

Electricity - Unit Planner

Grade 5-6: Science

Big Idea: Electricity is everywhere around us. How can we learn more about how it works, how to be safe around it, how to work with it, as well as what effects magnets have on our world?

Program of Studies Curricular Outcomes:

5-5-1 Recognize and appreciate the potential dangers involved in using sources of electrical currents:

- understand that household electrical currents are potentially dangerous and not a suitable source for experimentation
- understand that small batteries are a relatively safe source of electricity, for experimentation and study, but that care should be taken to avoid short circuits
- understand that short circuits may cause wires to heat up, as well as waste the limited amount of energy in batteries.

5-5-2 Describe and demonstrate example activities that show that electricity and magnetism are related:

- demonstrate that electricity can be used to create magnetism
- demonstrate that a moving magnet can be used to generate electricity.

5-5-3 Demonstrate and interpret evidence of magnetic fields around magnets and around current-carrying wires, by use of iron filings or by use of one or more compasses.

5-5-4 Demonstrate that a continuous loop of conducting material is needed for an uninterrupted flow of current in a circuit.

5-5-5 Distinguish electrical conductors—materials that allow electricity to flow through them— from insulators—materials that do not allow electricity to flow through them.

5-5-6 Recognize and demonstrate that some materials, including resistors, are partial conductors of electricity.

5-5-7 Predict the effect of placing an electrical resistance in a simple circuit; e.g., in a circuit with a light bulb or electric motor.

5-5-8 Recognize that the amount of electricity we use in our homes is measured in kilowatt hours.

5-5-9 Interpret and explain:

- the reading on a household electrical meter
- efficiency labels on electrical appliances.

5-5-10 Draw and interpret, with guidance, circuit diagrams that include symbols for switches, power sources, resistors, lights and motors.

5-6-1 Identify example applications of electrical devices in the school and home environment, and classify the kinds of uses. Categories of electrical use may include such things as: heating, lighting, communicating, moving, computing.

5-6-2 Design and construct circuits that operate lights and other electrical devices.

5-6-3 Recognize the importance of switches and other control mechanisms to the design and operation of electrical devices, and identify purposes of switches in particular applications.

5-6-4 Construct and use a variety of switches.

5-6-5 Design and construct vehicles or other devices that use a battery-powered electric motor to produce motion; e.g., model cars, hoists, fans.

5-6-6 Design and construct a burglar alarm.

5-6-7 Demonstrate different ways of lighting two lights from a single power source, and compare the results. Students should recognize that wiring two bulbs in series makes both bulbs glow less brightly than if the bulbs are wired in parallel. Students may demonstrate this knowledge operationally and do not need to use the terms series and parallel.

5-6-8 Demonstrate different ways of using two batteries to light a bulb, and compare the results. Students should recognize that wiring the batteries in series causes the bulb to glow brighter than it would if parallel wiring were used.

5-6-9 Given a design task and appropriate materials, invent and construct an electrical device that meets the task requirements.

POS Outcome(s)	Overview of Opportunities	Competency (ies)	Assess Type	Day (s)
5-5-6 5-6-1	<p align="center">1 - What is Electricity?</p> <p>Introduction</p> <ul style="list-style-type: none"> • Watch “Bill Nye the Science Guy - S01E18 - Electricity” (0:00-2:41) • Class discussion. “What is electricity?” • Sources of electricity (nature, generators, and batteries) • Table groups create lists of electricity items that are produced by nature and electricity items that are produced by humans 	Critical Thinking Collaboration Managing Info	<input type="checkbox"/> F I J <input type="checkbox"/> S	1 Day (1)
5-5-1 5-5-7 5-6-1	<p align="center">2 - Electricity is All Around Us</p> <p>Electricity in our communities</p> <ul style="list-style-type: none"> • Discuss how we are dependant on electricity in many ways • Students disperse around the school to discover as many items as possible that use power • List ways that electricity is used at home, in the kitchen, shops, barns, schools, etc 	Communication Problem Solving Citizenship	<input type="checkbox"/> F OB J <input type="checkbox"/> S	1 Day (2)
5-5-1	<p align="center">3 - Safety Rules!</p> <p>Electrical Safety</p> <ul style="list-style-type: none"> • Read about electrical safety as a class • Hand out safety rules cards and play Match Game • Fill out the worksheet with unsafe situations and their reasons why they’re unsafe with the electrical safety rule 	Critical Thinking Problem Solving Personal Growth	<input type="checkbox"/> F OB J <input type="checkbox"/> S	1 Day (3)
5-5-4 5-5-7	<p align="center">4 - Short-Circuiting</p> <p>Demonstrating Short Circuits</p> <ul style="list-style-type: none"> • Review electrical circuits that discuss short circuits • Discuss the parts of a battery • Teacher example: starting a fire through a shorted circuit • Students create their own short circuit with a single D-cell battery 	Critical Thinking Problem Solving Collaboration	<input type="checkbox"/> F CL J TP <input type="checkbox"/> S	1 Day (4)
5-5-4 5-5-10 5-6-2 5-6-7	<p align="center">5 - Creating a Circuit</p> <p>Creating a Circuit</p> <ul style="list-style-type: none"> • Review short circuits and how we made the bulb light up • Let there be light activity (light a lamp with one wire) 	Problem Solving Collaboration	<input type="checkbox"/> F OB J TP	3 Days (5-7)

