APES Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_\_\_\_\_

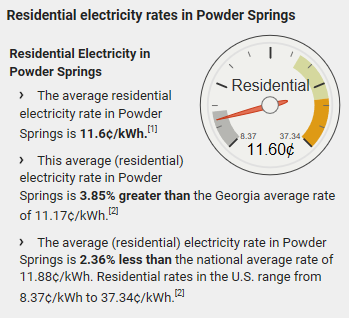
**Kill-A Watt Learning Cycle**

**Explore**

Use your group’s Kill-A Watt Meter to measure several different small appliances.

To use:

1. Plug the Kill-A-Watt Meter into the socket, power strip, or extension cord.
2. The device will read “volts”. What is the voltage of the electrical outlet? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Click the MENU button once. It will show the cost in electricity. What is the current reading? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This $ shows how much energy has been used today (and the cost of it) by other students during lab. If you plugged an appliance into this device at home and left it there for a day or month, you would accumulate watt-hours and then kilowatt-hours (kWh) and then it would show a $ cost. How is this useful for people? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Click the MENU button again. It will show the rate of electricity. In Powder Springs, this is an average rate for electricity.

  
www.electricitylocal.com

Set your meter at $0.116 if it is not already there.

1. Click the MENU button again several times until you get back to VOLTS
2. Then, click the UP button until you see WATTS. This is the measurement you will need for the lab.
3. Go through each station and plug in the appliances/electrical devices into the Kill-A-Watt meter. Fill in the chart.

**SAFETY: Be careful with hot appliances. Keep hands away from boiling water, heaters, and the hairdryer coil.**

**DO NOT pull out plugs by the cords---this will break the cords over time. Pull the plugs out by the end piece.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Station** | **Electric device** | **Watts plugged in (NOT turned on)** | **Watts plugged in and turned on.** |
| 1 | Toaster |  |  |
| 2 | Coffee pot |  |  |
| 3 | Laptop |  |  |
| 3 | Old laptop cart | Doesn’t turn off |  |
| 4 | Hair Dryer Low |  | Hot: Cold: |
| 4 | Hair Dryer High |  | Hot: Cold: |
| 5 | LED Lamp (Black) |  |  |
| 5 | Incandescent Lamp (silver) |  |  |
| 6 | Regular Christmas Lights (green) | n/a |  |
| 6 | Christmas Lights with LED bulbs (bronze) | n/a |  |
| 7 | Cell Phone Charger | Just the Charger plugged in | With phone attached |
| 7 | iPad Charger | Just the Charger plugged in | With iPad attached |
| 8 | Heater |  | Low  Hi  Does changing the number do anything? |

**Explain: Draw a graph of the items from stations 1-8. Don’t forget to label your axes and make a title.**

(Start making your graph as you wait to rotate tables). Graph columns 2 (x axis) and 4 (y axis). Your y axis (Watts plugged in) should go from 0 to 1500 Watts

1. Which devices use the most watts in the lab? Were these items that are used for long periods of time or for short periods of time?
2. Most of the items in lab are smaller and can easily be set up on lab tables. But, they don’t use most the electricity in your home. What are bigger items in your home that probably use the bulk of the electricity on your bill?

**Elaborate**

When you calculate the amount of electricity used, you push the watts and hours together.   
For example, if a cell phone charger uses 6 Watts and it was run for 3 hours to charge your phone, it used 18Wh. It's NOT 18 W per hour, but you combine the units to get 18Wh. Divide by 1000 to get kWh. So, the cell phone used 0.018 kWh to charge.

SHOW SET-UP for ALL MATH PROBLEMS. Use the 4th column (Watts Turned On) for all data and calculations.

3. How many kWh would the laptop use if it was on for 10 hours? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kWh

4. How many kWh would the toaster use if it was on for 2 hours? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kWh

5. How many kWh would the heater use if it was used during the day for a total of 4 hours?\_\_\_\_\_\_\_ kWh

6. Google what is meant by a tiered rate system. Why do you think we have a tiered system? Who does it benefit? For whom does it cost more?

7. Why do you think there are different allotments for summer and winter?

8. Many homes use so much energy in the summer that some of their electricity cost is in Tier 3. Any electricity that can be saved during this time is a huge $ saver. What are some ways you can save electricity and therefore save $?

The regular Christmas lights cost $3/strand and the LED Christmas lights cost $10/strand for the same size.

9. The Bisesi family decided to decorate their house and yard with 10 strands of these lights. They want to operate the strands for from 5 PM to 11 PM on a timer each night. They want the house lit up for 30 nights in December.

1. How many kWh would 10 regular strands use each day? \_\_\_\_\_\_\_\_\_\_\_ for 30 days? \_\_\_\_\_\_\_\_\_\_\_\_
2. How many kWh would 10 LED strands use each day? \_\_\_\_\_\_\_\_\_\_\_ for 30 days? \_\_\_\_\_\_\_\_\_\_\_\_

10. This is not the true cost of the lights. The cheaper lights often break sooner and the more expensive lights will last longer.

Assuming the regular lights will need to be replaced every 2 years and the LED lights will need to be replaced every 6 years. Calculate the cost of owning and replacing the lights for 5 years (remember you only use them for 30 days each year):

1. Regular: Electricity cost: $\_\_\_\_\_\_\_\_\_\_\_ X 5 years

+ Purchase price for all 10 strands X 3 (replaced twice) $\_\_\_\_\_\_\_\_\_\_ = $\_\_\_\_\_\_\_\_\_\_\_ total

1. LED: Electricity cost: $\_\_\_\_\_\_\_\_\_\_\_ X 5 years

+ Purchase price for all 10 strands X 1 (not replaced) $\_\_\_\_\_\_\_\_\_\_ = $\_\_\_\_\_\_\_\_\_\_\_ total

15. In addition to being more expensive, think of and list environmental costs from cheaper lights:

16. What are the sources of electricity in our town? (Coal, Natural Gas, Solar, Wind etc). How does saving electricity impact the environment?

17. How does saving electricity impact human health?

**Evaluate - Write at least one solid paragraph**

How does electricity use impact our lives? Use information about cost, types of appliances, and amount of usage.