5th Grade - Elementary Science Bundle 7

Title	Suggested Dates
Forms of Energy / Electricity (These concepts span bundles 7 & 8)	Jan 4 – Jan 28 (18 days)

Link to Integrated Process Skills Link to Assessment Link to Related Assurance Words Link to Related Literature
Link to Science Project / Science Fair Information

Big Idea/Enduring Understanding	Guiding Questions
Energy occurs in many forms and is used in our everyday lives. The depletion of nonrenewable energy sources has led to the increased development and use of alternative energy sources.	What are different forms of energy and how are they used? What are some alternative energy sources and how are they used? How do the concepts and ideas in this bundle connect / relate the concepts / ideas in previous bundle(s)?

The resources included here provide teaching examples and/or meaningful learning experiences to address the District Curriculum. In order to address the TEKS to the proper depth and complexity, teachers are encouraged to use resources to the degree that they are congruent with the TEKS and research-based best practices. Teaching using only the suggested resources does not guarantee student mastery of all standards. Teachers must use professional judgment to select among these and/or other resources to teach the district curriculum.

Knowledge & Skills with Student Expectations	District Specificity/Examples	Suggested Resources (See note above)
5.6 Force, Motion, and Energy. The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The student is expected to: 5.6a explore the uses of energy including mechanical, light, thermal, electrical, and sound energy	Including: • Mechanical energy: movement • Light energy: vision, phones, ipods, tvs, computers, daylight, street lights, etc. • Thermal energy: (heat) sun, lamps, ovens, batteries, etc. • Electrical: used by many items in the home (lights, TVs, computers, etc. • Sound: connect to hearing, ipod, tv, voices, emergency vehicles, etc Such as: introducing potential and kinetic energy basic definitions Potential energy: energy that is stored in an object Kinetic energy: energy of motion	TAKScopes 5.6a Uses of Energy AIMS 5th Grade Physical Science Texas Core Curriculum "What is Energy", page 75 "Sound is Vibration", page 212 "Traveling Sounds", page 218 "Slinky Sound", page 223 "Buzzin Bugs", page 236 Gateway, 5th Grade 2.3 Light Energy (Explain) 2.5 Sound Energy 2.6 Electrical Energy (Engage, Explain, Elaborate) Exploring Energy What is potential and kinetic energy? Sound Waves Animation
5.7 Earth and Space. The student knows Earth's surface is constantly changing and consists of	Connect to fossil fuels (non-renewable) from Bundle 4. Renewable and nonrenewable is in 4th grade, review as part	TAKScopes 5.7c Alternative Energy

useful resources. The student is expected: 5.7c identify alternative energy resources such as wind, solar, hydroelectric, geothermal, and biofuels	of process. Including: **Solar Energy:** • The "original" energy source • Renewable Energy • The energy received by the Earth from the Sun • Vital to support life on Earth, it helps grow our food, light our days, influence weather, and provide heat (natural resource) • We can harness solar energy (through the use of Solar Panels) to generate solar powered electricity ("man made" use) • Not "new"; solar energy has been used by man in many smaller applications, such as solar powered calculators • Partly responsible for wind energy because wind patterns are greatly influenced by the Sun **Wind Energy:** • Generated by harnessing the wind, usually by windmills / turbines • Renewable Energy • The "force" of winds blowing across the Earth's surface • Not "new:, wind energy was first harvested centuries ago, when windmills were used to power mills, pumps, etc • Wind energy systems generate electrical energy • Wind energy can be produced in stand-alone applications or produced centrally and distributed (ex: windmill powering a water pump vs wind farm harnessing energy and sending it to a grid for larger consumption) **Hydroelectric (Hydropower)** • Generating electricity by harnessing the power of moving water • Renewable energy • Produces the most electricity in the United States • The amount of available energy in moving water is determined by its flow or fall • Not "new"; one of the oldest sources of energy; it was used thousands of years ago to turn a paddle wheel in grain mills, etc • Generated through use of water wheels, dams, etc	Gateway, 5th Grade 2.1 Solar Energy

