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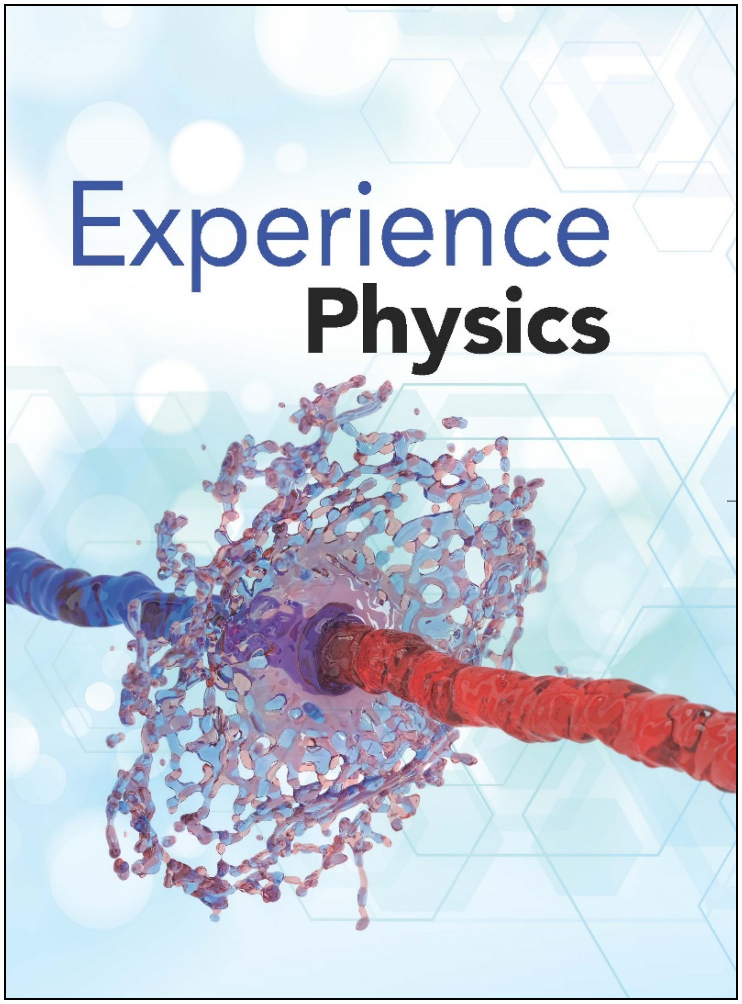

to

Nebraska’s College- and Career-Ready Standards for Science 2017 Plus Standards for Physics

Prepared by Savvas Learning Company, formerly Pearson K12 Learning

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Introduction

This document demonstrates how ***Experience Physics* ©2022** supports Nebraska's College- and Career- Ready Standards for Science 2017: Plus Standards for Physics. Correlation references include the Experience Notebook, Teacher Guide, and online digital assets.

Savvas Learning Company is excited to introduce ***Experience Physics***!

Students best learn science when they *do* science! Therefore ***Experience Physics*** puts the focus on the student experience. This modern program implements a learning model that organizes learning around phenomena giving students an authentic, real-world experience. ***Experience Physics*** includes a variety of hands-on and digital activities designed to reach every learner, and partners with Flinn Scientific to deliver high-quality inquiry labs, engineering workbenches, and performance assessments.

Phenomenal Experiences Begin with a relevant and engaging phenomenon. Learning is organized around learning around phenomena, giving students an authentic, real-world experience. ***Experience Physics*** includes a variety of hands-on and digital activities designed to reach every learner, encouraging students to ask and answer questions, gather evidence, and organize their reasoning as they experience the concepts of physics firsthand.

Flinn Scientific Partnership Labs, Engineering Workbenches, dataset activities, and performance tasks enhance the student experience and encourage your class to do more science! Hands-on inquiry labs are available in open-ended, guided, shortened, and advanced versions, perfect for meeting the needs of every student.

Personalize Instruction The Teacher Guide allows instructors to personalize their course by selecting from our activities or embedding their own. Enhance instructional plan with Got More Time? Activities, or substitute with Related Phenomena when you want to make a change! Additionally, storyline and Investigation Planners use the 5E model to streamline your prep time.