5-6-8	<ul style="list-style-type: none"> Predicting which set ups will light the lamp Closed Circuit: Two Wires <ul style="list-style-type: none"> Review how to make a lamp can light with one wire Add more equipment to the circuits to create new ones Students will use appropriate equipment to built and test a variety of circuits with the given supplies 	Creativity	<input type="checkbox"/> S	
5-5-5 5-5-10	<p style="text-align: center;">6 - It's Symbolic</p> Symbols for Electric Circuits <ul style="list-style-type: none"> Learn the symbols for electric circuits Discuss the problem with having pictures represent circuits Draw circuits Play a class game where table groups must built the circuit described on the board (first as drawings then as written words) 	Communication Problem Solving Collaboration	J <input checked="" type="checkbox"/> F <input type="checkbox"/> S	1 Day (8)
5-5-4 5-5-5 5-5-6 5-5-7 5-6-2 5-6-3 5-6-4 5-6-8	<p style="text-align: center;">7 - Circuit Varieties</p> Open and Closed Circuits <ul style="list-style-type: none"> Using lamps, demonstrate the difference between an open and closed circuits Discuss different ways to create an open circuit Allow students to built their circuits Switches <ul style="list-style-type: none"> Build a switch that turns a light on and off with a paperclip Discuss what a switch is and their advantages Give students the opportunity to construct circuits with operable switches More About Short Circuits <ul style="list-style-type: none"> Review what short circuits are and how they can be dangerous Create a short circuit with stripped wires 	Critical Thinking Problem Solving Collaboration	<input checked="" type="checkbox"/> F CL J TP <input type="checkbox"/> S	4 Day (9-12)
5-5-1 5-5-4 5-5-5 5-5-6 5-5-7	<p style="text-align: center;">8 - Review & Part 1 Test</p> Review <ul style="list-style-type: none"> Reviewing concepts on sources of electricity, uses in the community, safety, varieties of circuits, switches and diagrams After completing review worksheets, go over as a class 	Communication Managing Info Personal Growth	<input checked="" type="checkbox"/> F PE <input checked="" type="checkbox"/> S T	2 Days (12-13)

5-6-1 5-6-2	Test <ul style="list-style-type: none"> Work through part 1 electricity test 			
5-5-4 5-5-5 5-5-6 5-6-2 5-6-3 5-6-4 5-6-5 5-6-6 5-6-7 5-6-9	<p style="text-align: center;">9 - Putting Knowledge Into Action</p> Caine's Arcade <ul style="list-style-type: none"> Watch Caine's arcade and discuss how students will build their own Penny Arcade Make a list of arcade games students can make, use photos for inspiration Discuss what the requirements are for using lights, sounds, moving parts, etc as part of a circuit to be used in arcade games Allow students to group together to create arcade game Use cardboard boxes, circuits, lightbulbs, tubes, wires, batteries, buzzers, switches, toys, etc Build a Burglar Alarm <ul style="list-style-type: none"> Introduce the concept of how a burglar alarm works Give students all equipment needed to construct the alarm (plus more than they need) Have them use existing knowledge to try to build the alarm with minimal instruction 	Critical Thinking Problem Solving Collaboration Managing Info Creativity Personal Growth	<input type="checkbox"/> F OB CL TP <input type="checkbox"/> S R	2 Days (14-15)
5-5-2 5-5-3	<p style="text-align: center;">10 - Electromagnets</p> Introduction <ul style="list-style-type: none"> Introduce magnets, how they work, how to handle them, etc Try to make an electromagnet Conclude with more coils Using Magnets to Make Electricity <ul style="list-style-type: none"> Review last lesson Reverse operations and use magnets to make electricity Electromagnetic induction activity Magnetic Fields <ul style="list-style-type: none"> Review how magnets have an invisible magnetic field around them Iron filings magnetic field activity 	Problem Solving Collaboration	<input type="checkbox"/> F OB J TP <input type="checkbox"/> S	3 Days (16-18)

