



**CALIFORNIA STATE SCIENCE FAIR  
2014 PROJECT SUMMARY**

<b>Name(s)</b> <b>Rishi Shah</b>	<b>Project Number</b> <b>J2199</b>
<b>Project Title</b> <b>Wall Plug Efficiencies of Luminescent LEDs and Incandescent Lights</b>	
<b>Objectives/Goals</b> The objective of my experiment was to determine and compare Wall Plug Efficiencies (WPE) of white, red, yellow, green, and blue LED and Incandescent lights. My hypothesis was based on Planck-Einstein relationship: $E = hf = hc/v$ where $h$ = Planck's Constant, $c$ =speed of light, $v$ =wavelength. White light will be most efficient because white light is comprised of all the primary colors. Wavelengths increase from blue, green, yellow to red, therefore, efficiencies will decrease from blue, green, yellow, to red.	
<b>Abstract</b> <b>Methods/Materials</b> Input power was determined by measuring voltage across the light (the input current was kept constant using a 350mA constant current driver - 3023 BuckPuck). Output power was determined by measuring voltage across a 10kilo ohm resistor that was connected across ground and output voltage terminal of TSL14S Light-to-Voltage Converter. The control was the light itself. The independent variable was the color. The dependent variable was the voltage across: resistor, LED and incandescent light.	
<b>Results</b> My WPE results for LED lights are: White was the most efficient, then blue, red, green, and yellow the least. WPE results for incandescent lights: Yellow was the most, then red, blue, white, and green the least. Relative WPE (LED WPE/Incandescent WPE) results: White highest, then blue, red, green, and yellow the least.	
<b>Conclusions/Discussion</b> For LEDs, the results show that my hypothesis should be: (1) Accepted for white and blue lights. (2) Accepted for green and yellow in so far as green is more efficient compared to yellow. (3) Rejected for red light, since red is shown to be more efficient than green and yellow. For incandescent lights, my hypothesis should be rejected since yellow and red had higher efficiencies than white and blue. For maximum efficiency and savings LED lights should be used: White first, then blue, red, green and yellow last. If I were to continue with this experiment, I would compare the overall cost/savings of different colors of LEDs.	
<b>Summary Statement</b> My project was to determine and compare Wall Plug Efficiencies of white, red, yellow, green, blue LED and Incandescent lights.	
<b>Help Received</b> My mom helped me get all the components, materials, supplies needed for the project, put the display board together, and proofreading the report.	