Madison Public Schools

Honors Physics - Unit 8 - Electricity

Unit Focus

Students will perform investigations into the behavior of series, parallel and combination electric circuits. Students will design circuits for specific behavior with a focus on an analysis of household circuitry. Electric power and the cost of electricity will be studied, in addition to AC and DC electricity.

Stage 1: Desired Results - Key Understandings

Standard(s)

Next Generation Science Standards (DCI)
Science: 11

- "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. *PS3.9.A1*
- Although energy cannot be destroyed, it can be converted to less useful forms-for example, to thermal energy in the surrounding environment. *PS3.9.D1*

Student Growth and Development 21st Century Capacities Matrix
Critical Thinking

- Problem Identification: Students will be able to clarify the problem and pose significant questions for investigation. *MM.1.1*
- Analyzing: Students will be able to examine information/data/evidence to make inferences and identify possible underlying assumptions, patterns, and relationships. *MM.1.2*

Transfer

T1 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.
T2 Create models to explore complex systems, show mastery of key science concepts, and/or develop solutions through creation of a product open to testing and redesign.

Meaning

Understanding(s)	Essential Question(s)
U1 Each form of energy can be converted into other forms of energy or into work (e.g. kinetic to potential, mechanical to electrical). **U2** While energy within a system is continually changing forms, and being transferred, the total energy of the system is conserved.	**Q1** Where does the energy of a system come from? How does it change? Where does it go?

Acquisition of Knowledge and Skill

Knowledge	Skill(s)
K1 Students will understand basic circuits and the requirements needed in order to have current. Students will be able to draw circuit diagrams using appropriate circuit symbols for power sources (i.e. batteries), resistors, ammeters and voltmeters. **K2** Students will understand the role of voltmeters and ammeters and know how to use them to measure current and voltage **K3** Students will understand that voltage is NOT energy but is related to energy. Students will understand the role	**S1** Students will be able to draw circuit diagrams using appropriate circuit symbols for power sources (i.e. batteries), resistors, ammeters and voltmeters. **S2** Given a graph of Voltage vs. Current, students should be able to determine the resistance of a circuit. **S3** Students will be able to use Ohm's Law to determine voltage, current and/or resistance. **S4** Given a series, parallel or combination circuit, students will be able to determine the equivalent resistance of the circuit. Students will also be able to determine the voltage

Stage 1: Desired Results - Key Understandings		
	of a voltage source in a circuit. **K4** Students will understand basic circuits and the requirements needed in order to have current. **K5** Students will understand the relationship between voltage and current and the role resistance plays in a circuit. **K6** Students will understand the role of a fuse or circuit breaker in a circuit **K7** Capacitors are used to store charge	across and current through each resistor in the circuit. **S5** Students will be able to determine the rate at which energy is used (i.e. Power) by electrical devices in simple circuits. Students will understand how power relates to voltage, current and resistance. **S6** Students will know that a kw-hr is a unit of energy NOT power. From this, they should be able to determine the cost to operate the circuit. **S7** Solving for current and voltage for specific circuit elements in complex circuits **S8** Calculating initial and steady state current values in RC circuits