Build Mathematical Fluency Stepped-out examples in the Experience Handbook break down sample problems for clarity and process guidance, while math tutorial videos reinforce mathematical processes. The Physics and Math Skills Workbook includes four pages of review and practice problems for every learning experience. These activities and more guide students as they become more proficient with math and physics concepts.

Savvas Realize™ Award-Winning Digital Platform Access all your digital content, virtual labs, simulations, assessments, and student data in ONE location. Savvas Realize has offline accessibility, so students can study from anywhere.

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SC.HSP.1 Forces, Interactions, and Motion	
SC.HSP.1.1 Gather, analyze, and communicate evidence of forces, interactions, and motion.	
SC.HSP.1.1.A Generate and interpret mathematical and graphical representations to describe the relationships between position, velocity, acceleration and time. Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to no acceleration and objects undergoing a constant acceleration, including projectile motion, free fall, and circular motion. Examples should also include both average and instantaneous velocities. Assessment is limited to one and two- dimensional motion and to objects moving at non-relativistic speeds.	**Student Experience Notebook:** Dot Diagrams, 11 Position Graphs, 12 Speed and Velocity, 13 SEP Analyze and Interpret Data, 13 Speed and Velocity Graphs, 15 SEP Argue from Evidence, 15 SEP Analyze and Interpret Data, 20 Graphs of Changing Velocity, 22 Acceleration, 23 SEP Analyze and Interpret Data, 34 Projectile Motion, 38 SEP Analyze and Interpret Data, 64 SEP Analyze and Interpret Data, 66 Solving Two-Dimensional Force Problems, 73 **Teacher Guide:** **Inquiry Labs:** Motion Plots, Free Fall Acceleration, Forces and Motion, The Buoyant Force, Friction, Model Projectile Motion **Digital Activities:** Acceleration, Fast Cars, Satellites in Circular Orbits, Types of Forces, Vehicle Stopping Distance, Coin Drop **Performance-Based Assessment:** Speed, Acceleration, and Trajectory

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SC.HSP.1.1.B Use mathematical and pictorial models as applied to Newton's second law of motion describing the relationship among the net force on a macroscopic object, its mass, and its acceleration. Examples include drawing and using free body diagrams to analyze the net force on the object and the resulting motion; vectors including decomposition and recomposition, addition and subtraction. Assessment is limited to two-dimensional motion.	**Student Experience Notebook:** Dot Diagrams, 11 Position Graphs, 12 Speed and Velocity, 13 SEP Analyze and Interpret Data, 13 Speed and Velocity Graphs, 15 SEP Argue from Evidence, 15 SEP Analyze and Interpret Data, 20 Graphs of Changing Velocity, 22 Acceleration, 23 SEP Analyze and Interpret Data, 34 Projectile Motion, 38 Force Causes an Acceleration, 54 Momentum, 56 Representing Forces, 58 Mowing the Lawn, 55 Modeling Force, 60 Writing Force-Acceleration Equations, 61 SEP Analyze and Interpret Data, 64 SEP Analyze and Interpret Data, 66 SEP Use Mathematics, 72 **Teacher Guide:** **Inquiry Labs:** Motion Plots, Free Fall Acceleration, Forces and Motion, The Buoyant Force, Friction, Model Projectile Motion **Digital Activities:** Acceleration, Fast Cars, Satellites in Circular Orbits, Types of Forces, Vehicle Stopping Distance, Coin Drop **Performance-Based Assessment:** Speed, Acceleration, and Trajectory
SC.HSP.1.1.C Use mathematical representations of momentum to predict the outcome of a collision. Emphasis is on the quantitative conservation of momentum in interactions an the qualitative meaning of this principle. Assessment is limited to quantitative analysis of systems of two macroscopic bodies moving in one-dimension and qualitative analysis of multiple macroscopic bodies moving in two or three-dimensions.	**Student Experience Notebook:** Impulse and Momentum in Collisions, 338 High-Speed Collision, 341 Types of Collisions, 342 A Ballistic Pendulum, 344–345 Inelastic Collision, 346 **Teacher Guide:** **Inquiry Labs:** Momentum and Impulse During Collisions, Elastic and Inelastic Collisions **Digital Activities:** Kinetic Energy and Collisions

