**MATERIALS PAGE**

You will only have access to the following materials. Put a check in the box next to the materials that you need for your experiment. **If you are not changing a specific variable you will only have access to the underlined values that correspond to that variable.**

**General Materials:**
- Wind turbine base
- Multimeter
- Measuring tape
- Binder Clips
- Swing arm protractor
- Wind turbine protractor

**Blade Material:**
- Kleenex
- Styrofoam
- Paper
- Metal
- Paper towel
- Cardstock (original)

**Number of Blades:**
- 1
- 2
- 3 (original)
- 4
- 5
- 6

**Number of Weights:**
- 0
- 3 (original)
- 6
- 9
- 12
- 15
- 18
- 21
- 24

**Weight Placement:**
- 0 cm
- 1 cm
- 2 cm
- 3 cm
- 4 cm
- 5 cm
- 6 cm (original)
- 7 cm
- 8 cm
- 9 cm
- 10 cm
- 11 cm

**Note:** if you are changing Number of Weights, you may only place your weights at 6 cm.

**Dowel Placement:**
- 0.5 cm
- 1 cm
- 1.5 cm
- 2 cm
- 2.5 cm
- 3 cm (original)
- 3.5 cm
- 4 cm
- 4.5 cm
- 5 cm
- 5.5 cm
- 6 cm

**Blade Angle:**
- 0°/180°
- 10°
- 20°
- 30°
- 40° (original)
- 50°
- 60°
- 70°
- 110°/-70°
- 120°/-60°
- 130°/-50°
- 140°/-40°
- 150°/-30°
- 160°/-20°
- 170°/-10°

**Fan Distance:**

Any distance between 20 cm – 100 cm (original fan distance = 60 cm)

**Fan Angle:**
- 40°
- 50°
- 60°
- 70°
- 80°
- 90° (original)
- 100°
- 110°
- 120°
- 130°
- 140°

**Turbine Angle:**
- 0°
- 15°
- 30°
- 45°
- 60° (original)
- 75°
- 90°
- 105°
- 120°
- 135°
- 150°
- 165°
- 180°
EXPERIMENTAL SET-UP

Determine the values of your changing variable (ex: number of blades) from the materials page and write the values (ex: 4) for your four trials under each wind turbine.

Changing Variable

Trail A : Trail B : Trail C : Trail D

Controls (variables you will hold constant):
Determine the variables that you will hold constant and indicate the specific value you will use in all your trials.

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SciTrek Member Approval__________________
RESULTS

Table

Fill out the chart for each of your trials. If one of the variables remains constant for all trials write the value in trial A and then draw a line through each box indicating that this variable is a control.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Trial A</th>
<th>Trial B</th>
<th>Trial C</th>
<th>Trial D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blade Material:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Blades:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Weights</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight Placement:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dowel Placement:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Blade Angle: 
  (list both the actual angle and what angle you will find on the wind turbine protractor) | | | | |
| Fan Distance:              |         |         |         |         |
| Fan Angle:                 |         |         |         |         |
| Turbine Angle:             |         |         |         |         |

**Other Variable**

**Predictions**

Put an “M” in the trial that will give the most current and an “L” in the trial that will give the least current.

<table>
<thead>
<tr>
<th>Predictions</th>
<th>Trial A</th>
<th>Trial B</th>
<th>Trial C</th>
<th>Trial D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

**Data**

<table>
<thead>
<tr>
<th>Final Observations/Measurements:</th>
<th>Trial A</th>
<th>Trial B</th>
<th>Trial C</th>
<th>Trial D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
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</tr>
</tbody>
</table>

The independent variable is the changing variable and the dependent variables are current and other.
NOTES ON PRESENTATIONS

What variables affect the current a wind turbine produces?

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Changing Variable:</th>
<th>Current (mA):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary:</td>
<td>___________________</td>
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<tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 2</th>
<th>Changing Variable:</th>
<th>Current (mA):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary:</td>
<td>___________________</td>
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<td>___________________</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 3</th>
<th>Changing Variable:</th>
<th>Current (mA):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>Summary:</td>
<td>___________________</td>
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<td>___________________</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 4</th>
<th>Changing Variable:</th>
<th>Current (mA):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>Summary:</td>
<td>___________________</td>
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<tr>
<td></td>
<td>___________________</td>
<td>---------------</td>
</tr>
<tr>
<td>Group 5</td>
<td>Changing Variable:</td>
<td></td>
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<tr>
<td>--------</td>
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<td>---</td>
</tr>
<tr>
<td></td>
<td>Current (mA):</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Summary:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group 6</th>
<th>Changing Variable:</th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current (mA):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Summary:</td>
<td></td>
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</tr>
</tbody>
</table>
Effects of Changing Blade Angle

Controls:

- Dowel Placement / 1 cm
- Number of Weights / 3
Effects of Changing Dowel Placement

<table>
<thead>
<tr>
<th>Dowel Placement (cm)</th>
<th>Current (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1.9 mA</td>
</tr>
<tr>
<td>5</td>
<td>2.0 mA</td>
</tr>
<tr>
<td>3.5</td>
<td>2.2 mA</td>
</tr>
<tr>
<td>2</td>
<td>2.6 mA</td>
</tr>
<tr>
<td>0.5</td>
<td>3.0 mA</td>
</tr>
</tbody>
</table>

Controls:

Blade Angle / 40°  Number of Weights / 3
Effects of Changing Number of Weights

<table>
<thead>
<tr>
<th>Number of Weights</th>
<th>Current (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3.7 mA</td>
</tr>
<tr>
<td>12</td>
<td>3.8 mA</td>
</tr>
<tr>
<td>0</td>
<td>3.8 mA</td>
</tr>
<tr>
<td>9</td>
<td>3.9 mA</td>
</tr>
<tr>
<td>6</td>
<td>3.9 mA</td>
</tr>
</tbody>
</table>

Controls:

- Blade Angle / 40°
- Dowel Placement / 1 cm