**Solar Panel Exploration**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Definitions [units]:**

Voltage: difference in electric potential between those two points [Voltage or V]

Current: flow of electric charge [Amperage, Amps, or A]

Power: rate at which electrical energy can be transferred or moved [Watts, W, or Volts x Amps]

Energy: ability of a system to perform work [Joules, J, kilowatt\*hours, or kWh]

**Directions:**

1. Using a multimeter, measure the voltage and current three similar solar cells.

|  |  |  |
| --- | --- | --- |
| Solar Cell | Voltage (V) | Current (A) |
| #1 |  |  |
| #2 |  |  |
| #3 |  |  |

 Bonus: Does the voltage change with different intensities of light? Record observations.

1. Using a ruler, measure each solar cell. Area = Width x Length

|  |  |  |  |
| --- | --- | --- | --- |
| Solar Cell | Width (cm) | Length(cm) | Area (cm2) |
| #1 |  |  |  |
| #2 |  |  |  |
| #3 |  |  |  |
|  |  | Total Area (cm2) |  |

1. Calculate the power of each solar cell. Power= Voltage x Current

|  |  |
| --- | --- |
| Solar Cell | Power (W) |
| #1 |  |
| #2 |  |
| #3 |  |

1. Calculate the power density. Power density = Power / Area

|  |  |
| --- | --- |
| Solar Cell | Power Density (W/cm2) |
| #1 |  |
| #2 |  |
| #3 |  |

1. Connect the same three solar cells in

series and parallel.

 -Measure the voltage and current.

 -Calculate power and power densities.

(Hint: Theoretically, in series, voltages are added and in parallel, currents are added.)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Voltage (V) | Current (A) | Power (W) | Power Density (W/cm2) |
| Series |  |  |  |  |
| Parallel |  |  |  |  |

1. Which type of configuration resulted in the highest power?
2. Do the experimental values match theoretical values for voltage and current?
3. How many of these solar cells, and in what configuration, would you need to power a

100 W light bulb?

1. Count the number of light bulbs in this room and calculate the number of solar cells needed to power them. (This is a rough estimate.)

**Discussion Questions:**

Do you think you can power your whole school with these solar cells? What about a home? Or a vehicle? Or a computer? Or a phone? If so, why? If not, what needs to change?