



## A Paste with a Taste

### Introduction:

Calcium and phosphorus are natural building blocks of teeth. When there are insufficient amounts in our teeth they can be sensitive or can become brittle. This can lead to tartar build up, cavities, and other dental problems. One of the purposes of toothpaste is to restore the mineral balance in the mouth and brushing your teeth is an easy and efficient way to restore this balance. Both the abrasive and cleansing compounds, calcium carbonate and sodium bicarbonate found in toothpaste, are minerals. Dicalcium Phosphate,  $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ , can be found in toothpaste and other food products. Phosphate is not only found in our teeth, it helps strengthen our bones, helps make our DNA, and energy. Phosphate continuously cycles in the environment and is a nonrenewable resource. This laboratory demonstration will allow students to understand the role of phosphate in their everyday life. The students will be able to produce a "marketable" product used by most people every day that are made from minerals.

### Standards:

SC.B.1.1.4    SC.F.1.1.2    SC.G.1.1.1    SC.G.1.2.4    SC.F.1.3.1    SC.F.1.3.5  
SC.G.1.3.4    SC.G.2.3.1    SC.912.E.7.1  
SC.912.L.18.1    SC.912.L.14.12    SC.912.L.17.10    SC.912.L.18.10

### Objectives:

- Students will understand the role of phosphate in the biogeochemical cycles
- Students will understand how bones are strengthened and DNA is made
- Students will understand the role of biotic and abiotic factors in the environment
- Students will understand the impact of renewable and nonrenewable resources on a system

### Materials: (for 8 groups of 4)

Calcium carbonate (finely powdered unflavored TUMS will work)

Sodium bicarbonate (baking soda)

8 plastic spoons

8 pipettes

32 small plastic cups

Water

32 Popsicle sticks for stirring

Assorted food colors and extract flavorings

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Come up with a recipe for a “marketable” toothpaste and write it here. You may use the different supplies provided for you. (As the samples are quite small, only small amounts of color and flavoring are needed. Be very careful when using hydrogen peroxide. Use a very small quantity. Hydrogen peroxide can induce vomiting )

**TOOTHPASTE WORKSHEET**

Group No. \_\_\_\_\_

Product Name \_\_\_\_\_

**Basic Recipe:**

1 tbsp Calcium carbonate

½ tbsp Sodium bicarbonate

Water to form paste.

**Added:**

\_\_\_\_\_

ingredient amount

\_\_\_\_\_

ingredient amount

Flavoring: \_\_\_\_\_ Color(s) \_\_\_\_\_

**Ad Campaign:**

Slogan (if any) \_\_\_\_\_

**15 second ad:**

\_\_\_\_\_

Each group will have to keep a record of their recipe and submit it with the sample for judging.

**Taste the other groups’ toothpaste:**

Group #	What does it taste like?	Would you buy this?	Suggested changes

**Analysis/Conclusion:**

1. How did the homemade toothpaste compare to commercial products?
2. What other mineral is added to toothpaste to fight cavities?
3. How many of the commercial toothpaste's had minerals in them?
4. How does the taste compare of commercial toothpaste in relation to the number of mineral ingredients?
5. What role does phosphate play in toothpaste's purpose?
6. Why is it important to maintain the balance of minerals in our mouth and bodies?

Adapted from **Women in Mining Education Foundation**