Check the box of your subgroup control and write your subgroup symbol on the line. Then, fill out the chart for each of your trials. For the variables that remain constant, write the value in Trial D and then draw an arrow through each box indicating the variable is a control. Remember to record data measurements to the nearest tenth (Ex. 4.1 mA), calculate power to the nearest tenth (Ex. 13.2 mW), and percentages to the nearest whole number (Ex. 75%).

<table>
<thead>
<tr>
<th>Subgroup Control:</th>
<th>Panel Angle</th>
<th>Shading Amount</th>
<th>Temperature</th>
<th>Subgroup Symbol:</th>
<th>△</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>Trial D</td>
<td>Trial E</td>
<td>Trial F</td>
<td>Trial G</td>
<td></td>
</tr>
<tr>
<td>Power Source:</td>
<td>1 solar panel</td>
<td>2 solar panel</td>
<td>3 solar panel</td>
<td>4 solar panel</td>
<td></td>
</tr>
<tr>
<td>Panel Angle:</td>
<td>50°</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shading:</td>
<td>0/8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>RT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room Temp:</td>
<td>22°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light Height:</td>
<td>14 cm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Predictions**

Put an “L” in the trial that will give the smallest power and an “S” in the trial that will give the largest power.

**Trial E**

- L

**Trial G**

- S

**Data and Calculations**

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Trial D</th>
<th>Trial E</th>
<th>Trial F</th>
<th>Trial G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current (mA):</td>
<td>5.2 mA</td>
<td>6.0 mA</td>
<td>6.7 mA</td>
<td>7.7 mA</td>
</tr>
<tr>
<td>Voltage (V):</td>
<td>1.9 V</td>
<td>1.9 V</td>
<td>2.0 V</td>
<td>2.0 V</td>
</tr>
<tr>
<td>Percent CV: (get values from pg. 20)</td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Calculations**

\[ P = I \times V \]

- Power (mW): 5.2 mA \times 1.9 V = 9.9 mW  
  6.0 mA \times 1.9 V = 11.4 mW  
  6.7 mA \times 2.0 V = 13.4 mW  
  7.7 mA \times 2.0 V = 15.4 mW

The independent variable is the changing variable and the dependent variables are the current and voltage.
Use the clear scale to measure the angle.

$45^\circ$
FINDINGS

Experiment 1

Conclusion Summaries:

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_____________________________________________________________________________

Experimental Design:

_____________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________

_____________________________________________________________________________
CLASS PLAN

Subgroup: The original people you worked with.

Team: Multiple subgroups that are investigating the same changing variable.

Class Control: A control that everyone in the class has the same value for.
   • The class picks this value together.

Team Control: A control that everyone in a team has the same value for, but values vary for different teams within a class.
   • Teams pick this value together.

Subgroup Control: A control that everyone in a subgroup has the same value for, but values vary for different subgroups within a team.
   • Subgroups pick this value on their own, with team input.

Changing Variable: The variable that is purposely changed in an experiment.
   • Each subgroup picks multiple values on their own

---

Class Control

---

Team Panel Angle

☐ Orange 1 ☐ Blue 1 ☐ Green 1
☐ Orange 2 ☐ Blue 2 ☐ Green 2

---

Team Shading Amount

☐ Orange 1 ☐ Blue 1 ☐ Green 1
☐ Orange 2 ☐ Blue 2 ☐ Green 2

---

Team Temperature

☐ Orange 1 ☐ Blue 1 ☐ Green 1
☐ Orange 2 ☐ Blue 2 ☐ Green 2
RESULTS
Graph

Set up your graph. (Check off the steps as you complete them.)
✓ Write the title for your graph by filling in the blanks.
✓ Label the y-axis (vertical) with what you calculated, including units (Ex: Power (mW)).
✓ Label the x-axis (horizontal) with your modified name of changing variable, including units (Ex: Percent Angled (%)).
✓ Select your subgroup control in the legend by checking the appropriate box. Then, put your subgroup control value next to your subgroup symbol.

Plot your data.
✓ On the x-axis, circle your 4 changing variable values (as percentages). If a value is not there, write it in.
✓ Starting with the smallest changing variable value, determine the power, and put your subgroup symbol at the appropriate level. Write the power next to the point.
✓ Once you have plotted all 4 points, draw a trend line that best fits your data.

Plot the data collected by the other subgroup in your team.
☐ Complete the legend for the other subgroup in your team by writing their subgroup control value next to their subgroup symbol.
☐ Graph the other subgroup’s 4 points using their symbol as the markers (do not label these points). Then, draw a trend line that best fits their data.

![Graph with power source and panel angle effects on power](image)

Legend

<table>
<thead>
<tr>
<th>Subgroup Symbol</th>
<th>Subgroup Control Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Δ</td>
<td>50°</td>
</tr>
</tbody>
</table>

Effects of [insert changing variable] and [insert subgroup control] on the [insert what you calculated] power.
Set up your graph. (Check off the steps as you complete them.)

- Write the title for your graph by filling in the blanks.
- Label the y-axis (vertical) with what you calculated, including units (Ex: Power (mW)).
- Label the x-axis (horizontal) with your modified name of changing variable, including units (Ex: Percent Angled (%)).
- Select your subgroup control in the legend by checking the appropriate box. Then, put your subgroup control value next to your subgroup symbol.

Plot your data.

- On the x-axis, circle your 4 changing variable values (as percentages). If a value is not there, write it in.
- Starting with the smallest changing variable value, determine the power, and put your subgroup symbol at the appropriate level. Write the power next to the point.
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Plot the data collected by the other subgroup in your team.

- Complete the legend for the other subgroup in your team by writing their subgroup control value next to their subgroup symbol.
- Graph the other subgroup’s 4 points using their symbol as the markers (do not label these points). Then, draw a trend line that best fits their data.

Effects of [power source] and [panel angle] on the [power].

---

**Legend**

<table>
<thead>
<tr>
<th>Subgroup Control:</th>
<th>Subgroup Control Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Angle</td>
<td>30°</td>
</tr>
<tr>
<td>Shading Amount</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>50°</td>
</tr>
</tbody>
</table>
NOTES ON PRESENTATIONS
What variables affect the power produce by a solar panel?

<table>
<thead>
<tr>
<th>Percent Changing Variable:</th>
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<th>☐ Shading Amount</th>
<th>☐ Temperature</th>
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<th>Power (mW):</th>
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Summary: ____________________________________________________________________
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Summary: ____________________________________________________________________
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