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SC.HSP.1.1.D Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it by applying the impulse-momentum theorem. Examples of a device could include a football helmet or an airbag. Assessment is limited to qualitative evaluations and/or algebraic manipulations.	**Student Experience Notebook:** SEP Construct an Explanation, 347 Investigation Assessment, 363 **Teacher Guide:** **Digital Activity:** Minimizing Car Crash Injuries **Engineering Workbench:** Egg Supply Drop **Performance-Based Assessment:** Build Your Own Egg-Transport Vehicle
SC.HSP.1.1.E Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. Emphasis is on both quantitative and conceptual descriptions of forces from gravitational and electric sources. Assessment can be expanded to systems with multiple objects.	**Student Experience Notebook:** SEP Use a Model, 119 SEP Develop a Model, 119 Earth and the Moon, 120 SEP Use Mathematics, 122 SEP Use Mathematics, 128 SEP Use Mathematics, 159 SEP Systems and System Models, 160 Electric Force Between Particles, 161 Electric Field Due to Two Charges, 173 SEP Systems and System Models, 174 SEP Use Math, 175 **Teacher Guide:** **Inquiry Lab:** Electric Charges and Coulomb's Law
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SC.HSP.2.2.A Use mathematical representations to describe the relationships among the frequency, wavelength, and speed of waves traveling in various media. Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth. Examples also include descriptive changes in observed frequency based on relative motion of observer or source (Doppler effect). Assessment is limited to algebraic relationships and describing those relationships qualitatively.	**Student Experience Notebook:** SEP Analyze Data, 467 SEP Use Mathematics, 467 SEP Analyze and Interpret Data, 469 SEP Argue From Evidence, 471 **Teacher Guide:** **Inquiry Lab:** Mechanical Waves **Digital Activities:** Making Waves, Properties of Waves, Waves and Shallow Water

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SC.P.2.2.B Develop and use models to predict interactions of longitudinal and transverse waves in various media. Examples could include P, Sand Surface seismic waves, water waves, and waves on a spring. Emphasis is on structure and function of waves.	**Student Experience Notebook:** Properties of Waves, 467 SEP Analyze Data, 467 SEP Use Mathematics, 467 Transverse Waves, 468–470 SEP Analyze and Interpret Data, 469 Wave Speed at an Interface, 471 Longitudinal Waves, 472–474 Properties of Sound Waves, 474 Modeling Waves, 475 Modeling a Sound Wave, 476–477 SEP Use Mathematics, 478 SEP Analyze and Interpret Data, 478 Moving Wave Source, 480–481 A Passing Ambulance, 481 SEP Develop a Model, 482 SEP Develop a Model, 483 SEP Use Mathematics, 484 Standing Waves, 485–487 Standing Waves on a Rope, 487 SEP Analyze and Interpret Data, 489 Energy in Waves, 490–492 SEP Use Mathematics, 490 SEP Use Mathematics, 492 SEP Use Mathematics, 499 SEP Use Computational Thinking, 504 Image of a Rubber Duck, 505 **Teacher Guide:** **Inquiry Labs:** Mechanical Waves, Interference of Sound Waves **Digital Activities:** Making Waves, Properties of Waves, Waves and Shallow Water **Performance-Based Assessment:** The Speed of Sound in Open Air
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SC.HSP.2.2.D Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, photoelectric effect and the idea that photons associated with different frequencies of light have different energies. Assessment includes qualitative and quantitative models of light.	**Student Experience Notebook:** Wave Behavior of Electromagnetic Radiation, 516 SEP Construct and Argument, 516 Shortcomings of Eave Theory, 520 Photoelectric Effect, 521 SEP Evaluate Claims, 521 Particles of Light, 523 SEP Argue from Evidence, 523 **Teacher Guide:** **Inquiry Lab:** Particle Nature of Light **Digital Activities:** Particle-Wave Duality of Light, Particle-Wave Duality
SC.HSP.2.2.E Use evidence to support explanations for causes of emission and absorption spectra of electromagnetic radiation. Emphasis is on the idea that photons associated with different frequencies of light have different energies. This could include the displacement and broadening of spectral lines (redshift and blueshift). Examples could include different elements absorb or emit specific frequencies of light. Assessment is limited to qualitative descriptions.	**Student Experience Notebook:** Photon-Electron Interactions, 529 CCC Energy and Matter, 529 Photon Energy Absorption by Matter, 530–531 SEP Construct an Explanation, 531 Blackbody Radiation, 532–533 Damage to Living Cells, 534–536 SEP Evaluate Claims, 535 SEP Evaluate Claims, 536 **Teacher Guide:** **Inquiry Lab:** Electromagnetic Radiation and Matter **Digital Activity:** Sunscreen and UV Protection **Performance-Based Assessment:** Clothing and Sun Protection
SC.HSP.2.2.F Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. Examples could include solar cells capturing light and converting it to electricity; medical imaging; communications technology; lasers. Assessments are limited to qualitative information. Assessments do not include band theory.	**Student Experience Notebook:** SEP Construct an Explanation, 531 Storing Sounds in Digital Code, 544 CCC Energy and Matter, 549 Audio Information, 549 Visual Information, 550–551 SEP Construct Explanations, 552 Medical Imaging, 552–553 Wireless Wonders, 555 Capturing an EM Wave Energy, 557 Energy From the Sun, 558 Solar Panels, 559 **Teacher Guide:** **Inquiry Labs:** Converting Electrical Signals to Sounds, Converting Sunlight to Electricity **Digital Activities:** Antennas, Solar Panels on a Cloudy Day