<p>5-5-5 5-5-6 5-5-7 5-6-2</p>	<p style="text-align: center;">11 - Conductors, Insulators, & Resistors</p> <p>Conductors & Insulators</p> <ul style="list-style-type: none"> Review electrical safety and why the wires have a plastic coating Conductors and insulators activity Distinguishing the difference between conductors and insulators helps with making effective circuits and electrical safety <p>Resistors</p> <ul style="list-style-type: none"> Review conductors and insulators Explain and demonstrate what resistors are Introduce incandescent light bulbs Teacher demonstration of resistor activity <p>Resistor Length & Performance</p> <ul style="list-style-type: none"> Review advantages of using a resistor in a circuit Alternating resistor length activity 	<p>Critical Thinking Problem Solving Collaboration</p>	<p><input checked="" type="checkbox"/> F OB J <input type="checkbox"/> S</p>	<p>3 Days (19-21)</p>
<p>5-5-6 5-5-8 5-5-9</p>	<p style="text-align: center;">12- Electricity Consumption</p> <p>Measuring Electricity Consumption</p> <ul style="list-style-type: none"> Discuss how electricity we use comes from the power companies and the more we use, the more we pay The amount of electricity used in an electrical device is measured in watts Teach about the concept of kilowatt hours (play online game to deepen the understanding) As a class, choose an appliance and figure out it's usage in a month, from there calculate it's number of kilowatt hours <p>Reading an Electric Meter</p> <ul style="list-style-type: none"> Explain that utility companies generally come out to read the electrical meter, they use these to calculate the kilowatt hours Teach students how to read the electrical meters Play a game where students are challenged to read a variety of meters and figure out their kilowatt usage <p>Energy Efficiency Labels</p> <ul style="list-style-type: none"> Explain that electricity is generated in a variety of ways 	<p>Critical Thinking Communication Problem Solving Collaboration</p>	<p><input checked="" type="checkbox"/> F OB J TP <input type="checkbox"/> S</p>	<p>3 Days (22-25)</p>

	<ul style="list-style-type: none"> Class discussion about how some are renewable while others are not Introduce the idea of the laws that are related to electricity and resources Discuss pollution caused by resources used to create electricity 			
5-5-2 5-5-3 5-5-5 5-5-6 5-5-8 5-5-9	<p style="text-align: center;">13 - Review & Part 2 Test</p> <p>Review</p> <ul style="list-style-type: none"> Reviewing concepts on electromagnets, conductors, insulators, resistors, electricity consumption, and energy efficiency After completing review worksheets, go over as a class <p>Test</p> <ul style="list-style-type: none"> Work through part 2 electricity and magnetism test 	Communication Managing Info Personal Growth	SE T	<input type="checkbox"/> F <input type="checkbox"/> S 2 Days (26-27)
5-5-4 5-5-5 5-5-6 5-6-2 5-6-3 5-6-4 5-6-5 5-6-7 5-6-9	<p style="text-align: center;">14 - Penny Arcade</p> <p>Caine's Arcade</p> <ul style="list-style-type: none"> Rewatch video "Caine's Arcade" Make sure students are on the right track with their arcade games (have met all requirements set out) Final touches on all games <p>Penny Arcade</p> <ul style="list-style-type: none"> Set up all arcade games, prize tables, ticket booth, etc in gymnasium Have half day of arcade (classes will be attending penny arcade at various times throughout the afternoon) 	Critical Thinking Communication Problem Solving Collaboration Creativity Personal Growth	OB CL R	<input type="checkbox"/> F <input type="checkbox"/> S 2 Days (28-29)

Possible Formative (F) or Summative (S) Assessment Types				
Admit/Exit Slips (AES)	Graphic Organizer (G)	Pass/Fail (PF)	Journal (J)	Test/Exam (T)
Checklist (CL)	Interview (I)	Poll/Survey (PS)	Rubric (R)	Quiz (Q)
Complete/Incomplete (CI)	Know/Want to Know/Learned (KWL)		Peer Evaluation (PE)	Task Performance (TP)
Frequency Chart (FC)	Observations (OB)	Portfolio (P)	Self-Evaluation (SE)	Other (OT)