

PHYSICAL SCIENCE LAB - WIND POWER

1. **DESCRIPTION:** Teams will build a blade assembly that consists of any kind of propeller/pinwheel/rotor attached to a compact disc (CD), which will be used to capture wind power and generate voltage. Students will also be tested on their knowledge regarding alternative energy.

A TEAM OF UP TO: 2

IMPOUND: Yes

APPROXIMATE TIME: 50 minutes

2. **EVENT PARAMETERS/CONSTRUCTION:**

- a. Each team may bring one or two pre-constructed blade assemblies attached to a standard CD.
- b. All reference materials to be used during part two of the competition must be secured in a 3-ring binder, must be 3-hole punched and inserted in the binder so that regardless of orientation none can fall out. Materials such as pencils, pens, protractors, rulers, nonprogrammable calculators, and any other similar tools may also be used during the set up and activity.
- c. At impound, the event supervisor will announce the kind and size of multispeed fan that will be used at the competition. (A box fan is recommended)
- d. The CD must fit on the mount found in a standard CD player. Modification of the CD (except for the center hole) is allowed. When mounted, the blade assembly must fit within a 30 cm diameter circle. The blade assembly may be made of any nonmetallic substance. Commercial blades (modified or unmodified) are **not** permitted.
- e. Blade assemblies must be placed in a box and labeled with the team number and impounded. Impact goggles must be worn during the event, but need not be impounded.

3. **THE COMPETITION:**

- a. The supervisor will provide all testing materials that will be the same for all teams. There will be two stations: a high speed and a low speed fan station to test the blade assemblies. Materials provided will include: the fan, ring stand or similar stand (which allows for vertical and horizontal adjustments of the blade assembly); a clamp or clamps that allow teams to orient the mount to any angle with reference to the fan; a motor/generator (a portable CD player motor will be used at the National Finals); and a voltmeter, probe or multi-meter to record voltage. Consult www.soinc.org for a sample setup. Other motors/generators may be adapted for CD attachment to record voltage.
- b. The fan used must have a fixed position whose bottom of the grill is at least 15 cm above the table. The position of the blade assembly can be oriented and placed in any position or angle in front of the fan. The teams must mount their blade assemblies and position in front of the fan prior to the fan starting.
- c. At each station teams will attach their blade assembly to the motor/generator. When the students are ready, they will tell the event supervisor who will then start the fan, the time and begin recording the highest voltage during a one-minute time period. Students may use either blade assembly in front of either fan. However, once mounted, blades may not be modified or switched.
- d. Teams must set up and complete the blade assembly testing within a 5-minute period at each fan.
- e. Teams will have approximately 40 minutes to complete stations that may include questions, data analysis, or experiments.

4. **SAMPLE STATIONS/QUESTION TOPICS:** Wind power, solar power, geothermal energy and other alternative energy forms; advantages and disadvantages of these forms of energy to society; environmental concerns regarding current use and practices regarding energy; and interpretation of data regarding energy usage and availability.

5. **SCORING:**

- a. High score wins. The final score will be the voltage scores plus the station score. To calculate the station score, base it on a maximum 300-point scale (e.g., if you have 30 questions each one would be worth 10 points). Equate one millivolt to one point for the voltage score.

Voltage Score = Low speed voltage (mV) + High speed voltage (mV)

Final score = Voltage Score + Station Score (300 point base)

- b. Ties will be broken by the best high-speed performance.

RECOMMENDED RESOURCES: <http://www.alliantenergykids.com> and American Wind Energy Association at www.awea.org

NATIONAL SCIENCE EDUCATION STANDARDS: Content Standard B: All students should develop an understanding of motions and forces and transfer of energy. Content Standard E: All students should develop abilities of technological design and understandings about science and technology.