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SC.HSP.4 Energy: Physics	
SC.HSP.4.3 Gather, analyze, and communicate evidence of the interactions of energy.	
SC.HSP.4.3.A Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. Emphasis is on explaining the meaning of mathematical expressions used in the model including the Work-Energy theorem. Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.	**Student Experience Notebook:** Bowling Ball Bounce, 304–305 Modeling Systems, 311 SEP Use Mathematics, 311 Roller Coaster Energy, 314–315 SEP Use Mathematics, 318 Expanded Work-Energy Theorem, 312 **Teacher Guide:** **Performance-Based Assessment:** Energy Conversion
SC.HSP.4.3.B Plan and conduct an investigation to rate the power and efficiency used in performing work on a system. Emphasis is on the quantitative determination of power in interactions. Examples could include use of pulleys and electric motors.	**Student Experience Notebook:** SEP Analyze Data, 283 Calculating Work, 284 SEP Develop a Model, 284 Work Done by a Gas, 285 SEP Use Mathematics, 286 SEP Use Mathematics, 287 Sample Problem: Work Done a Work, 290\ Power, 292 Mechanical Energy and Work, 302 Roller Coaster Energy, 314–315 **Teacher Guide:** **Inquiry Labs:** Electric Motors and Generators **Engineering Workbench:** Design a Roller Coaster **Digital Activity:** Classifying Work and Energy
SC.HSP.4.3.C Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, generators, heat engines and heat pumps. Examples of constraints could include use of renewable energy forms and efficiency. Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.	**Student Experience Notebook:** SEP Design a Solution, 206 SEP Design a Solution, 212 SEP Design a Solution, 238 Engineering Performance-Based Assessment, 363 **Teacher Guide:** **Inquiry Labs:** Build a Battery, Electric Motors and Generators **Engineering Workbench:** Design a Roller Coaster **Performance-Based Assessment:** Design, Build, and Refine a Wind-Turbine Rotor

