

## **Problem Set 13: Introduction to Acids and Bases, pH and Buffers**

1. Classify the following as a salt, an acid or a base.
  - a. NaCl
  - b. BaSO<sub>4</sub>
  - c. HCl
  - d. H<sub>2</sub>SO<sub>4</sub>
  - e. Ca(OH)<sub>2</sub>
2. Classify the following acids as strong or weak.
  - a. HCl
  - b. HBr
  - c. HF
  - d. HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>
3. Which of the following will conduct electricity when dissolved in water?
  - a. sulfuric acid
  - b. sodium chloride
  - c. sodium hydroxide
  - d. glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>)
4. Write a balanced equation to represent the reaction between hydrochloric acid and magnesium hydroxide.
5. Stomach acid is about 0.1 M HCl. How many milliliters of stomach acid will completely react with an antacid that has 500 mg of magnesium hydroxide? HINT: Use your equation from #4, and round your final answer to 3 sig figs.
6. Given the following information, classify the following as an acid or a base. Try to do this problem without using a calculator!
  - a. Human sweat, which has a pH between 4.0-6.8.
  - b. A vinegar solution, which has a hydronium ion concentration of  $4.0 \times 10^{-3}$  M.
  - c. A household cleaner with a pH of 12.
7. A solution of 0.10 M hydrobromic acid has a pH of 1, but a solution of 0.10 M acetic acid has a pH of 2.88. Explain why the two solutions have the same concentration in molarity, but a different pH.
8. Rainfall is naturally acidic with a pH of about 5.60. Acid rain with a pH of 1.87 was recorded at Inverpolly Forest, Highland, Scotland, in 1983. Calculate the hydronium ion concentration for natural rainfall and compare it with the hydronium ion concentration of the acid rain that fell in Scotland.

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9. Which of the following could be used to make a buffer?
- nitric acid and sodium nitrate
  - hydrochloric acid and sodium chloride
  - sodium dihydrogen phosphate and potassium hydrogen phosphate
  - acetic acid and sodium hydroxide
10. An ammonia solution has a hydronium ion concentration of  $2.3 \times 10^{-12}$  M. Calculate the pH of this solution.