

6th grade: Physical Science: Energy Transfer and Conservation Weeks 10-15

6.P.3A. Students will learn about the various forms of energy, how energy exists in multiple forms, and can change forms without energy being created or destroyed (Law of Conservation of Energy).

6.P.3B. Students will learn how energy transfer occurs within systems that enable work to occur. Students will perform investigations with simple machines and develop methods to improve the efficiency of machines.

<p>6.P.3A. Energy manifests itself in multiple forms, such as mechanical (kinetic energy and potential energy), electrical, chemical, radiant (solar), and thermal energy. According to the principle of conservation of energy, energy cannot be created nor destroyed, but it can be transferred from one place to another and transformed between systems.</p>	<p>6.P.3B. Conceptual Understanding: Energy transfer occurs when two objects interact thereby exerting force on each other. It is the property of an object or a system that enables it to do work (force moving an object over a distance). Machines are governed by this application of energy, work, and conservation of energy.</p>
<p>Some important terms: Chemical energy Conduction Conservation of energy Convection Elastic potential energy Generator Gravitational potential energy Kinetic energy Magnetic field Mechanical energy Potential energy Radiation Radiant (solar energy) Simple electrical motor Thermal energy</p>	<p>Some important terms: Complex machine Efficiency Inclined plane Input energy (effort) Output Force Lever Pulley Screw Simple machine Spring Scale Wedge Wheel and axle Work</p> <p>https://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Units/6-Physical-Science--Energy-Transfer-and-Conservation.pdf</p>

What's Review - What's New

Review:

- In 1st Grade students were taught a unit called Exploring Light & Shadows.
- In 2nd grade students completed a unit called Solids, Liquids & Magnets, and another called Exploring Pushes & Pulls.
- In 3rd grade students completed a unit called Properties & Changes in Matter. Here, they looked at how heat energy impacts matter to changing it from solid to liquid to gas, and vice versa.
- Vocabulary from the 3rd grade: Energy Transfer-Electricity & Magnetism
Energy, Electricity, Motion, Electric Current, Simple Circuit, Light Energy, Heat Energy, Sound Energy, Transformation, Electrical Insulator, Electrical Conductor, Wire, Switch, Battery, Light Bulb, Magnet, North Pole, Attraction, Repulsion, Electromagnet, Magnetic Field, Iron Core, Conductive Wire, South Pole
- Vocabulary from 4th grade: Forms of Energy-Light & Sound
Energy, Color, Prism, Spectrum, Brightness, Intensity, Visible, Reflection, Refraction, Absorption, Transparent, Translucent, Opaque, Vibration, Pitch, Thickness, Length, Tension, Volume, Force, Distance
- Vocabulary from 5th grade: Forces & Motion
Inertia, Mass, Magnetism, Force, Gravity, Friction, Position, Direction, Speed, Balanced Forces, Unbalanced forces, Acceleration, Deceleration, Texture, Surface, Rough surface, Smooth surface, Weight, Lubrication, Rate, Motion.
- Definition of energy - Students learned in 3rd and 4th grade that *energy is the ability to cause change*. Please spend a day helping students to recognize examples of energy in their environment. (lights in the room, calories on food packaging, have students test how long they can stand on one foot before losing their balance or getting tired)
- As an intro lab, pose the question: Do magnets have energy? What evidence do we have that magnets have or do not have?
 - ➡ Supply each group with a magnet, a box of paperclips, and various materials (paper squares, cardboard, plastic, aluminum foil, a rock, etc.) Once the students

have determined how many paperclips the magnet can securely attract, have them predict which (if any) material will block or reduce the strength of their magnet. Students then develop a chart to show their results.

New

6.P.3A.1 Analyze and interpret data to describe the properties and compare sources of different forms of energy (including mechanical, electrical, chemical, radiant, and thermal).

- This is more than just identifying different forms of energy, it involves data analysis.
- Test and graph the mass of a bob vs its period or angle of origin vs. the period.
- Infographic on household energy usage.

6.P.3A.2 Develop and use models to exemplify the conservation of energy as it is transformed from kinetic to potential (gravitational and elastic) and vice versa.

- How can we show energy transformations?
- How can we have students calculate energy conversions?
- Carowinds Education Packet
- The Physics Classroom

6.P.3A.3 Construct explanations for how energy is conserved as it is transferred and transformed in electrical circuits.

- How does screen brightness (laptop, phone, etc.) impact battery power?
- Does the speed at which your laptop charges your phone change if the laptop is plugged or unplugged? Why would it matter?
- Is wifi or carrier better for conserving battery power? Why? How can students test this?

6.P.3A.4 Develop and use models to exemplify how magnetic fields produced by electrical energy flow in a circuit is interrelated in electromagnets, generators, and simple electrical motors.

- Do you have magnets, motors, batteries? jparker@rhmail.org
- Students MUST make these devices!
- The standards refer to series circuits as “simple” circuits. Parallel circuits are extended knowledge. Please teach parallel circuits - no additional materials are needed for this content, and it will not be tested, but students need to see and understand the difference.

6.P.3A.5 Develop and use models to describe and compare the directional transfer of heat through convection, radiation, and conduction.

-Tie in to weather.

-[Thermodynamics activities for kids](#)

6.P.3A.6 Design and test devices that minimize or maximize heat transfer by conduction, convection, or radiation.

-Is styrofoam equally effective at keeping hot things hot as it is cold things cold?

-Have students compete to design insulating devices to maintain temperature for the longest time.

6.P.3B.1 Plan and conduct controlled scientific investigations to provide evidence for how the design of simple machines (including levers, pulleys, inclined planes) helps transfer mechanical energy by reducing the amount of force required to do work.

-This is not an exploration of different types of simple machines - it is how to improve them. How can students improve an existing device?

6.P.3B.2 Design and test solutions that improve the efficiency of a machine by reducing the input energy (effort) or the amount of energy transferred to the surrounding environment as it moves an object.

-What new device(s) can students make? How efficient is it?

Helpful Links:

SC Energy Commission <http://energy.sc.gov/>

MS Energy Labs and Lessons from BP

https://www.bp.com/content/dam/bp-country/en_us/PDF/STEM/ScienceFairBook_BP_Intermediate_FINAL.PDF

Lessons and Info from Teach Engineering

<https://www.teachengineering.org/>

Solar Energy Info and projects for students

<https://www.builditsolar.com/index.htm>

Weeks 16-18 Diversity of life: Classification (Chapter 8)

Benchmark Window: Dec. 9-13