

MASCOUTAH COMMUNITY SCHOOL DISTRICT #19

Teacher: Kevin Jaenke

Grade: 7

Subject: PLTW: Magic of Electrons Year: 2018 - 2019

Week	Content	Skills	Assessments	Standards
Week 1 2 3	Activity 1.1 Atomic Structure & Electricity Activity 1.2 Conductivity Activity 1.3 Static and Current Electricity Activity 1.4 Electromagnets Activity 1.5 DC Motor Construction Project 1.6 Generators Activity 1.7 (optional) Electricity: The Invisible River of Energy	<ul style="list-style-type: none"> Identify the roles of protons, neutrons, and electrons in an atom. Explain how charges interact to hold an atom together. Identify metals, metalloids, and non-metals on the periodic table. Identify an element based on the atomic number given a periodic table. Explain the relationship between current, voltage, and resistance Describe the properties of a magnet including polarity and defining characteristics. Explain the role of an electromagnet in the function of a DC motor and generator. Describe how electron transfer 	<ul style="list-style-type: none"> Periodic Table Activity 1.1 Conclusion Activity 1.2 Conclusion Activity 1.3 Conclusion Building a functioning Morse Code Transmitter Activity 1.4 Conclusion DC Motor Construction Activity 1.5 Conclusion Activity 1.6 Conclusion Electricity: The Invisible River of Energy Worksheet 	<p>English Language Arts</p> <p>Comprehension and Collaboration</p> <p>4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4)</p> <p>Conventions of Standard English</p> <p>1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. (AS.L.1)</p> <p>2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2)</p> <p>6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. (AS.L.6)</p> <p>NGSS</p> <p>Middle School</p> <p>Matter and Its Interactions</p> <p>1. Develop models to describe the atomic composition of simple molecules and extended structures. (MS.PS1.1) Motion and Stability: Forces and Interactions</p> <p>3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. (MS.PS2.3)</p> <p>5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. (MS.PS2.5)</p> <p>Math Grade 7</p> <p>The Number System Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.</p>

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		<p>between atoms and the flow of electricity are related</p> <ul style="list-style-type: none"> • Evaluate whether a material is a conductor, insulator, or semiconductor based upon its number of valance electrons and its position on the periodic table. • Measure voltage and current using a multimeter. • Demonstrate the characteristics and functions of an electromagnet. • Identify the primary parts of a DC motor and demonstrate how it functions. • Identify the primary parts of a generator and demonstrate how it functions. • Compare and contrast the characteristics of a 		<p>1.a. Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.(7.NS.A.1a)</p> <p>Geometry Draw, construct, and describe geometrical figures and describe the relationships between them.</p> <p>1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. (7.G.A.1) Grade 8</p> <p>Expressions and Equations Work with radicals and integer exponents.</p> <p>4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. (8.EE.A.4)</p>

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		basic motor and generator.		
Week 4 5 6	Project 2.1 Circuit Design Activity 2.2 Switches, Diodes, and Light-Emitting Diodes Activity 2.3 Resistance Activity 2.4 Ohm's Law Activity 2.5 Capacitors Activity 2.6 Transistors	<ul style="list-style-type: none"> Identify the characteristics of series, parallel, and combination electrical circuits. Identify standardized schematic symbols using a chart. Distinguish between the functions and operations of fixed resistors, variable resistors, and photo resistors. Construct series, parallel, and combination electrical circuits. Sketch circuit diagrams using standardized schematic symbols. Construct and test physical electrical circuits based upon circuit diagrams. Integrate DC sources, lamps, switches, diodes, light-emitting diodes, resistors, and 	<ul style="list-style-type: none"> Schematic Symbols Chart Circuit Construction: Series, Parallel, and Combination Project 2.1 Conclusion List and Describe the four types of mechanical switches Circuit Construction from a schematic drawing Activity 2.2 Conclusion Activity 2.3 Conclusion Activity 2.4 Conclusion Charging Circuit Schematic Discharging Circuit Schematic 	<p>Reading</p> <p>Comprehension and Collaboration</p> <p>4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4)</p> <p>Conventions of Standard English</p> <p>1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.(AS.L.1)</p> <p>2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2)</p> <p>6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.(AS.L.6)</p> <p>NGSS</p> <p>Middle School</p> <p>Waves and their Applications in Technologies for Information Transfer</p> <p>2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. (MS.PS4.2)</p> <p>3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. (MS.PS4.3) Engineering Design</p>

