



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Jayne S.L. McCauley	Project Number J1127
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Project Title Do Four 25 Watt Light Bulbs = One 100 Watt Light Bulb?

<p>Objectives/Goals My objective was to determine whether four 25 watt light bulbs create more heat than one 100 watt light bulb, and, if so, is it the case that they produce more heat because they produce less light.</p> <p>Methods/Materials I took three steps. First, I measured the heat produced by the two different light sources by placing each in turn in a closed oven, with a thermometer, and noting the difference in temperature produced by each light source in fifteen minutes.</p> <p>Next, I measured the light by placing first the 100 watt light bulb, and then the four 25 watt light bulbs, exactly three feet from a photographic light meter placed in a large dark closet, and took note of where the needle on the light meter registered in response to the two different sets of bulbs.</p> <p>Finally, I determined the ratio of light produced by the two light sources in the following way: 1. Because I only had a photographic light meter, the needle told me the different "f-stops" to use on a camera, not the amount of light (lumens) it was receiving. I could not use it, by itself, therefore, to tell me the ratio of light output between the two light sources. 2. To find that ratio, I determined how close the light meter needs to be to the four 25 watt light bulbs for the needle to reach the same position it had reached when it was 36 inches from the 100 watt light bulb. That distance turns out to be 17 inches. I then applied, from my research, the formula that states the relationship between light and distance from the light source. That formula is $E=L/d^2$. So the ratio of light as between these two light sources is $36^2 / 17^2$ (or about 4.5).</p> <p>Results A single 100 watt bulb produces much less heat than four 25 watt light bulbs (93 degrees 112 versus degrees). Furthermore, a 100 watt light bulb produces much more light (4.5 times more light) than four 25 watt light bulbs altogether.</p> <p>Conclusions/Discussion When 100 watts of electrical energy is used on four 25 watt light bulbs, much more of that energy goes to heat than when that same 100 watts of energy is used on a single 100 watt light bulb. The energy not used up on heat goes instead to light, which is why a 100 watt light bulb is so much brighter than four 25 watt light bulbs.</p>	<p>Abstract</p>
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Summary Statement Does a person get the same results from using four 25 watt light bulbs as that person gets from using one 100 watt light bulb, and, if not, why not?
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Help Received At the end of my project I had my father review my written work for grammatical mistakes, and my algebra for possible mistakes in my calculations.
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