# CALIFORNIA STATE SCIENCE FAIR
## 2007 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**J0516**

**Project Title**
## How Does the pH Level of a Fruit Affect Its Electric Current When It Is Made into a Voltaic Cell?

**Abstract**

**Objectives/Goals**
When a copper wire and a zinc nail are inserted into a fruit, electric current can be measured with a voltammeter flowing between the metals. The goal of my experiment was to determine if the pH level of a fruit affects the amount of electric current that fruit produces in this arrangment. My hypothesis was that the more acidic the pH of the fruit the more electric current it would produce.

**Methods/Materials**
To do my experiment I used various fruits including a pumpkin, persimmon, apple, bannana, orange, lemon and potato. I used distilled water as a control because it has a neutral pH. I created a voltaic cell by inserting a zinc nail and a copper wire into each fruit, one at a time and measured the electric current by compleating the circuit with a voltammeter. Because there was a surge of current at the beginning I also recorded the surge level. After measuring the current, I took out the metal and washed it, then I cut the fruit and then measured the pH level with litmus paper. Because I couldn't get a wide enough range from aquarium litmus paper, I used red cabbage to make litmus paper that could read a wider range of pH level. I repeated the experiment three times.

**Results**
I found that more acidic fruit, such as lemon, did produce more current than fruit with a near neutral pH. Distilled water produced no current. I also found pumpkin with a pH around ten produced a current similar to the more acidic fruits.

**Conclusions/Discussion**
Research on the voltaic cell showed that two reactions, oxidation and reduction are happening at the same time when the two metals are in the fruit juice, this is called redox for short. Because of the nature of the metals the zinc recives excess electrons and the copper loses electrons. This makes a potental difference between the two and the electrons flow from high concentration to low concentration causing a reading in the voltammeter. Low pH and high pH both caused more current because the farther from pH 7, which is neutral, the juice is the more reactive it is with metals.
There were other factors such as salt that could not be measured in this experiment but affected the results.

**Summary Statement**
My project compared the pH of different fruits and the current they produced when made into voltaic cells to see if the pH level affected the amount of electric current.

**Help Received**
My parents helped me cut and cook the cabbage, my teacher told me I could make litmus paper with red cabbage and my parents supervised the experiment.