Lesson Title	Simple Circuits
Length of Lesson	1 day
Created By	Jed Leggett
Subject	Physics
Grade Level	11-12 (Physics)
State Standards	Physics: 5b
DOK Level	DOK 3
DOK Application	Investigate, Compare
National Standards	NA
Graduate Research Element	Logic Gates

Student Learning Goal:
Have students build and investigate simple household circuits.

Mississippi State Standards:
Physics: 5. Apply an understanding of magnetism, electric fields, and electricity: (b) Use schematic diagrams to analyze the current flow in series and parallel electric circuits, given the component resistances and the imposed electric potential.

Materials Needed (supplies, hand-outs, resources):
Circuit boards, batteries, bulbs, wires, mult-meter

Lesson Performance Task/Assessment:
In this lesson, students will build various simple circuits and investigate specific properties of each circuit. Students will learn the difference between series and parallel circuits, they will learn about the importance of circuit breakers, and they will wire a 3-way switch and generate its corresponding logic table. Students will be required to create circuits from schematic diagrams and make measurements on these circuits using a multi-meter.

Lesson Relevance to Performance Task and Students:
All students have a basic familiarity with the functionality of electric circuits (e.g. common light switches). This lesson builds on students' previous experience to provide an understanding of the design and construction of simple electric circuits. This lesson also serves as a simple way to introduce basic concepts of electrical theory such as current and voltage and the use of circuits as logic gates.

Anticipatory Set/Capture Interest:
The teacher will draw a schematic diagram of the 3-way switch circuit. The teacher will lead a discussion of how the circuit works and the physical principles that cause it to work.

Guided Practice:
The teacher will explain two simple rules used to understand simple circuits: the need for a closed loop for current to flow, and Ohm's Law (V=IR). The teacher will then introduce 3 activities in which the students will investigate simple circuits using these rules.

Independent Practice:
First students will wire 2 light bulbs and a battery in both series and parallel. Students will compare the brightness of the bulbs in the two different circuits and measure the voltage drop across the bulbs in the 2 different circuits. Students will be asked to explain their observations in terms of Ohm's Law. Second, students will wire a single bulb, a battery, and a circuit breaker in series. Students will use a piece of wire to short across the bulb, and observe what happens to the breaker. Students will be asked to explain the importance of circuit breakers in household circuits. Finally, students will be given the schematic of a 3-way switch and asked to build it. Students must generate a valid logic table for the switch.

Remediation and/or Enrichment:
R: individual IEP; partner help throughout lesson; shorten parts of assignment; focus upon smaller elements of the process

E: The teacher can have students construct a 4-way switch and generate its logic table.

Check(s) for Understanding:
Why are the bulbs in the parallel circuit brighter?

Closure:
Have students compare their logic tables and discuss other ways that electric circuits are used to perform logic.

Possible Alternate Subject Integrations:

*Logic

Teacher Notes: