Name _____ Date_____

Pointing at Maximum Power for PV!

Investigation Worksheet Answers

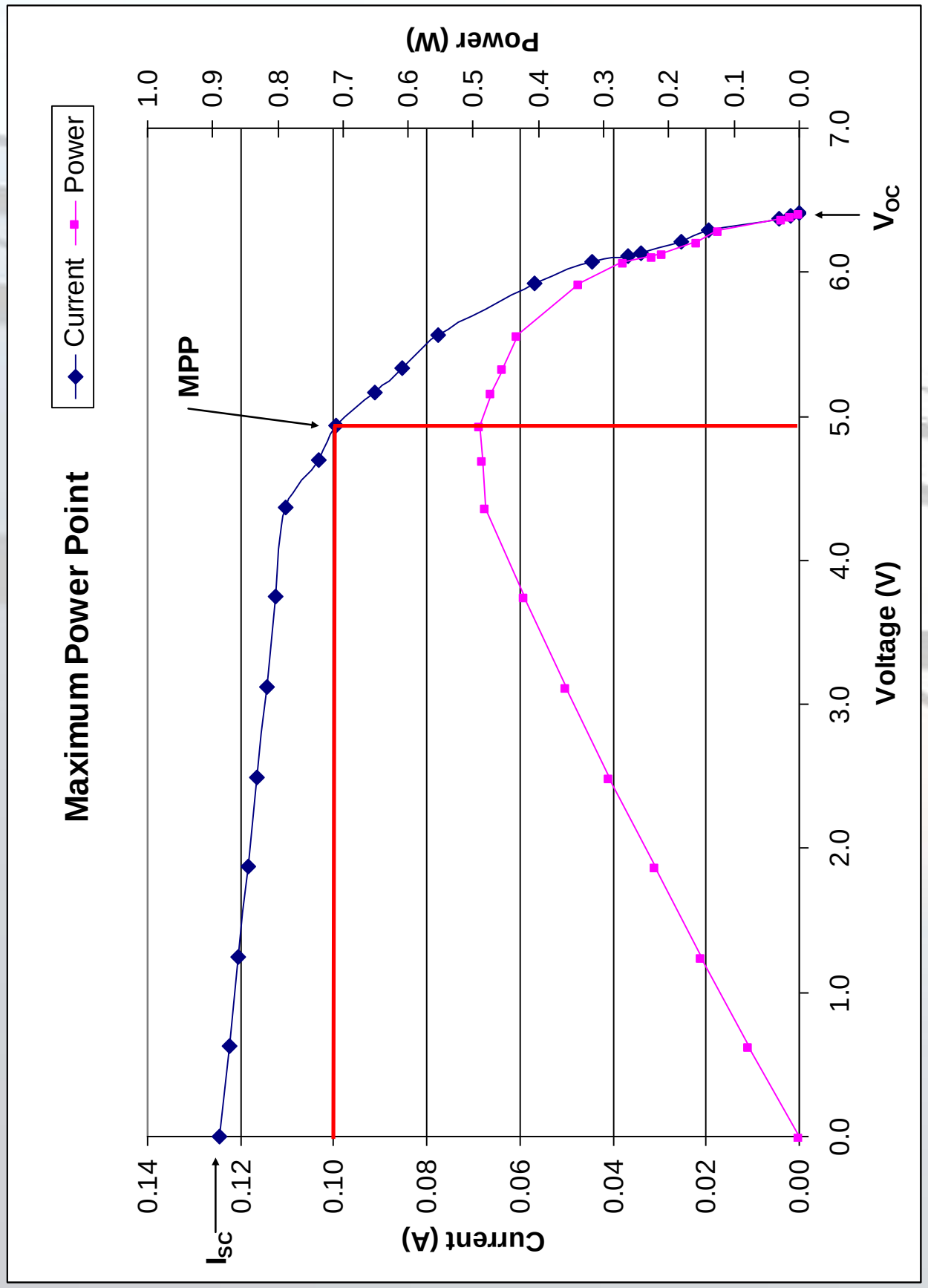
Data Collection

Follow instructions in the Student Investigation Guide and record your data in the table, below.

Table 1: PV Panel Data Collection

Trial #	Collected Data		Calculated
	Voltage (V)	Current (A)	Power (W)
1	0.000	0.124	0.000
2	0.624	0.122	0.076
3	1.248	0.120	0.150
4	1.872	0.118	0.222
5	2.497	0.116	0.291
6	3.121	0.114	0.357
7	3.745	0.112	0.421
8	4.369	0.110	0.482
9	4.700	0.103	0.485
10 [MPP]	4.934	0.100	0.491
11	5.165	0.091	0.472
12	5.336	0.085	0.455
13	5.566	0.078	0.432
14	5.927	0.057	0.337
15	6.070	0.045	0.270
16	6.113	0.037	0.225
17	6.137	0.034	0.209
18	6.210	0.025	0.156
19	6.294	0.020	0.123
20	6.373	0.004	0.027
21	6.389	0.002	0.013
22	6.407	0.000	0.000

Name _____ Date_____


Maximum Power Point
Current
Power
MPP
I_{sc}
V_{oc}
Current (A)
Power (W)
Voltage (V)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0

Name _____ Date_____

Post-Experiment Assignment

1. Calculate power (voltage * current) for each reading and record it in the table.
2. Graph current and power vs. voltage on the graph provided. Voltage is on the x-axis, current is on the left y-axis. Power is on the right y-axis. For each variable, create a range on the axis that fits all of the data points. (Note: This looks similar to the Fundamentals Article graph.)
3. On the graph, identify the maximum power point, short circuit current (I_{SC}), and open circuit voltage (V_{OC}).

Investigation Questions

1. What was the maximum power produced by your panel?

   The MPP can be found as the point at which the product of the current and voltage equals the greatest value. For the panel and the specific conditions used in the example experiment, the power calculation shows that the MPP has a voltage of V_{MPP} = 4.934, a current of I_{MPP} = 0.100 A, with the power, P = 0.491 W.

2. What is the short circuit current (I_{sc}, or current when V=0), and open circuit voltage (V_{oc}, or voltage when I=0) of your PV circuit?

   I_{sc} = 0.124 A, and V_{oc} = 6.407 V for the example experiment.

3. Do you think a PV panel produces the same amount of power in different weather conditions? Why or why not?

   The temperature of a PV panel affects the voltage in the circuit and the amount of solar radiation hitting the panel affects the current. Therefore, wind, clouds, temperature changes, and other environmental factors have an effect on the voltage and current of the PV circuit and thus the power output will be different for even small differences in weather conditions.

4. Would it be more efficient for a large field of PV panels (like the one in the photo on page 1 of the guide) to have one MPP tracker for the entire field, or to use many MPPTs for smaller areas of the field? Why or why not?

   One MPP tracker would be the lowest cost option, however this will not lead to the optimal system output. With an array this large, a cloud could easily cover a portion of the array, while the rest of the panels are exposed to the sun. In this situation, to ensure all PV panels are operating as efficiently as possible, a MPP tracker for smaller sections would be necessary. A MPP tracker for each panel would be too costly, so engineers decide on a balance between cost and performance.

5. If a cloud covered your panel and lowered the current in the circuit, what would happen to the maximum power point? Would it be necessary to adjust the resistance to find a new MPP?

   If a cloud covered a panel, the current would drop immediately and drastically, creating a new shape for the I-V curve. The MPP would drop to a lower value and it would be necessary to adjust the resistance to find the new voltage value, which results in the MPP for the new circuit conditions.