

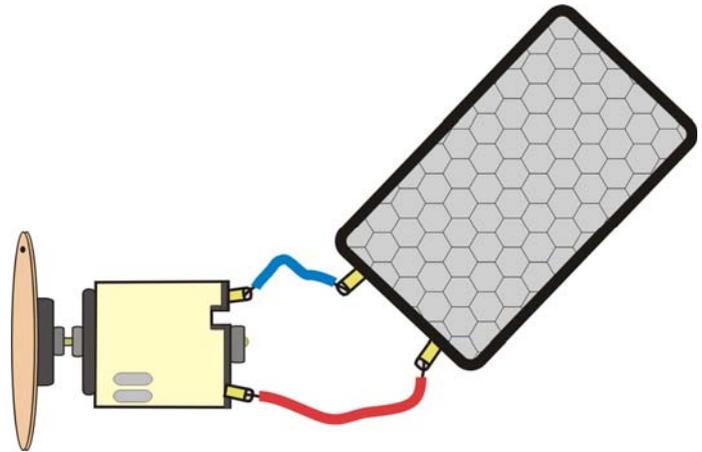
Experiments with photovoltaic cells and motors

Solar cells, also called photovoltaic or PV cells, change sunlight directly to electricity. When sunlight strikes the solar cell, electrons are knocked loose. They move toward the treated front surface. An electron imbalance is created between the front and back. When the two surfaces are joined by a connector, like a wire, a current of electricity travels between the negative and positive sides. Solar cells are used to power calculators and watches as well as lights, refrigerators, and even cars ... or toy solar cars (*see following construction!*).



Materials

- ✓ a photovoltaic cell
- ✓ a couple of wires with crocodile clips
- ✓ an electric motor
- ✓ a 10-15 cm diameter cardboard circle with a dot drawn on it.
- ✓ a plastic wheel or pulley with an axle hole in the centre
- ✓ some black construction paper or carton
- ✓ several sheets of coloured transparency film, in a variety of colours
- ✓ a stopwatch
- ✓ scissors, cutter, ruler, pen or pencil

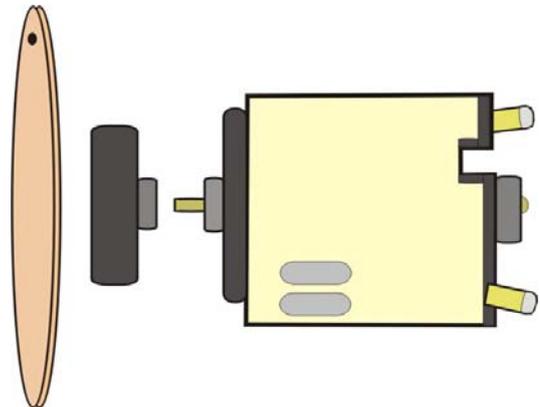


Setting up the experiment

- 1** Take the motor, preferably a low friction solar motor, and attach the plastic wheel to the motor by gently pushing the wheel onto the shaft of the motor.

Cut and glue or attach a 10-15 cm diameter cardboard circle on the face of the wheel, with a black dot drawn on it (*see drawing aside*).

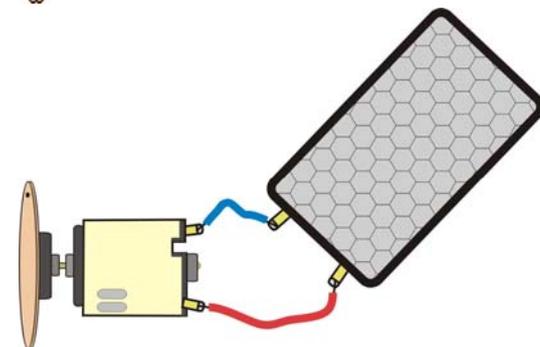
This dot will be used as a frame of reference to measure the speed that the wheel is spinning.



- 2** Connect the photovoltaic cell with the wires and the crocodile clips to the motor with the dotted circle.

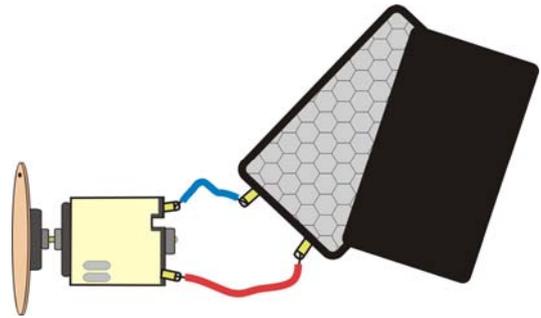
Observe the spinning motion. (If the motor does not spin the wheel, check the wire connections.)

Using the stopwatch and watching the dot, count the number of spins in 15 seconds. Multiply this number by 4 to obtain the number of spins per minute. Record the spinning rate on a piece of paper.



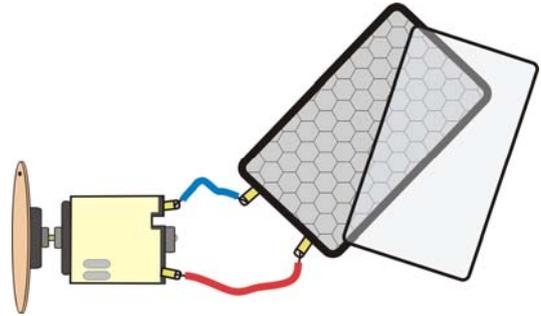
- 3** Shade one area of the solar cell with the black construction paper. Note down the portion of the cell shaded and record observations on a piece of paper and/or a chart.

Repeat the experiment by shading different areas and/or sections of the solar cell.



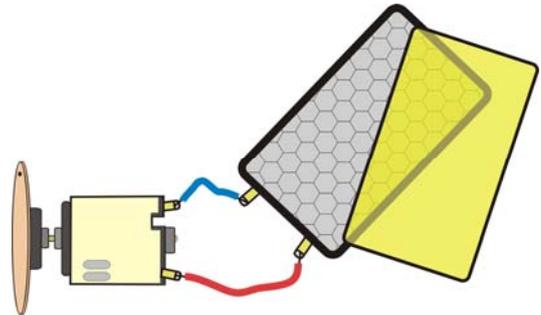
- 4** Cover the solar cell with a piece of transparency film. Count the number of spins in 15 seconds. Multiply this number by 4 to obtain the number of spins per minute (*see drawing aside*).

Record the spinning rate in a table and/or chart.



- 5** Cover the solar cell with a piece of coloured transparency film. Count the number of spins in 15 seconds. Multiply this number by 4 to obtain the number of spins per minute. Record the spinning rate in a chart similar to the one below.

Colours	Number of Spins
Sunlight	
Red	
Yellow	
Blue	
Green	
Black	



Repeat the experiment with other colours of transparency film.

What did you observe?

- How did the spinning motion change when you covered different parts of the solar cell?
- How did the spinning motion change when shading or covering the entire cell?
- Which colours slowed down the spinning of the motor and the attached disk the least?
- Which colours slowed down the spinning the most?

