

**Lesson Outline****LESSON 3*****Acid and Base Solutions*****A. What are acids and bases?**

1. Acids are found in many \_\_\_\_\_, including fruits, \_\_\_\_\_, milk, and vinegar; bases are also found in many household items, such as \_\_\_\_\_, baking soda, and medicines called antacids.
2. A substance that produces a hydronium ion ( $\text{H}_3\text{O}^+$ ) when it is dissolved in water is called a(n) \_\_\_\_\_.
  - a. Almost all acid molecules contain one or more \_\_\_\_\_ atoms, which separate from the acid when they are mixed with \_\_\_\_\_.
  - b. The hydrogen atom combines with a water molecule to form a(n) \_\_\_\_\_ ion, ( $\text{H}_3\text{O}^+$ ), which is a positively charge ion that forms when an acid dissolves in water.
3. A substance that produces hydroxide ions ( $\text{OH}^-$ ) when it is dissolved in water is called a(n) \_\_\_\_\_.
  - a. Some bases, such as sodium hydroxide, contain \_\_\_\_\_ ions; when hydroxide compounds mix with \_\_\_\_\_, the hydroxide ions \_\_\_\_\_ from the base in the water.
  - b. Some bases, such as ammonia, do not contain hydroxide ions; but when these bases mix with \_\_\_\_\_, they take \_\_\_\_\_ ions ( $\text{H}^+$ ) away from water molecules, producing \_\_\_\_\_ ions ( $\text{OH}^-$ ).

**B. What is pH?**

1. The \_\_\_\_\_ is an inverse measure of the concentration of hydronium ions ( $\text{H}_3\text{O}^+$ ) in a solution; the \_\_\_\_\_ of something means that as one thing increases, the other thing decreases.
  - a. A solution that has a lower pH is more \_\_\_\_\_ than a solution that has higher pH.
  - b. A solution that has a higher pH is more \_\_\_\_\_ than a solution that has a lower pH.

### Lesson Outline continued

2. A solution that is \_\_\_\_\_, such as pure water, contains an equal number of hydronium and \_\_\_\_\_ ions.
  - a. An acid has a greater concentration of \_\_\_\_\_ ions ( $\text{H}_3\text{O}^+$ ) than \_\_\_\_\_ ions ( $\text{OH}^-$ ).
  - b. A base has a greater concentration of \_\_\_\_\_ ions ( $\text{OH}^-$ ) than \_\_\_\_\_ ions ( $\text{H}_3\text{O}^+$ ).
3. The \_\_\_\_\_ scale, which ranges from 0 to \_\_\_\_\_, is used to indicate how acidic or basic a solution is.
  - a. A solution with a pH of 7 is \_\_\_\_\_; a solution with a pH lower than 7 is \_\_\_\_\_; a solution with a pH higher than 7 is \_\_\_\_\_.
  - b. An change of 1 unit on the \_\_\_\_\_ scale represents a(n) \_\_\_\_\_ change in the acidity or basicity of the solutions being compared.

#### C. How is pH measured?

1. A compound that changes color at different pH values when it reacts with acidic or basic solutions is called a(n) \_\_\_\_\_.
2. Strips that contain a universal \_\_\_\_\_ can be dipped into a(n) \_\_\_\_\_; the color change of the strip is matched against a list that shows which colors represent which \_\_\_\_\_.
3. Using a pH \_\_\_\_\_, which has an electrode sensitive to the concentration of hydronium ions, is a more accurate way to measure pH than using pH strips.