	NOTE: Only a small percentage of all dams in the United States produce electricity. Most dams were constructed solely to provide irrigation and flood control **Geothermal** • Heat from within the Earth [Geo (earth) and thermal (heat)] • Renewable Resource (heat is continuously produced within the Earth) • We recover this heat as steam or hot water and use it to heat buildings or generate electricity • We use geothermal energy by digging deep wells and pumping the heated underground water or steam to the surface. We can also make use of the stable temperatures near the surface of the Earth to heat and cool buildings • Examples: Geothermal reservoirs, volcanoes, geysers, hot springs • Type of uses include: o Direct Use: use hot water from springs or reservoirs near the surface. o Electricity generation power plants (geothermal plants usually built where reservoirs are located within a mile or two of the surface o Geothermal Heat Pumps use stable ground or water temperatures near the Earth's surface to control building temperatures above ground **Biofuel (Biomass)** • Biofuel is any fuel that derives from biomass – recently living organisms (plants and animals) or their byproducts, such as manure. • Renewable Energy • Biomass contains stored energy from the Sun • When burned, the chemical energy in biomass is released as heat. If you have a fireplace, the wood you burn in it is a biomass fuel. Wood waste or garbage can be burned to produce steam for making electricity, or to provide heat to industries and homes. • Examples: wood, crops, manure, and some garbage **NOTE**: wood is most common form	
5.6 Force, Motion, and Energy. The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The	Introduced in 4th grade Consider amount of energy needed (example: a "C" cell	TAKSCopes 5.6b Circuits and Electricity Complete a Circuit Investigation

student s expected to: 5.6b demonstrate that the flow of electricity in circuits requires a complete path through which an electric current can pass and can produce light, heat and sound	batter will not light a large bulb) Including: • Complete circuit o Electrical current is able to flow from the power source (such as a battery), through a transmission source (such as a copper wire), (often through a resistor), and return to the power source. [visualize a circle although complete circuits do not have to be circular in shape] o An OPEN circuit is **NOT** a COMPLETE circuit o A CLOSED circuit is a complete circuit EXAMPLE: flipping a switch to the OFF position "opens" the circuit and therefore it is not a complete circuit. Flipping a switch to the ON position closes the circuit and is therefore considered a complete circuit. o By-products can include heat, light, and magnetism (such as with an electro-magnet, introduced in 4th grade) o Light bulbs, motors, buzzers, and other items are RESISTORS (impedes the flow of electricity: how we "use" the electrical flow) Including: • Series circuits o Electricity flows in one path o No electricity flows when the path is open; example: if one light bulb is out the rest do not work • Parallel Circuits o Electricity flows in multiple paths stemming from the same energy source and completing at the same energy source Because the energy is flowing in parallel circuits, if one light bulb goes out they do not all go out (such as with modern holiday lights)	Electrical Circuits, Series and Parallel: Teacher background Make a Circuit Online - Teacher Information Make a Circuit Online Circuits for Kids *4th Grade has FOSS Magnetism and Electricity Kit listed in their Bundles as a resource AIMS 5th Grade Physical Science Texas Core Curriculum "Electrical Energy", page 129 "Sparky's Light Kit", page 131 "Pathfinders", page 136 "Conductor or Insulator", page 144 "Circuit Quiz Board", page 151 "Electric Circuits", page 156
5.5 Matter and energy. The student knows that matter has measureable physical properties and those properties determine how matter is classified, changed, and used. 5.5a classify matter based on physical properties, including ~~mass~~, ~~magnetism, physical state (solid, liquid, gas), relative density~~ ~~(sinking and floating), solubility in water,~~ and **the ability to conduct or insulate** ~~thermal energy~~ or **electric energy**	Including: • An insulator is a material that does not conduct electricity, such as glass • A conductor is a material that does conduct electricity, such as copper Including testing: • wood, aluminum, glass, different types of metal, plastic, water	
5.6 Force, Motion, and Energy. The student	Including:	TAKscopes 5.6c Light

knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. 5.6c demonstrate that light travels in a straight line until it strikes an object or travels through one medium to another and demonstrate that light can be reflected such as the use of mirrors or other shiny surfaces and refracted such as the appearance of an object when observed through water	• Reflection occurs when light bounces off objects o Amount of reflection depends upon the property of the surface • Refraction occurs when light bends	Reflection and Refraction for Kids Bridging to TAKs Light and Optics "Reflecting on Refraction": Engage: could skip mylar mirror and CD Explore Station 2: delete measurement so skill this; Stations 3 and 4, can use large plastic comb instead Behavior of Light animation FOSSWEB: Matter and Energy Activities: Reflecting Light, Colored Light AIMS 5th Grade Physical Science Texas Core Curriculum "What's Blocking the Light?", page 170 "Light Rays Slow Down", page 176 "Bent on It", page 181 "Light Reflections", page 188 AIMS 4th Grade Physical Science Texas Core Curriculum "Prism Path", page 187 "A Hat Trick", page 219
5.6 Force, motion, and energy. The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The student is expected to: 5.6d design an experiment that tests the effect of a force on an object	Focus: effect of a force on an object Experimental Design / Engineering in late Bundle 11 will focus on original design Choices include but are not limited to: • Gravitational force • Natural Forces • Push / Pulls • Change in position, direction, movement	TAKScopes 5.6d Experimenting with Forces
Scientific Investigation and Reasoning	The Process TEKS are integrated with and taught THROUGH the content TEKS.	**Back to Top**
5.1 Scientific investigations and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and environmentally appropriate and ethical practices. The student is expected to: 5.1a demonstrate safe practices and the use of safety equipment as described in the Texas Safety Standards during classroom and outdoor investigations	Including: conservation of energy	PISD Science Safety Page Texas Science Safety Standards DuPont Science Safety Zone

5.1b make informed choices in the conservation, disposal, and recycling of materials		
5.2 Scientific investigations and reasoning. The student uses scientific methods during laboratory and outdoor investigations. The student is expected to: 5.2c collect information by detailed observation and accurate measuring 5.2d analyze and interpret information to construct reasonable explanations from direct (observable) and indirect (inferred) evidence 5.2f communicate valid conclusions in both written and verbal forms 5.2g construct appropriate simple graphs, tables, maps, and charts using technology, including computers, to organize, examine, and evaluate information	Experimental Investigations including: • Whole group participation • Small group participation • Partner participation • Individual participation Experimental Investigations including: • Pre-determined inquiry (i.e. AIMS activities) • Guided inquiry • Full inquiry Experimental Investigation (Scientific Method) steps including: • Problem / Question • Hypothesis • Materials • Procedure • Data / Results • Conclusions **NOTE**: Not all investigations / activities are experimental investigations	What are descriptive, comparative, and experimental investigations? 5th graders experience all three types.
5.3 Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to: 5.3a in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations so as to encourage critical thinking by the student	Such as: • Current event discussion/debate on use of energy, conservation of energy	Using Socratic Seminars for higher-order thinking and discussion Multisensory Strategies for Science Vocabulary by Sandra Husty and Julie Jackson includes Bag & Tag
5.3 Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to: 5.3b evaluate the accuracy of the information related to promotional materials for products and services	Including: • Claims made by/for fossil fuel industry, "clean energy", and related fields	

such as nutritional labels		
5.3 Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to: 5.3c draw or develop a model that represents how something works or looks that cannot be seen such as how a soda dispensing machine works	Such as: • Models/ representations of equipment used: solar panels, hydropower plants, wind turbines, etc.	
5.4 Scientific investigation and reasoning. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to: 5.4a collect, record, and analyze information using tools including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, prisms, mirrors, pan balances, triple beam balances, spring scales, graduated cylinders, beakers, hot plates, meter sticks, magnets, collecting nets, and notebooks; timing devices including clocks and stopwatches, and materials to support the observation of habitats of organisms such as terrariums and aquariums 5.4b use safety equipment including safety goggles and gloves	Including: • Notebooks • Cameras • Computers • Prisms • Mirrors • Hot Plates • Magnets • Iron Filings • Timing Devices	

Related Assurance Words

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alternative energy, complete circuit, differentiate, experiment, fossil fuels, hypothesis, interact (interaction), interpret, reflect (reflected, reflection), refract (refracted, refraction), relationship, reliability, significance

