



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

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<b>Project Title</b> Sweet 'n Sour Soda Power	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of this experiment is to see which of several substances has the most acidity by measuring CO(2) production when mixed with baking soda. My hypothesis is that vinegar will be the most acidic.</p> <p><b>Methods/Materials</b> Materials: 1 qt. water, 2 oz. white vinegar (only 5 mL. will be used in each test; diluted in 1 part vinegar and 3 parts distilled water 1:4 dilution); 2 oz. each Pepsi and Bottled lemon juice (diluted same as vinegar); Orange juice 2 oz. (undiluted; when experiment is done, divide results by 4); Saturated solution baking soda and distilled water; 2 10 mL capacity test tubes; 1 25 mL capacity test tube; Plastic tubing and valve; Reaction chamber (jar with L-shaped brace attached via screw to lid); Rubber band; *apple juice, tomato juice, and coffee were also tested but produced no CO(2) reaction</p> <p>Methods:I constructed a device that measures acidity of substances efficiently and accurately by making a gas trap. To do this, a test tube was inverted in a bowl of water, ensuring no gas bubbles got inside. Substances were poured into the two 10ml test tubes; these were attached to the L-shaped brace on the jar lid with the rubber band. The lid was screwed on and the tubing was fed into the gas trap, then the jar was inverted. The baking soda and acid were mixed in a sealed environment. The CO(2) produced caused displacement of the water in the test tube, allowing volume of gas to be measured. The more acidic a substance, the more CO(2) produced; therefore a bigger water displacement occurred.</p> <p><b>Results</b> In this experiment, vinegar reacted most strongly out of all the acids tested. After this came Lemon Juice, Pepsi, and Orange Juice, in that order (as mentioned before coffee, tomato juice, and apple juice produced no reaction). The averages (measured in CO(2) produced) are listed: Orange Juice: 2.821; Pepsi: 6.225; Lemon juice: 19.65; Vinegar: 24.35</p> <p><b>Conclusions/Discussion</b> In conclusion, my hypothesis that vinegar is the most acidic is correct. The results were questioned because on certain information sources (internet) it states that Lemon Juice is more acidic than white vinegar, therefore questioning my method. To clarify this issue, the pH of the acids were tested in my dad's laboratory using a pH meter. The pH results correspond to the measurements of this project, so my method is correct. Here are the pH measurements: Vinegar 2.52; Lemon Juice 2.62; Orange Juice 3.94</p>	
<b>Summary Statement</b> The new method developed in this project shows that the acidity of a liquid can be determined by the amount of CO(2) produced in a baking soda-acid reaction.	
<b>Help Received</b> Dad helped build reaction chamber and test pH, Mom helped preparing backboard.	