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SC.HSP.4.3.D Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. Examples could include analysis of renewable energy systems for electricity generation and the effect of autonomous electric cars on the economy, society and the environment.	**Student Experience Notebook:** Energy Use, Population, and Impact, 446 Impacts on the Biosphere, 447 Impact Reduction, 448 Human Power Needs, 449-450 Energy Storage Technologies, 451 Costs and Benefits, 452 Costs and Benefits of Renewable Energy, 453 Costs and Benefits: Oil, Gas, and Coal, 454 Costs and Benefits: Wind, Solar, and Biomass, 455 Costs and Benefits: Hydroelectric, Geothermal, Tides, and Waves, 456 Costs and Benefits: Nuclear Power, 457 Sustainable Energy Future, 458–459 Energy from the Sun, 558 **Teacher Guide:** **Inquiry Labs:** Converting Sunlight to Electricity, Natural Resource Management **Digital Activities:** Resource Use and Biodiversity Trade Offs, Operate a Nuclear Fission Reactor **Engineering Workbench:** Design an Airdrop System, Egg Supply Drop, Earthquake-Resistant Structures **Performance-Based Assessment:** Build Your Own Egg-Transport Vehicle, Minimizing Car Crash Injuries **Problem-Based Learning:** Staying Fit to Mars and Back, Ultraviolet Radiation
SC.HSP.4.3.E Plan and conduct an investigation to provide evidence for the transfer of thermal energy within a system based on the Laws of Thermodynamics. Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually, such as changes in entropy of a system. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water, changes from kinetic to thermal energy, and heat engines and heat pumps. Assessment is limited to investigations based on materials and tools provided to students.	**Student Experience Notebook:** Transferring Energy Through Heating, 374–375 The First Law of Thermodynamics, 376 Thermodynamic Processes, 377 Expansion of an Ideal Gas, 378–379 CCC Systems and System Models, 380 The Second Law of Thermodynamics, 384–385 Thermodynamic Heat Engines, 386–387 Heat Pumps, 390–391 Heat Engine Efficiency, 392–393 **Teacher Guide:** **Inquiry Lab:** Heat Transfer **Digital Activity:** Thermal Equilibrium and Heat Flow **Engineering Workbench:** Build an Efficient Travel Mug

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SC.HSP.4.3.F Develop and use a model of two objects interacting through gravitational, electric, or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other. Assessment is limited to systems containing two objects.	**Student Experience Notebook:** Sample Problem: Earth and the Moon, 120 Gravitational Fields, 121 Acceleration Due to Gravity, 125 Sample Problem: The International Space Station, 126 Sample Problem: Geosynchronous Orbits, 134 What is a Field? 171 Electric Field, 172 Magnetic Fields, 203 Modeling Multiple Magnets, 205 Magnetic Fields From Moving Charges, 206 Force on a Moving Charge, 207 SEP Construct an Explanation, 393 SEP Design a Solution, 393 **Teacher Guide:** **Inquiry Labs:** Electric Motors and Generators, Magnetic Force and Separation Distance, **Digital Activities:** Electromagnetic Energy, Energy in Electric Circuits, Series and Parallel Circuits, Power Generation, Properties of Electric Motors, Magnetic Forces, Magnetism, Geomagnetic Polarity Reversal, Breaking Magnets, Magnetic Fields, Combining Magnetic Fields **Performance-Based Assessment:** Build a DC Motor
SC.HSP.16 Electricity and Magnetism	
SC.HSP.16.4 Gather, analyze, and communicate evidence of electricity and magnetism.	
SC.HSP.16.4.A Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. Emphasis is on both quantitative and conceptual descriptions of forces from gravitational and electric sources. Assessment can be expanded to systems with multiple objects.	**Student Experience Notebook:** What Causes Free Fall?, 116 Gravitational Force, 118 Electric Charge, 156 Electrons, Protons, and Neutrons, 157 Electric Force, 158 Electric Force and Vectors, 160 Coulomb Forces Between Atoms, 251 Covalent Bonds, 252 **Teacher Guide:** **Inquiry Lab:** Electric Charges and Coulomb's Law **Performance-Based Assessment:** Build and Test and Electroscope

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SC.HSP.16.4.B Use models to visualize and describe gravitational, magnetic and electrical fields and predict resulting forces on nearby objects. Examples of fields include point charges, charged parallel plates/rings/spheres, and bar magnets. Also could include electromagnetic forces, such as the magnetic force acting on a moving charge. Assessment is limited to descriptive analysis of the fields and the forces they produce.	**Student Experience Notebook:** Sample Problem: Earth and the Moon, 120 Acceleration Due to Gravity, 125 Sample Problem: The International Space Station, 126 Sample Problem: Geosynchronous Orbits, 134 Modeling Multiple Magnets, 205 Magnetic Fields From Moving Charges, 206 Force on a Moving Charge, 207 SEP Construct an Explanation, 393 SEP Design a Solution, 393 Electric Potential Field, 414 Point Charges, 415 Superposition, 416 Potential Due to Pint Charges, 417 Equipotential Surfaces, 418 Potential Difference, 419 Alternating Current Generators, 436 Direct Current Generators, 437 Motors, 439 Induction Devices, 442–443 **Teacher Guide:** **Inquiry Labs:** Electric Motors and Generators, Magnetic Force and Separation Distance, **Digital Activities:** Electromagnetic Energy, Energy in Electric Circuits, Series and Parallel Circuits, Power Generation, Properties of Electric Motors, Magnetic Forces, Magnetism, Geomagnetic Polarity Reversal, Breaking Magnets, Magnetic Fields, Combining Magnetic Fields **Performance-Based Assessment:** Build a DC Motor

