**General Biology I (BSC1010C)**

**Valencia College (Revised 9-14-2016)**

**Yasser Saad, Ph.D.**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**pH Exercise (In-Class)**

1. You have to know, what is pH measuring? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. You have to be aware that solutions will have a certain level of hydrogen ions and hydroxyl ions. What is used that designates hydrogen ions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. How about hydroxyl ions \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. You have to be aware of the relationship that they exist in, which is represented by this formula:

The hydrogen ion concentration multiplied by the hydroxyl ion concentration equal to 1x10-14 M.

How is this relationship written as a formula: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. How do we figure out the pH of a solution if you know the hydrogen ion concentration? Give the formula.
2. You also have to be aware of the scale used to designate something as acidic neutral and basic. And know what that means when it comes to the hydrogen ion-hydroxyl ion relationship.

Try the: Less than 7 is acidic; 7 Neutral; More than 7 is basic

pH of 2 is \_\_\_\_\_\_\_\_\_ and has more \_\_\_\_\_\_\_\_\_ ions than \_\_\_\_\_\_\_\_\_ ions.

pH of 5 is \_\_\_\_\_\_\_\_\_ and has \_\_\_\_\_\_\_\_\_ hydroxyl ions than \_\_\_\_\_\_\_\_\_ ions.

pH of 13 is \_\_\_\_\_\_\_\_\_ and has less \_\_\_\_\_\_\_\_\_ ions than \_\_\_\_\_\_\_\_\_ ions.

pH of 7 is \_\_\_\_\_\_\_\_\_ and has \_\_\_\_\_\_\_\_\_ hydrogen ions and \_\_\_\_\_\_\_\_\_ ions.

1. Please note that as the hydrogen ions concentration goes up, the actual pH value will be decreasing. Question: What will be happening to the hydroxyl ion concentration as the hydrogen ion concentration increases?
2. I can ask you questions in number of different ways:
   1. I can give you the hydrogen ion concentration and ask you to give me the pH (try these):
      1. 1x10-3 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      2. 1x10-5 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      3. 1x10-13 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      4. 1x10-4 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      5. 1x10-7 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
   2. I can give you the pH and ask you to give me the hydrogen ion concentration (try these):
      1. pH of 8 has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Is that Acidic, basic, or neutral.
      2. pH of 6 has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Is that Acidic, basic, or neutral.
      3. pH of 11 has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Is that Acidic, basic, or neutral.
      4. pH of 10 has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Is that Acidic, basic, or neutral.
      5. pH of 1 has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Is that Acidic, basic, or neutral.
   3. I can give you the hydroxyl concentration and ask you to give me the hydrogen ion concentration (try these):
      1. A solution with a hydroxyl concentration of 1x10-3 M has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      2. A solution with a hydroxyl concentration of 1x10-5 M has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      3. A solution with a hydroxyl concentration of 1x10-7 M has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      4. A solution with a hydroxyl concentration of 1x10-11 M has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      5. A solution with a hydroxyl concentration of 1x10-9 M has a hydrogen ion concentration of \_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
   4. I can give you the hydrogen ion concentration and ask you to give me the hydroxyl ion concentration (try these):
      1. A solution with a hydrogen ion concentration of 1x10-1 M has a hydroxyl ion concentration of \_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      2. A solution with a hydrogen ion concentration of 1x10-4 M has a hydroxyl ion concentration of \_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      3. A solution with a hydrogen ion concentration of 1x10-8 M has a hydroxyl ion concentration of \_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      4. A solution with a hydrogen ion concentration of 1x10-6 M has a hydroxyl ion concentration of \_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      5. A solution with a hydrogen ion concentration of 1x10-12 M has a hydroxyl ion concentration of \_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
   5. I can give you the hydroxyl ion concentration and ask you to give me the pH (try these):
      1. A solution with a hydroxyl ion concentration of 1x10-7 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      2. A solution with a hydroxyl ion concentration of 1x10-1 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      3. A solution with a hydroxyl ion concentration of 1x10-11 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      4. A solution with a hydroxyl ion concentration of 1x10-4 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      5. A solution with a hydroxyl ion concentration of 1x10-3 M has a pH of \_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
   6. I can give you the pH and ask you to give me the hydroxyl ion concentration (try these):
      1. A solution with a pH of 2 has a hydroxyl ion concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      2. A solution with a pH of 5 has a hydroxyl ion concentration of \_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      3. A solution with a pH of 9 has a hydroxyl ion concentration of\_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      4. A solution with a pH of 11 has a hydroxyl ion concentration of\_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
      5. A solution with a pH of 7 has a hydroxyl ion concentration of\_\_\_\_\_\_\_\_\_\_\_\_\_. Is that Acidic, basic, or neutral.
3. I can also ask you about the differences between two solutions:
   1. What is the fold difference in hydrogen ion concentration between two solutions one at pH of 5 and the other at pH 8? Which one has more hydrogen ions? What solution has more hydroxyl ions?
   2. What is the fold difference in hydrogen ion concentration between the following two solutions: 0.0001 M hydrogen ions in solution A and solution B at pH of 4?
   3. What is the fold difference in hydroxyl ion concentration between solution A at pH of 1 and solution B containing 0.001 M hydrogen ions.
   4. What is the fold difference between the hydrogen ion concentration and the hydroxyl ion concentration of pure water?
4. Give another way to write this number 1x10-5 M: \_\_\_\_\_\_\_\_\_\_\_\_ and another way \_\_\_\_\_\_\_\_.

Give another way to write this number 0.00001 M: \_\_\_\_\_\_\_\_\_\_\_\_ and another way \_\_\_\_\_\_\_\_.

1. What is the purpose behind using a buffer?