Magic of Electrons

Lesson 1: What is Electricity | 16 days

Activity 1.1: Atomic Structure and Electricity

Activity 1.2: Conductivity

Technology and Engineering
3.5.6-8.B Use instruments to gather data on the performance of everyday products.

Activity 1.3: Static and Current Electricity

Technology and Engineering
3.5.6-8.L Design methods to gather data about technological systems.

Activity 1.4: Electromagnets

Technology and Engineering
3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

Activity 1.5: DC Motor Construction

Technology and Engineering
3.5.6-8.P (ETS) Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.R Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.

3.5.6-8.U Evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design.

3.5.6-8.V Refine design solutions to address criteria and constraints.

3.5.6-8.W (ETS) 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.

3.5.6-8.X Defend decisions related to a design problem.

3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

Project 1.6: Generators (Optional)

Environmental Literacy and Sustainability
3.4.6-8.H Design a solution to an environmental issue in which individuals and societies can engage as stewards of the environment.

3.5.6-8.P (ETS) Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.R Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.

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Project 1.6: Generators (Optional) cont.

3.5.6-8.U Evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design.

3.5.6-8.V Refine design solutions to address criteria and constraints.

3.5.6-8.W (ETS) 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.

3.5.6-8.X Defend decisions related to a design problem.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

Activity 1.7: Electricity: The Invisible River of Energy (Optional)

Lesson 2: Electronics | 17 days

Activity 2.1: Circuit Design

Technology and Engineering

3.5.6-8.F Analyze examples of technologies that have changed the way people think, interact, live, and communicate.

3.5.6-8.H Evaluate trade-offs based on various perspectives as part of a decision process that recognizes the need for careful compromises among competing factors.

3.5.6-8.J Use tools, materials, and machines to safely diagnose, adjust, and repair systems.

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.R Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.

3.5.6-8.U Evaluate and assess the strengths and weaknesses of various design solutions given established principles and elements of design.

3.5.6-8.W (ETS) 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.

3.5.6-8.HH Create a closed-loop system that has a feedback path and requires no human intervention.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

Activity 2.2: Switches, Diodes, and Light Emitting Diodes

Technology and Engineering

3.5.6-8.A Research information from various sources to use and maintain technological products or systems.

3.5.6-8.F Analyze examples of technologies that have changed the way people think, interact, live, and communicate.

3.5.6-8.I Examine the ways that technology can have both positive and negative effects at the same time.

3.5.6-8.J Use tools, materials, and machines to safely diagnose, adjust, and repair systems.

3.5.6-8.K Use devices to control technological systems.

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

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Activity 2.3: Resistance

Technology and Engineering

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

Activity 2.3.a: More Resistors

Technology and Engineering

3.5.6-8.J Use tools, materials, and machines to safely diagnose, adjust, and repair systems.

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.V Refine design solutions to address criteria and constraints.

3.5.6-8.HH Create a closed-loop system that has a feedback path and requires no human intervention.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

Activity 2.4: Ohm's Law

Technology and Engineering

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.

3.5.6-8.HH Create a closed-loop system that has a feedback path and requires no human intervention.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

Activity 2.5: Capacitors

Technology and Engineering

3.5.6-8.C Hypothesize what alternative outcomes (individual, cultural, and/ or environmental) might have resulted had a different technological solution been selected.

3.5.6-8.F Analyze examples of technologies that have changed the way people think, interact, live, and communicate.

3.5.6-8.J Use tools, materials, and machines to safely diagnose, adjust, and repair systems.

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

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Activity 2.6: Transistors

Technology and Engineering

3.5.6-8.C Hypothesize what alternative outcomes (individual, cultural, and/ or environmental) might have resulted had a different technological solution been selected.

3.5.6-8.F Analyze examples of technologies that have changed the way people think, interact, live, and communicate.

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.W (ETS) 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.

3.5.6-8.CC Consider historical factors that have contributed to the development of technologies and human progress.

3.5.6-8.HH Create a closed-loop system that has a feedback path and requires no human intervention.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

Lesson 3: Digital Electronics | 12 days

Activity 3.1: Digital Number Systems

Activity 3.2: Logic Gates

Activity 3.3: Transistors to Gates

Technology and Engineering

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.BB Demonstrate how knowledge gained from other content areas affects the development of technological products and systems.

3.5.6-8.HH Create a closed-loop system that has a feedback path and requires no human intervention.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.

Problem 3.4: Logic Problems

Technology and Engineering

3.5.6-8.M (ETS) 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.

3.5.6-8.N (ETS) 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.

3.5.6-8.Q Apply a technology and engineering design thinking process.

3.5.6-8.R Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.

3.5.6-8.W (ETS) 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.

3.5.6-8.X Defend decisions related to a design problem.

3.5.6-8.HH Create a closed-loop system that has a feedback path and requires no human intervention.

3.5.6-8.JJ Apply informed problem-solving strategies to the improvement ofexisting devices or processes or the development of new approaches.