HW05 - Acids, Bases, and Salts

Question 1 1 pts

In the reversible reaction

$HCN + H_2O \rightleftharpoons CN^- + H_3O^+$,

the two Bronsted-Lowry acids are...

- There is only one Bronsted-Lowry acid shown: H_3O^+.
- HCN and H_3O^+
- H_2O and H_3O^+
- HCN and CN^-
- H_2O and CN^-

Question 2 1 pts

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

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

Question 3 1 pts

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

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

Question 4 1 pts

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

- $[H_3O^+][OH^-] = 1.0 \times 10^{-14}$
- $[H_3O^+] = [OH^-]$
- K_w decreases with increasing temperature.
- pH = 7.0

Question 5 1 pts

What is $[H_3O^+]$ when $[OH^-] = 3.3 \times 10^{-9}$ M?

- 3.0×10^{-6} M
- 3.3×10^{-9} M
- 3.3×10^{-5} M
- 1.0×10^{-7} M

Question 6 1 pts

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

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

Question 7 1 pts

Which of the following substances is a strong acid?

- H_2SO_4
- H_3PO_4
- HF
- HSO_3
- H_2CO_3

Question 8 1 pts

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

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

Question 9 1 pts

Which of the following substances is a weak acid?

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

Question 10 1 pts

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

- $H_2O : OH^-$
- $SO_4^{2-} : HSO_4^-$
- $HCN : CN^-$
- $H_3O^+ : H_2O$

Question 11 1 pts

The conjugate base of H_2SO_4 is:

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

Question 12 1 pts

What is the conjugate acid of NO_3^-?

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

Question 13 1 pts

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

1 - 1.0×10^{-3}

2 - 3.0×10^{-5}

3 - 2.6×10^{-7}

4 - 4.0×10^{-9}

5 - 7.3×10^{-11}

The anion of which acid is the strongest base?

- 3
- 4
- 2
- 5
- 1

Question 14 1 pts

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

- $NH_4^+ + OH^- \rightleftharpoons NH_3 + H_2O$
- $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$
- $NH_4Cl(solid) + H_2O \rightleftharpoons NH_4^+ + Cl^-$
- $NH_4^+ + H_2O \rightleftharpoons NH_3 + H_3O^+$

Question 15 1 pts

If the value of K_b for pyridine (C_5H_5N) is 1.8×10^{-9}, calculate the equilibrium constant for the following reaction:

$C_5H_5NH^+(aq) + H_2O(l) \longrightarrow C_5H_5N(aq) + H_3O^+(aq)$

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

Question 16 1 pts

What is $[OH^-]$ in a 0.0050 M HCl solution?

- 1.0×10^{-7} M
- 6.6×10^{-5}
- 2.0×10^{-12} M
- 1.0 M

Question 17 1 pts

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

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

Question 18 1 pts

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

- 1.33
- 13.3
- 9.98
- 8.7

Question 19 1 pts

Hydroxylamine is a weak molecular base with $K_b = 6.6 \times 10^{-9}$. What is the pH of a 0.0500 M solution of hydroxylamine?

- 8.93
- 10.4
- 9.48
- 9.26

Question 20 1 pts

What is the pH of a 0.23 M solution of potassium generate (KR-COO)? K_a for the generic acid R-COOH is 2.7×10^{-8}.

- 10.23
- 10.47
- 10.83
- 10.60

Question 21 1 pts

Which solution has the highest pH?

- 0.1 M KClO, K_a for HClO is 3.5×10^{-8}
- 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!!

Question 22 1 pts

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

- 1.0×10^{-7}
- 9.0
- 10^{-1}
- 7.0

Question 23 1 pts

What is the pH of a solution made by mixing 0.050 mol of NaCN with enough water to make a liter of solution? K_a for HCN is 4.9×10^{-10}.

- 12
- 11
- 10^{-3}
- 3

Question 24 1 pts

Identify the list in which all salts produce a basic aqueous solution.

- NH_4Cl, $C_6H_4NH_3NO_3$, FeI_3
- $AlCl_3$, $Zn(NO_3)_2$, $KClO_4$
- KCH_3COO, NaCN, KF
- $AgNO_3$, $NaCHO_2$, CrI_3

Question 25 1 pts

What is the pH in a solution made by dissolving 0.100 moles of sodium acetate ($NaCH_3COO$) in enough water to make one liter of solution? K_a for CH_3COOH is 1.80×10^{-5}.

- 10.25
- 9.25
- 8.87
- 5.74

Question 26 1 pts

A 0.200 M solution of a weak monoprotic acid HA is found to have a pH of 3.00 at room temperature. What is the ionization constant of this acid?

- 5.0×10^{-6}
- 1.0×10^{-3}
- 2.0×10^{-9}
- 5.3

Question 27 1 pts

What is the percent ionization for a weak acid HX that is 0.40 M? $K_a = 4.0 \times 10^{-7}$.

- 0.0010%
- 0.10%
- 0.0020%
- 0.20%

Question 28 1 pts

A 0.28 M solution of a weak acid is 3.5% ionized. What is the pH of the solution?

- 1.46
- 2.01
- 3.17
- 0.55

Question 29 2 pts

The pH of 0.010 M aqueous aniline is 8.32. What is the percentage protonated?

- 0.021%
- 2.1%
- It is impossible to tell without knowing the K_a or the K_b for aniline.
- 0.0021%