

ACTIVITY 4B :

The pH of Common Foods

Name _____

Background Information:

Acidic foods and food ingredients encourage demineralization. By using pH paper, the pH of common foods and food ingredients can be determined. By interpreting the pH, one can determine which substances increase the risk for tooth demineralization.

OBJECTIVES:

- ▶ determine the pH of common foods and food ingredients
- ▶ identify high risk foods which promote demineralization

Materials: (students will work in groups of 2 to 4)

12 test tubes per group (50 ml beakers or 28-g paper cups may be used)

1 test tube rack per group

pH paper 1–11 range (plus color chart to read pH paper)

labels or greased pencils

deionized water (distilled water may be substituted)

foods or food ingredients

test tube #

1. tap water
2. deionized water
3. white vinegar (5 percent acetic acid)
4. sodium bicarbonate (baking soda)—a few crystals dissolved in deionized water
5. lemon juice
6. lemon-lime soda
7. cranberry-apple juice
8. milk
9. powdered orange drink
10. clear carbonated drink (Sprite, 7-Up, Mountain Dew)
11. 5 ml honey dissolved in tap water
12. mixture of test tubes 3 and 4

Procedure:

1. Prepare half a test tube of each of the substances listed above.
2. Gently shake each test tube until the mixtures are dissolved.
3. Label each test tube with the substance it contains.
4. To determine the pH of each solution, dip a small piece of pH indicator paper into each liquid sample.
5. Match the color of the pH paper to the chart provided with the pH paper.
6. Record your results in the data table.

pH OF COMMON FOODS—WORKSHEET

The pH scale ranges from 0 to 14. The lower the pH, the greater the hydrogen ion concentration, and, therefore, the greater the acidity of a solution. The higher the pH, the lower the hydrogen ion concentration, which indicates an alkaline, or basic solution. A pH of 7 is midway between 0 and 14 and represents neutrality. The solution is neither acidic nor basic, but neutral.

TEST TUBE	SOLUTION	pH	ACID, BASE, OR NEUTRAL
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

pH OF COMMON FOODS—TEACHER ANSWER SHEET

The pH scale ranges from 0 to 14. The lower the pH, the greater the hydrogen ion concentration, and, therefore, the greater the acidity of a solution. The higher the pH, the lower the hydrogen ion concentration, which indicates an alkaline, or basic solution. A pH of 7 is midway between 0 and 14 and represents neutrality. The solution is neither acidic nor basic, but neutral.

TEST TUBE	SOLUTION	pH	ACID, BASE, OR NEUTRAL
1	tap water	5-7	acid/neutral
2	deionized water	7	neutral
3	white vinegar	3	acid
4	sodium bicarbonate	8	base
5	lemon juice	3	acid
6	lemon-lime soda	4	acid
7	cranberry-apple juice	3	acid
8	milk	6.5	acid
9	powdered orange drink	3	acid
10	clear carbonated drink	4	acid
11	honey dissolved in tap water	4	acid
12	mixture of test tubes 3 and 4	4.5	acid

THE pH OF COMMON FOODS

EVALUATION QUESTIONS:

1. Examine your data table to identify which foods or food ingredients are acidic. The lower the pH below 7, the more acidic the food. Record which substances are the most acidic.

2. If demineralization of teeth is caused by acid working on the teeth, which substances would promote this process the most?

3. Explain your results with test tube # 12.

4. Based on your results with test tube # 12, how does the addition of baking soda to toothpaste reduce demineralization?

5. If a person chose to eat acidic foods or food ingredients, how could their eating habits and oral hygiene habits reduce the process of demineralization?

6. Why does saliva production in the mouth decrease demineralization?
(*hint: the pH of saliva is slightly basic*)

THE pH OF COMMON FOODS

ANSWERS TO EVALUATION QUESTIONS

1. All substances with a pH below 7 are acidic. Food substances with the lowest pH values are the most acidic.
2. The substances with the lowest pH: vinegar, lemon juice, cranberry-apple juice.
3. The acid and base neutralize each other.
4. Baking soda neutralizes acid in the mouth.
5. Eat foods that are abrasive last when eating a meal. Avoid drinking an acid drink throughout the day. Try to brush and floss after meals. Avoid eating trigger foods slowly throughout the day. Trigger foods include foods containing sugar or acid, such as candy, raisins, sweetened sodas, and lemons and limes.
6. Saliva contains minerals and helps with remineralization. Saliva bathes the teeth in a slightly basic solution.

The pH scale was developed by a bottling plant scientist who wanted to insure that the correct acidity was maintained for carbonated drinks produced by his plant. Now, this scale is used worldwide by scientists. The “p” stands for the mathematical value “power of ten.” The “H” represents the number of hydrogen ions or hydroxyl ions in a solution. The strength of an acid or base depends upon this number of ions. A neutral solution has a pH of 7, while acids are below 7 (0–6), and bases are above 7 (8–14). The official definition of pH is “the negative of the logarithm of the hydrogen ion concentration.” Listed below are some common solutions and their pH values:

pH	Solution
1	Hydrochloric Acid
2	Stomach Acid
3	Soft Drinks
4	Tomato Juice
6.5	Milk
7	Water, corn oil
11	Ammonia
13	Bleach
14	Sodium Hydroxide