



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

Name(s) Rishi Shah	Project Number <div>35077</div>
Project Title Energy from C(2)H(5)OH / H(2)O(2)	
<div><div>Objectives/Goals To determine if the energy released by ethanol is increased when mixed with various concentrations of hydrogen peroxide: 95% ethanol 5% H₂O₂ v/v, 90/10 v/v, 85/15 v/v, 80/20 v/v. The control was water. I hypothesized that addition of H₂O₂ will increase the energy released by the ethanol.</div><div>Methods/Materials The change in the temperature of 50mls of water was measured after it was heated for 60 seconds by the ethanol/ hydrogen peroxide blends. The procedure was repeated 5 times for each of the different samples.</div><div>Results The heat energy transferred by the ethanol / hydrogen peroxide blends to the water was calculated using the Heat Formula: $Q = m \times c \times \Delta T$, where Q= Energy (J), m= mass of water (g), c= specific heat capacity of water (J/g°C), ΔT = change in temperature of the water (°C). The Heat of Combustion (J/mol) = Q/ moles ethanol used. My results are the average heat of combustion for Ethanol/ H₂O₂ (kJ per mole): 5%: 380.124, 10%: 365.077, 15% : 417.355, 20%: 411.745. Average heat of combustion of Ethanol with control H₂O (kJ per mole): 5%: 417.062, 10%: 426.618, 15%: 348.958, 20%: 372.821.</div><div>Conclusions/Discussion My hypothesis was supported at 15% and 20%, but not at 5% and 10%. Lower results at 5% and 10% compared with the control may be because the decomposition of hydrogen peroxide is concentration dependent. Errors due to heat loss were minimized by surrounding the apparatus with polystyrene foams wrapped in several layers of aluminium foil. Also, the heat absorbed by the apparatus was not taken into account in the calculations. Next steps of the project would be to: determine the octane numbers of ethanol with H₂O₂; investigate if combustion of ethanol with H₂O₂ is environmentally friendly and the effects it might have on vehicles. Incorporating H₂O₂ to the current ethanol and gasoline blends in vehicles can make them more efficient.</div></div>	
Summary Statement The purpose was to determine if the energy released by ethanol is increased when mixed with hydrogen peroxide.	
Help Received My mom helped me: get materials and supplies; supervised and properly disposed of the hazardous materials; proofreading my report and putting the display board together.	