1. Have one person in your group collect a tub with the materials needed for experimenting with series and parallel wiring.
2. Set-up a simple circuit using a single PV module and multimeter (see diagrams, Handout 6). Record the amperage and voltage for the single PV module under the following conditions, and then calculate the maximum theoretical wattage:

|  |  |  |  |
| --- | --- | --- | --- |
| Condition | Amperage | Voltage | Max Theoretical Wattage (Calculated) |
| Direct sun flat on ground |  |  |  |
| Direct sun tilted directly at sun |  |  |  |
| Direct sun tilted away from sun |  |  |  |
| Outdoors in shade of tree or building |  |  |  |

1. Write a sentence or two with your observations about how the output of your PV module changes in the various conditions.
2. Obtain a second PV module and connect the two using **series** wiring (see corresponding diagram). Use the multimeter to record the amperage and voltage; then, calculate max theoretical wattage. Remember that red is positive and black is negative.

|  |  |  |  |
| --- | --- | --- | --- |
| Condition | Amperage | Voltage | Max Theoretical Wattage (Calculated) |
| Direct sun flat on ground |  |  |  |
| Direct sun tilted directly at sun |  |  |  |
| Direct sun tilted away from sun |  |  |  |
| Outdoors in shade of tree or building |  |  |  |

1. Re-wire your circuit using **parallel** wiring instead of series wiring (see corresponding diagram). Use the multi-meter to again record the amperage, voltage, and calculate maximum theoretical wattage.

|  |  |  |  |
| --- | --- | --- | --- |
| Condition | Amperage | Voltage | Max Theoretical Wattage (Calculated) |
| Direct sun flat on ground |  |  |  |
| Direct sun tilted directly at sun |  |  |  |
| Direct sun tilted away from sun |  |  |  |
| Outdoors in shade of tree or building |  |  |  |

1. Compare your values in tables two and three to your values in table one. Write an observation about how the two different wiring methods changed or did not change values for each of the three units.
2. Parallel wiring increases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, while series wiring increases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. In both cases the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is increased.

**Calculations**

1. Under ideal conditions, what is the maximum voltage that can be achieved by linking 10 of the modules together?

\_\_\_\_\_\_\_\_\_ V

* 1. Would you use series or parallel wiring to do this?

* 1. What would the amperage be with this set-up?
  2. What is the wattage with this set-up?

1. Under ideal conditions, what is the maximum amperage that can be achieved by linking 10 of the modules together?

\_\_\_\_\_\_\_\_ A

* 1. Would you use series or parallel wiring to do this?

* 1. What would the voltage be with this set-up?
  2. What is the wattage with this set-up?

1. Calculate the number of modules you would need to wire together in order to produce one kilowatt of power.

\_\_\_\_\_\_\_\_\_\_ modules

* 1. How large would the panel(s) be? (measure the dimensions of one of the modules you tested first). Give your answer in m2.