

ECO 161: FOUNDATIONS OF ECONOMICS

- **Due date:**
- You should complete this in partnership with another student (and turn in one set of solution with both names on it).

INCANDESCENT vs. LED LIGHT BULBS



- I bought a LED (Light Emitting Diode) light bulb last year. These bulbs are very energy efficient, last much longer but are very expensive. I am wondering if it was worth it (monetarily) buying the LED bulb or if I should have bought an incandescent bulb.
 - Here is information on costs, how long the bulbs last and their energy usage:
 - 75 watt¹ incandescent light bulb costs \$0.60 and lasts 2,000 hours.
A 14 watt LED bulb produces the same light-output as a 75 watt incandescent bulb, costs \$9.00 and lasts 18,000 hours.
 - In term of electricity cost, I pay about \$0.14 for 1 kilowatt (1 kilowatt = 1000 watts) and let's assume I use this bulb for 3,000 hours in a year.
 - To compute the electricity cost, suppose a 75 watt light bulb is being used for 20 hours. The electricity consumption is 1,500 watts, or 1.5 kilowatt, for these 20 hours (20 hours * 75 watts per hour). The electricity cost is: 1.5 kilowatts * \$0.14 = \$0.21 (21 cents).
1. Compute the total cost of each type of bulb over a 6 year period (the life-span of the LED bulb given annual usage of 3,000 hours)². Since costs are spread over the next 6 years we need to use present value computations. Assume the discount rate (interest rate) is 4%. Given all these assumptions, was it worth it to buy the LED bulb? Show all of your work , fully explain and clearly state any assumptions you make.
 2. Based on your computations in (1), what is the maximum price you are willing to pay for the LED bulb? Explain (hint: at what price would the lifetime cost of the two bulbs be the same?).
 3. If the cost of electricity increases, would that make the energy efficient light bulb more or less attractive (in terms of cost)? Explain intuitively (you should not compute anything).
 4. If the light bulb is used for less than 3,000 hours in a year, would that make the LED bulb more or less attractive (in terms of cost)? Explain intuitively (you should not compute anything).

¹ 75 watt bulb uses 75 watts per hour.

² Hint: How many incandescent bulbs do you need so that you have light for 25,000 hours?