

STUDENT ACTIVITY SHEET

PHOTOVOLTAIC EXPERIMENTS

Experiment 4—Series and Parallel Circuits with Solar Cells

INTRODUCTION

Which methods of connection will give you the greatest voltage across two or more solar cells? Which will give you greater current? Which is better for which use of the solar cells?

OBJECTIVE

Students will learn to connect solar cells in series circuit and a parallel circuit.

MATERIALS

- 2 or more solar panels
- Voltmeter
- Ammeter
- 2 to 4 extra electrical leads
- Strong light source—at least 150-watt light bulb
- Small motor, 1.5-volt, low-current type

PROCEDURE

For a series circuit

1. Turn on light source or place panels in the sun.
2. Connect two solar panels in series to the motor by clipping the red electrical lead of the first solar panel to the black electrical lead of the second solar panel, then that panel's red electrical lead to the motor.
3. You will have one lead from the first solar panel and the motor left open. Connect the panel's electrical lead and the motor to the ammeter. Record current in the table below.
4. To record the voltage, connect (or just touch metal to metal) the electrical leads from the voltmeter to black electrical lead from the first solar panel and to the red electrical lead from the second solar panel. If the needle moves backwards, switch the leads of the voltmeter. Record voltage and remove electrical leads from the voltmeter to the circuit and set the voltmeter aside.

For a parallel circuit

5. Using the previous circuit, disconnect the electrical lead between the ammeter and the first solar panel and the first solar panel's red electrical lead that is connected to the second panel. (You should have an open electrical lead coming off the ammeter and the black electrical lead from the second solar panel.)

6. Connect the ammeter to the black lead from the second solar panel. (Check to make sure that the ammeter is connected to the solar panel that is connected back to the motor that is connected to the ammeter—one continuous pathway.)
7. Place the disconnected solar panel in a parallel with the circuit by connecting its electrical leads (metal to metal) to the solar panel already in the circuit (red to red and black to black).
8. Record ammeter reading into the table below.
9. Voltage readings are taken by placing the voltmeter's leads on the leads of the two solar panels (one of the voltmeter's leads on the connection point of the two red leads and the other on the two black leads). Take voltage reading and record.
10. You may add more solar panels to either the series or parallel circuits described above, but carefully consider the voltage and current readings if you have made a combination of both types of circuit.
11. Calculate the power of each circuit. Power = voltage x current

| Type of Circuit | Number of solar panels | Current (Amps) | Voltage (Volts) | Power (Watts) |
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QUESTIONS

1. Which type of circuit had the highest voltage?
2. Which type of circuit had the highest current?
3. Which type of circuit had the highest power?