Related Literature

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Natural Resources: Using and Protecting Earth's Supply by Darlene Stille
A Bright Idea Conserving Energy by Tristan Boyer Binns
Biomass: Fueling Change by Niki Walker
Generating Wind Power by Niki Walker
Wind Power by Joshepha Sherman
Harnessing Power From the Sun by Niki Walker
My Light by Molly Bang
Geothermal Power by Josepha Sherman

Electricity
The Shocking World of Electricity With Max Axiom, Super Scientist by Liam O'Donnell

La energía: calor, luz, y combustible by Darlene Stille
Ahorrar ernergia by Charlotte Gullain

Electricity
Electricity in My World = La electricidad en mi mundo by Joanne Randolph
La electricidad: focus, pilas y chispas by Darlene R. Stille
Usar la electricidad by Angela Royston
Luz y sombra by Susan Ring
Empujar y haler by Hollie J. Endres

Charged Up : the Story of Electricity by Jacqui Bailey Electricity by Darlene Stille Electricity: Bulbs, Batteries, and Sparks by Darlene R. Stille Using Electricity by Angela Royston Switch On, Switch Off by Melvin Berger Light: Shadows, Mirrors, and Rainbows by Natalie M. Rosinsky Light by Darlene Stille All About Light by Lisa Trumbauer Manipulating Light: Reflection, Refraction, and Absorption by Darlene R. Stille Forces and Motion by Angela Royston Forces Around Us by Sally Hewitt	

Assessment Support Region XIII Science TAKS Resources **www.tmsds.org** **Back to Top**

Assessment Probes	***Performance Assessment***
Uncovering Student Ideas in Science (Page Keeley), Volume 1 "Making Sound", page 43 "The Mitten Problem", page 103 "Can it Reflect Light?", page 25 "Apple in the Dark", page 31 "Birthday Candles", page 37 "Talking About Gravity", page 97 Uncovering Student Ideas in Science (Page Keeley), Volume 3 "Batteries, Bulbs, and Wires", page 57 "Mirror on the Wall", page 51 "Batteries, Bulbs, and Wires", page 57 "Apple on a Desk", page 63 "Rolling Marbles", page 71 "Dropping Balls", page 77 Uncovering Student Ideas in Science (Page Keeley), Volume 4 "Standing on One Foot", page 61	Bridging to TAKS Light and Optics: 5th Grade Page 14/15: Students could simply do it by manipulating the objects or in science notebooks; each object gets its own chart
Scenario / Open Ended	***Multiple Choice***
Energy and Society Activity book(Project Learning Tree) **pages 20-24**-Compare the impact of the different forms energy productions on the environment **Gateway, 5th Grade:** 2.5 student page 96 question 3	**Gateway, 5th Grade:** 6.1 student pages 211 and 212 **Gateway, 5th Grade:** 6.2student pages 223 and 224 **Gateway, 5th Grade:** 2.3 student pages 86 and 87 **Gateway, 5th Grade:** 2.4 student pages 91 and 92 **Gateway, 5th Grade:** 2.5 student page 96 questions 1 and 2 **Gateway, 5th Grade:** 2.6 student pages 103 and 04

5th Grade - Elementary Science Bundle 7

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<tr><td rowspan="2">Instructional Points for Bundle 7: Results, Conclusion, Reference and Acknowledgments
Students plan / create display (including Title), present at Campus Science Fair Event

Science Project / Testable Question Support: Campus share folder > Sci Curriculum Info > Science Fair</td><td>*Each campus has its own timeline based upon when the campus science fair event is scheduled to occur.

Individual or team EXPERIMENT required for all 5th graders</td></tr>
<tr><td>Experiment Components:
Title, Question (testable), Definitions, Hypothesis, Background Information, Materials, Procedure, Results, Conclusion

Experimental Investigation Rubric</td></tr>
<tr><td>Participation in campus Science Fair required for all 5th graders;
Students wishing to be considered for the Austin Energy Regional Science Festival complete and submit an “AERSF Intent Form” prior to the campus science fair event.</td><td>Austin Energy Science Festival Website</td></tr>
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