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		<p>capacitors into electrical circuits to achieve specific functions.</p> <ul style="list-style-type: none"> • Determine the value of a fixed resistor based upon the color codes on those resistors. • Measure voltage, current, and resistance using a multimeter. • Mathematically calculate voltage, current, and resistance using Ohm's law. • Design a circuit that uses a transistor as a switch. 	<ul style="list-style-type: none"> • Activity 2.5 Conclusion • Build a working nightlight 	<p>1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (MS.ETS1.1)</p> <p>MATH</p> <p>Grade 6</p> <p>The Number System Compute fluently with multi-digit numbers and find common factors and multiples.</p> <p>2. Fluently divide multi-digit numbers using the standard algorithm. (6.NS.B.2)</p> <p>3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.(6.NS.B.3)</p> <p>Expressions and Equations Apply and extend previous understandings of arithmetic to algebraic expressions.</p> <p>1. Write and evaluate numerical expressions involving whole-number exponents.(6.EE.A.1)</p> <p>2. Write, read, and evaluate expressions in which letters stand for numbers. (6.EE.A.2)</p> <p>2.c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = 1/2$. (6.EE.A.2c)</p> <p>Reason about and solve one-variable equations and inequalities.</p> <p>6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.(6.EE.B.6)</p>

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				<p>7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. (6.EE.B.7)</p> <p>Grade 7</p> <p>The Number System Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.</p> <p>2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. (7.NS.A.2)</p> <p>2.c. Apply properties of operations as strategies to multiply and divide rational numbers. (7.NS.A.2c)</p> <p>3. Solve real-world and mathematical problems involving the four operations with rational numbers. (7.NS.A.3)</p> <p>Expressions and Equations Solve real-life and mathematical problems using numerical and algebraic expressions and equations.</p> <p>4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (7.EE.B.4)</p> <p>Grade 8</p> <p>Expressions and Equations Work with radicals and integer exponents.</p> <p>4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. (8.EE.A.4)</p> <p>Analyze and solve linear equations and pairs of simultaneous linear equations.</p> <p>7. Solve linear equations in one variable. (8.EE.C.7)</p>

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Week 7 & 8	Activity 3.1 Digital Number Systems Activity 3.2 Logic Gates	<ul style="list-style-type: none"> • Identify the relationship between the binary number system and the decimal number system. • Describe the functions of NOT, AND, OR, NAND, NOR, and XOR gates. • Convert binary numbers to base-10. • Convert ASCII characters to binary. • Interpret logic scenarios to determine outputs based upon possible conditions within those scenarios. • Create truth tables for logic scenarios and match those gates to truth tables. • Create a digital wave form and graph it for a binary sequence. • Communicate using electronic circuit diagrams. 	<ul style="list-style-type: none"> • Convert Binary to Decimal • Convert ASCII to Binary • Activity 3.1 Conclusion • NOT , NOR, XOR and AND Gate schematics • Activity 3.2 Conclusion • Activity 3.3 Conclusion • Logic Problem • Activity 3.4 Conclusion 	<p>Reading</p> <p>Comprehension and Collaboration</p> <p>4. Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience. (AS.SL.4)</p> <p>Conventions of Standard English</p> <p>1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.(AS.L.1)</p> <p>2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. (AS.L.2)</p> <p>6. Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.(AS.L.6)</p> <p>NGSS</p> <p>Middle School Waves and their Applications in Technologies for Information Transfer</p> <p>3. Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. (MS.PS4.3)</p> <p>Engineering Design</p> <p>1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (MS.ETS1.1)</p> <p>2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (MS.ETS1.2)</p>

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				<p>3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. (MS.ETS1.3)</p> <p>4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.(MS.ETS1.4)</p>
<p>Week 9</p>	<p>Activity 3.3 Transistors to Gates</p> <p>Problem 3.4 Logic Problem</p>	<ul style="list-style-type: none"> • Communicate using electronic circuit diagrams. • Use transistors as switches to create circuits that function as AND and OR gates. • Determine the logic, sensors, gates, outputs, and other components needed to emulate existing electronic devices that utilize logic. • Design, construct, and test device solutions for emulating common electronic devices that utilize logic. 		

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Week Content

Skills

Assessments

Standards