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SC.HSP.16.4.C Use mathematical representations to provide evidence that describes and predicts relationships between power, current, voltage, and resistance. Emphasis is on insulators and conductors accounting for Ohm's Law, total resistance for combinations of resistors and P=IV.	**Student Experience Notebook:** Current, 187 Conductivity and Resistivity, 188 Series and Parallel Resistance, 190-191 What Causes Current?, 421 Ohm's Law, 422 SEP Use Mathematics, 422 Voltage-Current Relationship, 423 Circuit Elements and Diagrams, 424-425 Analyzing a Circuit, 431 Sample Problem: Applying Kirchoff's Junction Rule, 432-433 SEP Construct an Explanation, 434 SEP Use Mathematics, 444 **Teacher Guide:** **Inquiry Labs:** Build a Battery, Electric Motors and Generators
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SC.HSP.16.4.E Obtain and communicate technical information about how some technological devices use alternating current and others use direct current. Examples could include why public utilities use AC while many devices use DC and energy loss in transmission of electricity.	**Student Experience Notebook:** SEP Develop a Model, 194 Electric Generators, 435 Alternating Current Generators, 436 Direct Current Generators, 437 SEP Develop a Model, 194 **Teacher Guide:** **Inquiry Labs:** Electric Motors and Generators, **Performance-Based Assessment:** Build a DC Motor

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SC.HSP.16.4.F Design a solution to a problem using the fact that an electric current can produce a magnetic field and/or that a changing magnetic field can produce an electric current. Emphasis is on both quantitative and conceptual descriptions of electric and magnetic fields. Examples include designing a generator, motor or transformer. Assessment is limited to systems with two objects.	**Student Experience Notebook:** Magnetic Force on a Wire, 213–215 SEP Plan an Investigation, 214 Modeling a Simple Motor, 219 Current and Magnetic Fields, 220–222 **Teacher Guide:** **Inquiry Labs:** Electromagnets and Magnetism, Induction of Electrical Current, Electric Motors and Generators **Digital Activities:** Generator Testing, Magnetic Fields, Inducing Current **Engineering Workbench:** Build a Flashlight Without Batteries **Performance-Based Assessment:** Build a DC Motor
SC.HSP.16.4.G Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. Examples could include analysis of renewable energy systems for electricity generation and the effect of autonomous electric cars on the economy, society and the environment.	**Student Experience Notebook:** Energy Use, Population, and Impact, 446 Impacts on the Biosphere, 447 Impact Reduction, 448 Human Power Needs, 449-450 Energy Storage Technologies, 451 Costs and Benefits, 452 Costs and Benefits of Renewable Energy, 453 Costs and Benefits: Oil, Gas, and Coal, 454 Costs and Benefits: Wind, Solar, and Biomass, 455 Costs and Benefits: Hydroelectric, Geothermal, Tides, and Waves, 456 Costs and Benefits: Nuclear Power, 457 Sustainable Energy Future, 458–459 Energy from the Sun, 558 **Teacher Guide:** **Inquiry Labs:** Converting Sunlight to Electricity, Natural Resource Management **Digital Activities:** Resource Use and Biodiversity Trade Offs, Operate a Nuclear Fission Reactor **Engineering Workbench:** Design an Airdrop System, Egg Supply Drop, Earthquake-Resistant Structures **Performance-Based Assessment:** Build Your Own Egg-Transport Vehicle, Minimizing Car Crash Injuries **Problem-Based Learning:** Staying Fit to Mars and Back, Ultraviolet Radiation