Name _____ Date _____

Partner _____

Electric Light Bulbs: Lab #8

M.L. West, after Harvey Leff

Objective: to think about electric light bulbs in depth, and to learn to use a spreadsheet well.

Definition: Outlier point:

Background: We use light bulbs so much that we take them for granted, and rarely consider what they can tell us about electricity and the properties of matter. They were first made practical in 1879 by _____ using a filament made of carbon.

Procedure:

1. Packaging Data on Light Bulbs

Make an Excel data table with information from the packages of at least ten different types of light bulbs. (This was the pre-lab assignment) Choose some from each partner's list.

What did each partner decide was a suitable measure of a light bulb's "goodness", that is, what was the most important criterion for you?

Make the "best value" in each column **Bold**.

Which was the best light bulb using your criterion? _____

2. Correlations between various quantities and power (watts)

Make a graph of each of the following quantities (y axis) vs. power (x axis). For each graph sketch a trend (linear or non-linear), if possible, then circle and discuss outlier points and try to explain why they do not fit with the rest of the points.

a) Luminous flux

b) Average life

c) Efficacy = luminous flux/ power **(This one is used by people in the lighting industry.)**

d) Light to cost ratio = (total light) / (total cost), where

Total light = (luminous flux) * (average life).

Total cost = initial price + cost of electricity to run the bulb

= initial price + (electric rate) * (power/1000) * (average life)

where the NJ residential electric rate was about 12 cents/kwh.

Conclusions: Compare indicators of "goodness" and choose your best lightbulb.

What was your most unusual lightbulb, and why?

Reference: Leff, Harvey S., "Illuminating Physics with Light Bulbs," The Physics Teacher, 28, p 30-35 (January 1990).