HW05 - Acids, Bases, and Salts

Question 1 1.0 pts

In the reversible reaction

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

the two Bronsted-Lowry acids are...

a. There is only one Bronsted-Lowry acid shown: H_3O^+.
b. H_2O and CN^-
c. HCN and CN^-
d. HCN and H_3O^+
e. H_2O and H_3O^+

Question 2 1.0 pts

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

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

Question 3 1.0 pts

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

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

Question 4 1.0 pts

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

a. pH = 7
b. $[H_3O^+][OH^-] = 1.0 \times 10^{-14}$
c. K_w decreases with increasing temperature.
d. $[H_3O^+] = [OH^-]$

Question 5 1.0 pts

What is $[H_3O^+]$ when $[OH^-] = 3.3 \times 10^{-3}$ M?

a. 3.0×10^{-6} M
b. 3.3×10^{-3} M
c. 1.0×10^{-7} M
d. 3.3×10^{-3} M

Question 6 1.0 pts

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

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

Question 7 1.0 pts

Which of the following substances is a strong acid?

a. H_3PO_4
b. HSO_3^-
c. H_2CO_3
d. HF
e. H_2SO_4

Question 8 1.0 pts

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

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

Question 9 1.0 pts

Which of the following substances is a weak acid?

a. HI
b. $HClO_4$
c. $HClO_3$
d. H_2ClO_4
e. HBr
f. HNO_3
g. H_2SO_4
h. HCl

Question 10 1.0 pts

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

a. HCN · CN^-
b. H_2O · OH^-
c. SO_4^{2-} · HSO_4^-
d. H_3O^+ · H_2O

Question 11 1.0 pts

The conjugate base of H_2SO_4 is:

a. HSO_4^-
b. SO_4^{2-}
c. HSO_3^-
d. $H_3SO_4^+$

Question 12 1.0 pts

What is the conjugate acid of NO_3^-?

a. NH_3
b. HNO_3
c. NO_2^-
d. NO_2^+

Question 13 1.0 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?

a. 3
b. 2
c. 5
d. 4
e. 1

Question 14 1.0 pts

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

a. $NH_4^+ + H_2O \rightleftharpoons NH_3 + H_3O^+$
b. $NH_4^+ + OH^- \rightleftharpoons NH_3 + H_2O$
c. $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$
d. $NH_4Cl(solid) + H_2O \rightleftharpoons NH_4^+ + Cl^-$

Question 15 1.0 pts

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

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

a. -1.8×10^{-9}
b. 5.6×10^{-6}
c. 1.8×10^{-16}
d. 5.6×10^{8}

Question 16 1.0 pts

What is [OH⁻] in a 0.0050 M HCl solution?

a. 2.0×10^{-12} M
b. 1.0×10^{-2} M
c. 1.0 M
d. 6.6×10^{-5}

Question 17 1.0 pts

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

a. pH = 4
b. pH = 7
c. pH = 8
d. pH = 6

Question 18 1.0 pts

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

a. 1.33
b. 8.7
c. 13.3
d. 9.98

Question 19 1.0 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?

a. 10.4
b. 9.48
c. 9.26
d. 8.93

Question 20 1.0 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^{-6}.

a. 10.83
b. 10.23
c. 10.60
d. 10.47

Question 21 1.0 pts

Which solution has the highest pH?

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

Question 22 1.0 pts

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

a. 9.0
b. 7.0
c. 10^{-1}
d. 1.0×10^{-7}

Question 23 1.0 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}.

a. 12
b. 11
c. 10^{-3}
d. 3

Question 24 1.0 pts

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

a. KCH_3CO_2, NaCN, KF
b. NaC_2, $C_6H_5NH_3NO_3$, FeI_3
c. $AgNO_3$, $NaC_2H_3O_2$, CrI_3
d. $AlCl_3$, $ZnONO_3)_2$, $KClO_4$

Question 25 1.0 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 1.8×10^{-5}.

a. 10.25
b. 8.87
c. 5.74
d. 9.25

Question 26 1.0 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?

a. 5.3
b. 5.0×10^{-6}
c. 1.0×10^{-3}
d. 2.9×10^{-6}

Question 27 1.0 pts

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

a. 0.0010%
b. 0.20%
c. 0.10%
d. 0.0020%

Question 28 1.0 pts

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

a. 0.55
b. 2.01
c. 1.46
d. 3.17

Question 29 1.0 pts

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

a. 0.021%
b. 0.0021%
c. It is impossible to tell without knowing the K_a or the K_b for aniline.
d. 2.1%