

SECTION 2 ACTIVITIES

Activity 4: Solar Circuits

ACTIVITY TYPE: Science-Kit Lab

OVERVIEW: Students build simple circuits using solar cells and use the solar cells to power pumps, motors, sound boards, and lights

GOAL: Students gain hands-on experience with solar electricity and an understanding of how solar circuits work. Students wire in series and parallel and build voltage and current to operate fans, sound boards, water pumps, and other devices.

SUBJECTS: Science and Earth Science

TIME: 2-3 1-hour class periods

SETTING: Classroom and outside on a sunny day. .

MATERIALS: Photovoltaic cell kits and multimeters (from science kit) and a bucket of water (optional for pumping activities).

KEY VOCABULARY: Amp, array, parallel wiring, photovoltaic cell, photovoltaic effect, photovoltaic module, photovoltaic series, volt, and watt.

CORRELATIONS TO STANDARDS	
NATIONAL	Science as Inquiry – 1c: Use appropriate tools and techniques to gather, analyze, and interpret data.
IDAHO	Science – Goal 5.2: Understand the relationship between science and technology.
OREGON	Science – Energy: Describe differences and similarities between kinds of waves, including sound, seismic, and electromagnetic, as means of transmitting energy.
WASHINGTON	Science – Application 3.1 Designing Solutions: Apply knowledge and skills of science and technology to design solutions to human problems.

ABOUT THE AUTHORS: Solar Schoolhouse is a K-12 energy program developed by the Rarus Institute. The program uses sun as a starting point for teaching about energy resources, conservation, and other energy topics. To find out more, visit <http://www.solarschoolhouse.org/ssh.html>.



* ACTIVITY 4: SOLAR CIRCUITS

source: Solar Schoolhouse



Project #12

Series and Parallel Circuits

Wire solar cells to a small DC motor. Watch what happens with series and parallel circuits. Find out how to make the motor turn faster, and which circuit works better on a cloudy day.

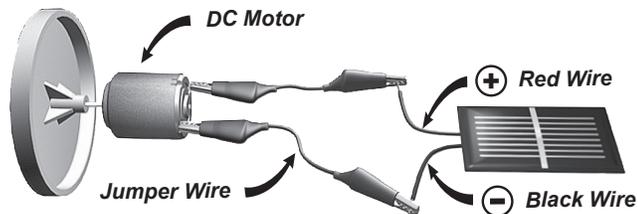
Materials

- Solar cells
- Direct current hobby motor
- Plastic wheel (optional)
- Jumpers with alligator clip ends

NOTE: This project uses the Solar Cell Classroom Set from the Solar Schoolhouse (www.solarschoolhouse.org). These circuits can be made with other small solar cells and loads.

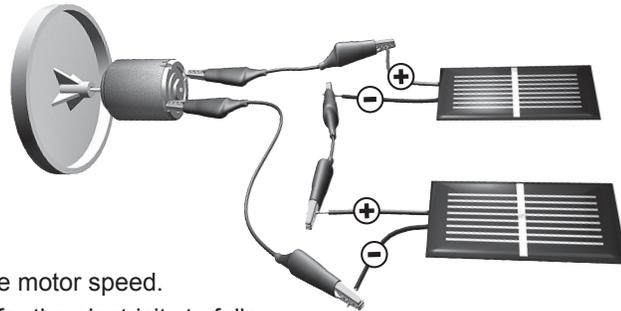
Simple Circuit to Motor

1. Use jumpers to connect wires from the solar cell to the terminals on the motor. Notice which way the motor spins. The plastic wheel makes it easier to see which way the motor is turning.
2. Reverse polarity by switching the jumpers on the motor terminals, and observe. **What happens when you reverse polarity?**



Series Circuit to Motor

1. Use a jumper to connect the black (-) wire of one cell to the red (+) wire of another cell.
2. Use jumpers to connect the remaining wire from each cell to the terminals on the motor. What happens?
3. Connect more cells in series, and notice motor speed.

