HW01 - Water, Acids & Bases I

1 4 points

Which of the following accurately explains a reason why water is so important for biology and chemistry?

- Water is a nonpolar molecule with a low molecular weight, causing it to be easily vaporized at room temperature
- The polar hydrogen bonds of water cause it to be a stable solid at room temperature
- Water is a very large organic molecule capable of dissolving many other organic molecules
- The polar hydrogen bonds of water cause it to be a liquid capable of dissolving many other polar solutes at room temperature

2 4 points

Which of the following explains why water is a liquid at room temperature?

- Water has a relatively small molecular weight
- Water is nonpolar
- Water is a large organic molecule
- Water contains hydrogen bonds

3 4 points

Which of the following best classifies pure water and pure sodium chloride (NaCl)?

- Pure Water: nonpolar covalent molecule
  NaCl: ionic compound
- Pure Water: nonpolar covalent molecule
  NaCl: polar covalent molecule
- Pure Water: polar covalent molecule
  NaCl: ionic compound
- Pure Water: ionic compound
  NaCl: ionic compound

4 4 points

Which of the following images represents a hydrated anion?

- 
- 

5 5 points

Which ions are produced by a base in an aqueous solution?

- SO_4^{2-}
- Cl^-
- OH^-
- Na^+

6 5 points

A solution is known to have a pH that is equal to 8.32. Which statement best describes this solution?

- the solution is slightly basic
- the solution is very acidic
- the solution is very basic
- the solution is slightly acidic

7 5 points

Which of the following concentrations represents a basic solution at room temperature?

- $[OH^-] = 1.8 \times 10^{-4}$ M
- $[OH^-] = 1.8 \times 10^{-11}$ M
- $[OH^-] = 1.8 \times 10^{-9}$ M
- $[OH^-] = 1 \times 10^{-7}$ M

8 5 points

Which of the following is the most basic solution?

- 0.300 M $Sr(OH)_2$
- 1×10^{-9} M HCl
- 0.400 M LiOH
- 0.500 M HNO_3

9 5 points

Rank the following solutions in order of increasing acidity:

Solution A: pH = 1.54
Solution B: pH = 7.00
Solution C: pH = 9.42
Solution D: pH = 5.31

- Solution A < Solution D < Solution B < Solution C
- Solution D < Solution A < Solution B < Solution C
- Solution B < Solution A < Solution D < Solution C
- Solution A < Solution B < Solution C < Solution D
- Solution C < Solution B < Solution D < Solution A

10 5 points

A 0.15 M solution of each of the following acids is prepared. Which of these weak acids gives the most acidic solution?

HCN, $K_a = 6.2 \times 10^{-10}$
HClO, $K_a = 3.5 \times 10^{-8}$
CH_3CH_2COOH, $K_a = 1.3 \times 10^{-5}$
HBrO, $K_a = 2.0 \times 10^{-9}$

- HClO
- HBrO
- CH_3CH_2COOH
- HCN

11 5 points

The K_b of hydroxylamine, NH_2OH, is 1.1×10^{-8}. Which of the following best classifies hydroxylammonium, NH_2OH^+?

- weak acid
- weak base
- strong base
- neutral salt
- strong acid

12 5 points

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

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

13 5 points

Every increase of one pH unit means...

- there are 10 times more H^+ ions in solution
- there are 10 times fewer H^+ ions in solution
- the acidity is slightly increased
- there are 10 fewer H^+ ions in solution

14 5 points

The pH of lemon juice is approximately 2.40. At this pH, the hydronium (H_3O^+) ion concentration is closest to which concentration?

- 5.6×10^{-4} M
- 4.0×10^{-3} M
- 0.38 M
- 2.5×10^{-12} M

15 5 points

What is the pH of 0.023 M HCl? Note: 2 sig-figs in a logarithmic scale would be X.XX.

Type your answer...

16 5 points

What is the pH of a 0.0156 M NaOH solution?
Note: Report 3 digits after the decimal.

Type your answer...

17 5 points

A can of Pepsi stored in a warehouse at room temperature has a pH equal to about 2.52. What is the H^+ concentration in a 12 oz can?

- 3.0×10^{-3} M
- 0.40 M
- 2.5×10^{-2} M
- 4.0×10^{-4} M
- 6.1×10^{-2} M

18 5 points

The hydronium ion (H_3O^+) concentration in a solution with pH 10 is _____ than the hydronium ion concentration in a solution with pH 13.

- 1000 times more
- 1000 times less
- 30 times more
- 3 times more
- 300 times less

19 5 points

A 4.80 g sample of sodium hydroxide is dissolve into water to make a 1.5 gallon solution. What is the pH of this solution?

- 14.51
- 11.84
- 12.50
- 1.68
- 12.32

20 2 points

Consider the following acid/base equation:

$$C_6H_5NH_2(aq) + H_2O(\ell) \rightarrow C_6H_5NH_3^+(aq) + OH^-(aq)$$

In this equation, water is behaving as a...

- weak acid
- neutral salt
- weak base
- neutral conjugate

21 2 points

Which of the following equations depicts a weak acid reaction?

- $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(\ell)$
- $CaCO_3(s) \rightarrow Ca^{2+}(aq) + CO_3^{2-}(aq)$
- $HNO_2(aq) + H_2O(\ell) \rightarrow NO_2^-(aq) + H_3O^+(aq)$
- $HCl(aq) + H_2O(\ell) \rightarrow H_3O^+(aq) + Cl^-(aq)$

22 2 points

Which of the following equations depicts a salt dissolving into water?

- $CaCO_3(s) \rightarrow CaCO_3(\ell)$
- $HCl(aq) + H_2O(\ell) \rightarrow H_3O^+(aq) + Cl^-(aq)$
- $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(\ell)$
- $CaCO_3(s) \rightarrow Ca^{2+}(aq) + CO_3^{2-}(aq)$

23 2 points

0.15 moles of strong acid are added to 0.15 moles weak base in aqueous solution. How would you describe the resulting solution?

- A strongly basic solution
- A weakly acidic salt
- A strongly acidic solution
- A weakly basic salt

24 5 points

Consider the classic strong acid/base neutralization reaction of hydrochloric acid (HCl) and sodium hydroxide (NaOH).

$$HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(\ell)$$

How many mL of 0.0362 M NaOH are needed to neutralize 30.0 mL of 0.0438 M HCl ?

- 33.7 mL
- 30.0 mL
- 36.3 mL
- 27.1 mL
- 24.8 mL
- 41.8 mL