

Voltage of Cells in Series and Parallel Circuits

Individual electric cells produce only a few volts at most. However, when we need a greater voltage, we can combine cells to make batteries. In this Investigation, you will look at using cells in series and in parallel.

Question

What are the effects of combining electric cells in series and in parallel?

Predictions

Predict about what will happen to the voltage in a circuit as cells are added in series. Predict what will happen to the voltage in a circuit as cells are added in parallel.

Experimental Design

In this Investigation, you will combine electric cells in series and in parallel.

Materials

- 4 D-cells with holders
- connecting wires
- switch
- voltmeter

Procedure

1. Read through the procedure and create a table in which to record your data.
2. Build a circuit based on the circuit diagram in Figure 1. Close the switch and read the voltmeter. Record the measurement in your table.

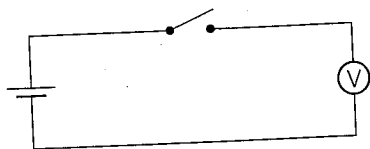


Figure 1

3. Open the switch and add another cell in series to the single cell (Figure 2). Close the switch and read the voltmeter. Record the measurement in your table.

INQUIRY SKILLS

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|---|---|--|
| <input type="radio"/> Questioning | <input checked="" type="radio"/> Conducting | <input checked="" type="radio"/> Evaluating |
| <input type="radio"/> Hypothesizing | <input checked="" type="radio"/> Recording | <input checked="" type="radio"/> Synthesizing |
| <input checked="" type="radio"/> Predicting | <input checked="" type="radio"/> Analyzing | <input checked="" type="radio"/> Communicating |
| <input type="radio"/> Planning | | |



Figure 2

4. Repeat step 3 two more times. You should have four cells in series.
5. Replace the four cells in series with two cells in parallel. Close the switch and read the voltmeter. Record the measurement in your table.
6. Add another cell in parallel. Read the voltmeter. Record the measurement in your table.
7. Repeat step 6. You now have four cells in parallel.

Analysis

- (a) Compare the voltage produced by one cell with the voltage produced by four cells in series.
- (b) Compare the voltage produced by two cells in parallel with the voltage produced by four cells in parallel.
- (c) Describe any trends you observed in the voltages of the various series and parallel circuits.
- (d) Write a general rule for determining the voltage produced by cells in series and cells in parallel.

Evaluation

- (e) Were your predictions accurate? Explain why or why not.

Synthesis

- (f) If different types of electric cells, for example D-cells and AA-cells, were combined, would this change your results? How could you determine this?