Lesson Title	Ohm's Law Lab
Length of Lesson	90 minutes
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Subject	Physics
Grade Level	11-12
State Standards	Physics: 1d and 5a
DOK Level	DOK 4
DOK Application	Analyze, Draw Conclusions, and Develop a Logical Argument
National Standards	Physics B
Graduate Research Element	Data analysis, model fitting, estimating error, experiment design.

Student Learning Goal:

Mississippi Standards:
Physics: 1d. Organize data to construct graphs (e.g., plotting points, labeling x-and y-axis, creating appropriate titles and legends for circle, bar, and line graphs) draw conclusions and make inferences.
Physics: 5a. Analyze and explain the relationship between electricity and magnetism.

- Characteristics of static charge and how a static charge is generated
- Electric fields, electric potential, current, voltage and resistance as related to Ohm's Law
- Magnetic poles, magnetic flux and field, Ampere's law and Faraday's law
- Coulomb's Law

National Standards:
Physics:
In some materials, such as metals, electrons flow easily, whereas in insulating materials such as glass they can hardly flow at all. Semiconducting materials have intermediate behavior. At low temperatures some materials become super conductors and offer no resistance to the flow of electrons.

Materials Needed (supplies, hand-outs, resources):

- Variable voltage electrical power supply
- Ammeter
- Voltmeter (You can use a multimeter for the ammeter and voltmeter, but it is nice to have 2 so you can measure both at the same time.)
- Things to test such as
  - coins
  - wire
  - nails

- diodes
- wood
- glass
- distilled water
- salt water

Lesson Performance Task/Assessment:
The students will be required to write a lab report on their findings in the lab. They will have to use graphs as evidence to support their conclusions about what materials are Ohmic. The range of their graphs will be determined by them, so they will be graded based on whether their evidence supports their claim even if their evidence may be a little faulty.

Lesson Relevance to Performance Task and Students:
The students will be collecting data and devising an experiment to answer the inquiry question of which materials are ohmic, and they will use their evidence to support their claim. The faultiness of the students measurements will be ignored since, given a large enough voltage range, one can argue that nothing is really ohmic.

Anticipatory Set/Capture Interest:
The student's interest will likely be captured by the fact that they are using cool electronic equipment in the lab.

Guided Practice:
The teacher will define how the current and voltage are related for an ohmic material, and what the students should look for.

- Ohmic materials obey Ohm's Law and therefore have a constant slope of the current vs. voltage graph, and the slope is the resistance.

Then the teacher should provide materials for them to test.

Independent Practice:
The students will test different materials to see if they obey Ohm's Law. They will make graphs of their measurements. Then the students will write a report telling whether materials are ohmic or not ohmic and why.

Remediation and/or Enrichment:
Enrichment: Have lots of different materials for them to test. Salt water is really cool since they can begin to see electrolysis happening.

Remediation: individual IEP; partner help throughout the lesson; the teacher can observe the students and intervene during the independent practice.

Check(s) for Understanding:

During the lab, the teacher can walk around and observe the students. If some of the students appear to not understand how the equipment works or what they are expected to do, ask them some leading questions.

Closure:
We closed by talking to the students about their lab reports.

Possible Alternate Subject Integrations:
Math

Teacher Notes: