



CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY

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<b>Project Title</b> Get More Hydrogen from Your Water	
<b>Abstract</b> <b>Objectives/Goals</b> Electrolysis must have an electrolyte in order to work. But what factors affect an electrolyte's effectiveness? My hypothesis is that it is either the pH of the solution or the ion concentration. <b>Methods/Materials</b> I tested 6 different electrolytes three times each, each trial with a different quantity of electrolyte. The following electrolytes were used: sodium chloride, potassium chloride, sodium bicarbonate, sodium hydroxide, hydrogen peroxide, and isopropyl alcohol. During each trial, I measured the pH of the solution, the temperature of the water, and the mL of gas produced in 5 minutes with a 9-volt charge. A trial with plain tap water was also performed as a control. <b>Results</b> Two of my electrolytes did not produce any gas: isopropyl alcohol and hydrogen peroxide. I hypothesized that this was because they did not ionize in water. I confirmed this hypothesis with one trial of sucrose, which I knew did not ionize. When I made a graph of gas production vs. electrolyte molarity that excluded the unproductive electrolytes, all of the points fell on a relatively straight line except for sodium bicarbonate. When an estimated percent of ionization was applied to the sodium bicarbonate, in a graph of mL gas vs. ion concentration measured in moles per liter, all of the points fell on a relatively straight line, demonstrated by a regression coefficient of 0.89. <b>Conclusions/Discussion</b> My results did not explain my first hypothesis because many substances did not change the pH but did produce gas. My second hypothesis explained all of my results. Gas production is directly proportional to the ion concentration in moles per liter, and the type of electrolyte is irrelevant.	
<b>Summary Statement</b> I determined the effectiveness of different concentrations of different electrolytes in electrolysis; the volume of gas produced is directly proportional to ion concentration, and independent of the type of electrolyte.	
<b>Help Received</b> My dad helped build the apparatus, and introduced and explained some chemistry terms.	