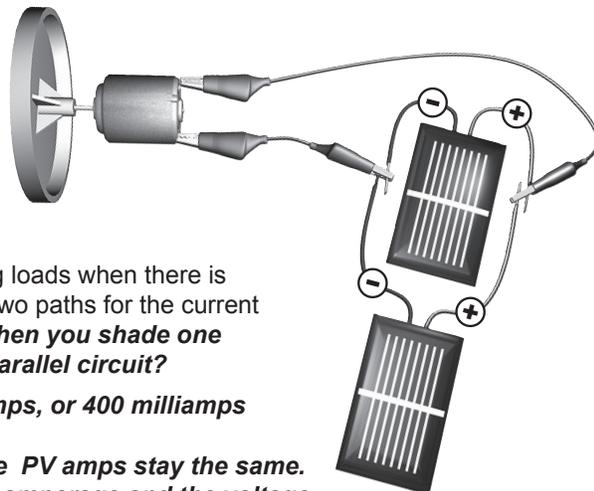


NOTE: Series circuits have only one path for the electricity to follow.

What happens when you shade one cell? Why do you think this happens in a series circuit?

Parallel Circuit to Motor

1. Use one end of a jumper to clamp the red wires from two solar cells together, and clip the other end to a terminal on the motor.
2. Use a jumper to clamp the black wires from the two solar cells together, and clip the other end to the other terminal on the motor.



NOTE: Parallel circuits are useful for powering loads when there is less sunlight, like on a cloudy day. There are two paths for the current to follow between the cells. What happens when you shade one cell? Why do you think this happens in a parallel circuit?

Each solar cell produces .5 volts and .4 Amps, or 400 milliamps (mA) in maximum sun.

Series wiring (+ to -) adds the voltage. The PV amps stay the same.

Parallel wiring (- to - and + to +) adds the amperage and the voltage stays the same.

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Project #13

Turn on The Radio

Imagine the power is out at your house and you want to listen to the radio. You're in luck! You have six solar cells, and it's a sunny day. All you need to do is figure out how to connect them to the radio.

You know the following information:

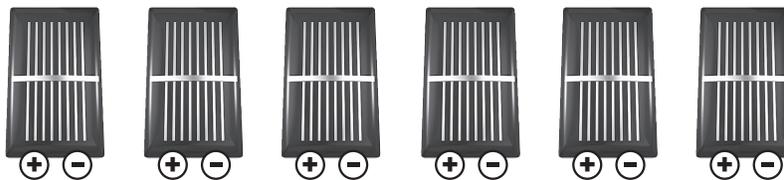
1. Each solar cell produces 0.5 volts and 0.4 amps in full sun.
2. The radio needs 3 volts and 0.3 amps.

Draw the wires between the solar cells, and connect them to the radio wires.

Remember:

Wiring cells in series (+ to -, + to -) adds volts, PV amps stay the same.

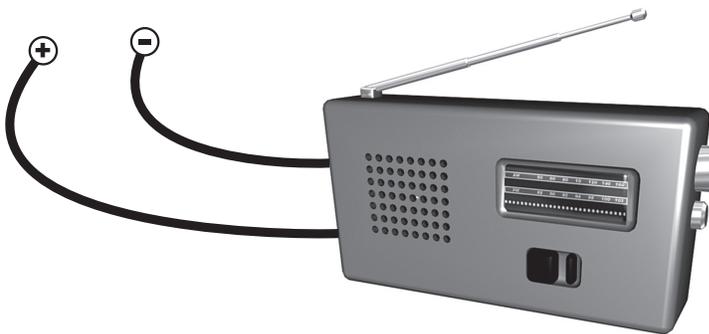
Wiring cells in parallel (+ to +, - to -) adds amps, volts stay the same.



Final output of solar cells:

_____ volts

_____ amps



What kind of wiring method did you use? _____

How much power (in watts) does the radio use? _____

Power formula: watts = volts x amps

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