Science Grade 6 Unit 1

Canterbury Public Schools

Subject	Science
Grade Level	6
Unit Title	Energy
Unit Goals	Demonstrate an understanding of the fundamental concepts of potential and kinetic energy, its conservation, and its transference.
Pacing (# of weeks)	10 Weeks
Standards	**NGSS Performance Standards** **MS-PS3-1.** Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. **MS-PS3-2.** Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. **MS-PS3-3.** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* **MS-PS3-4.** Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. **MS-PS3-5.** Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object
Content/Conceptual Knowledge (know)	Science knowledge is based on logical and conceptual connections between evidence and explanations. NGSS Disciplinary Core Ideas (See below) **PS3.A: Definitions of Energy** ▪ Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1) ▪ A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2) ▪ Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.

	(MS-PS3-3),(MS-PS3-4) **PS3.B: Conservation of Energy and Energy Transfer** ▪ When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5) ▪ The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. (MS-PS3-4) ▪ Energy is spontaneously transferred out of hotter regions or objects and into colder ones. (MS-PS3-3) **PS3.C: Relationship Between Energy and Forces** ▪ When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2) **ETS1.A: Defining and Delimiting an Engineering Problem** ▪ The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (secondary to MS-PS3-3) **ETS1.B: Developing Possible Solutions** ▪ A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (secondary to MS-PS3-3)
Skills (be able to do)	**Inquiry/Science skills:** ● Observing: Using all five senses to gather information, noting details, and describing objects or events. ● Measuring: Using standard and non-standard measures to accurately quantify dimensions, including the metric system (centimeters, liters, milliliters) ● Inferring: Interpreting or explaining observations to make sense of data. ● Hypothesizing and Testing: Forming a testable, educated guess and designing experiments to test it. ● Controlling Variables: Identifying and managing independent, dependent, and controlled variables in experiments. ● Data Analysis & Interpretation: Creating and reading graphs, charts, and tables to analyze data. ● Modeling: Using models to represent, understand, and explain complex systems. ● Draw conclusions and use data to determine next steps in an attempt to refine the experimentation process. Soft Skills:

	● Follow step by step directions ● Communication: Active listening, verbal, and written communication are crucial for collaborating and presenting ideas effectively. ● Teamwork & Collaboration: Working effectively in groups, respecting diverse perspectives, and contributing positively to shared goals. ● Adaptability & Flexibility: The ability to adjust to new situations, unexpected challenges, and evolving environments. **Digital Literacy Skills** ● Use Google classroom ● Use technology to complete tasks and research data. ● Use Google sheets to create graphs ● Use Google slides to present data ● Hyperlink data sources
Essential Questions	● What is energy? ● What are the two main types of energy? ● What is the relationship between kinetic and potential energy? ● What is the relationship between mass and kinetic energy of a moving object? ● What is meant by conservation of energy? ● How is energy transferred between objects or systems? ● How are forces related to energy? ● How do food and fuel provide energy? ● If energy is conserved why is it that people say it is “used”? ● What is the first law of thermodynamics? ● How are conductors and insulators different? ● What are the types of potential and kinetic energy?
Enduring Understandings	1. Energy is the ability to do work such as moving an object, creating light or generating heat. 2. Energy can neither be created or destroyed. (1st Law of Thermodynamics) 3. The mass and velocity of an object have a proportional impact on the total kinetic energy of a moving object. 4. Kinetic Energy is energy of motion 5. Potential Energy is stored energy 6. Food is potential energy that is stored chemically that we use to survive. 7. Energy can be transferred by conduction, convection, or radiation 8. Metals can make good conductors while non metals and materials that trap air make good insulators. 9. There are multiple forms of potential and kinetic energy 10. You can calculate the total kinetic energy of a moving object $KE=1/2M \times V^2$

Vocabulary	Energy, Potential Energy, Kinetic Energy, Mass, Conductor, Insulator, Conduction, Radiation, Convection, Velocity, Newton, Joule, Force, conservation, proportion gravitational energy, electrical energy, elastic rebound, mechanical energy, nuclear energy, chemical energy, thermal energy, sound, radiant energy
Common Learning Experiences	● Researching, testing, and designing an effective insulator ● Inquiry based investigations of the relationship of mass and total kinetic energy of a moving object through measurements of time, distance, and mass. ● Calculating the total kinetic energy of an object. ● Finding real examples for all types of kinetic and potential energy ● Using rollercoasters to model the relationship between kinetic and potential energy. ● Demonstrations of how mass and height have an impact on the potential gravitational energy an object has. ● Watching car crash test videos that demonstrate how mass and velocity can impact the total amount of kinetic energy a moving object has. ● Reading articles about different types of energy production and storage.
Assessments	Pretests Unit Assessments Demonstrations Lab Reports Experiments
Student Resources	Classroom library, Google classroom, Mystery Science activities and lessons, online classroom resources Online Super Stem articles,
Teacher Resources	NASA.gov, Mystery Science activities and lessons, Scholastic.com, NGSS,