 7.3 \times 10^{-11}$

The anion of which acid is the strongest base?

- A1
- A4
- A3
- A2
- A5

17 4 points

If the value of K_b for pyridine ($\text{C}_5\text{H}_5\text{N}$) is 1.8×10^{-9} , calculate the equilibrium constant for the following reaction:



- 5.6×10^8
- 1.8×10^{-16}
- 5.6×10^{-6}
- -1.8×10^{-9}

18 4 points

A water solution of sodium acetate is basic because...

- sodium acetate is only weakly ionized.
- the acetate ion acts as a Bronsted-Lowry base in a reaction with water.
- The statement is false. A water solution of sodium acetate is acidic.
- the conjugate base of the acetate ion is a strong base.

19 4 points

Which solution has the highest pH?

- 0.1 M KCH_3COO , K_a for CH_3COOH is 1.8×10^{-5}
- 0.1 M of KNO_2 , K_a for HNO_2 is 4.5×10^{-4}
- 0.1 M of KCl, K_a for HCl is VERY LARGE!!
- 0.1 M KClO , K_a for HClO is 3.5×10^{-8}

20 4 points

The term " K_a for the ammonium ion" describes the equilibrium constant for which of the following reactions?

- $\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$
- $\text{NH}_4\text{Cl}(\text{solid}) + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{Cl}^-$
- $\text{NH}_4^+ + \text{OH}^- \rightleftharpoons \text{NH}_3 + \text{H}_2\text{O}$
- $\text{NH}_4^+ + \text{H}_2\text{O} \rightleftharpoons \text{NH}_3 + \text{H}_3\text{O}^+$

21 4 points

A sample of 0.24 moles of a generic weak acid, HA is dissolved into 800 mL of water. After it all dissolved and equilibrium was reached, the pH was measured and found to be 3.56. What is the value of K_a for this weak acid?

- 6.2×10^{-4}
- 3.8×10^{-5}
- 2.5×10^{-5}
- 3.8×10^{-7}
- 2.5×10^{-7}

22 4 points

A weak base (B) is mixed at 0.064 M. It has a K_b equal to 4.1×10^{-6} . What is the pH of this weak base solution?

- 12.81
- 8.61
- 10.71
- 9.87
- 7.42

23 4 points

A weak base (B) is mixed at 0.064 M. It has a K_b equal to 4.1×10^{-6} . What is the pH of this weak base solution?

- 8.61
- 10.71
- 9.87
- 7.42
- 12.81

24 4 points

A weak acid (HZ) is mixed at 0.014 M and has a pH of 2.19. What is the percent ionization of HZ in this solution?

- 46 %
- 17 %
- 37 %
- 29 %
- 24 %

25 4 points

Let's be really a bit more accurate here... 3 sig figs this time... What is the pH of 0.0700 M trichloroacetic acid?

- 0.906
- 1.469
- 1.253
- 1.372
- 1.155