Springdale Public Schools
Physical Science-Integrated Unit 2

Title of Unit	Energy	Grade Level	secondary
Subject	Physical Science - Integrated	Time Frame	6 weeks
Developed By	SPS Science	Date Modified	7/31/2021

Identify Desired Results

Standards Covered in this Unit
(Evidence statements are LINKED from the standard number. Evidence statements assist in clarifying outcomes)

PSI-PS3-1 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. [**AR** Clarification Statement: This PE is partially addressed in this course. Emphasis is on explaining the meaning of mathematical expressions used in the model. Models could include spreadsheet analysis or other computer interfaces] [AR Assessment Boundary: Assessment is limited to basic algebraic expressions or computations.]

PSI-PS3-2 Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects). [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.] [AR Assessment Boundary: Assessment is limited to mechanical energy.]

PSI-PS3-3 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.* [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.]

PSI-PS3-4 Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). [Clarification Statement: Emphasis is on analyzing data from student

investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.] [Assessment Boundary: Assessment is limited to investigations based on materials and tools provided to students.]

Learning Outcomes for the Unit

What relevant goals will this unit address? These must come from the standards.

- **Students will analyze various energy models for similarities and differences between energy types.**
- **Students will use computational models to account for energy flow through combinations of systems.**
- **Students will predict behavior of energy systems using student-directed experimental design.**

Key Vocabulary for the Unit

energy	Kinetic energy	Potential energy	Thermal energy	Light energy
Electrical energy	work	system	Reference level (frame of reference)	conservation
radiation	transfer	microscopic	macroscopic	molecular/atomic level

Enduring Understandings for the Unit (for discussion within science and across content areas)

- **Energy throughout interactions within a defined system is conserved.**
- **Energy cannot be created nor destroyed.**
- **The availability of energy limits what can occur in any system.**
- **Uncontrolled systems always evolve toward more energetically stable states**
- **Justification for phenomena in everyday experiences can be supported through graphical and data analysis**

Essential Questions for the Unit

- **How is the motion of an object determined?**
- **How can it be determined if energy is transferred in a system?**

Misunderstandings That Will Be Addressed

- Energy lost from a system is destroyed.
- Internal energy is only motion.
- Total energy of a system is kinetic and potential energy only.

Content Literacy Skills for the Unit (Interpretation of data, experimental design, SEPs, CCs) [minimum list]

- Developing and using models, planning and carrying out investigations, using mathematics and computational thinking, constructing explanations and designing solutions
- Identifies similarities and differences between complex experiments.
- Evaluates the design or methods of a simple experiment (e.g., possible flaws or inconsistencies; precision and accuracy issues).

Assessment Evidence
What type(s) of Common Formative Assessment (CFA) will be given?
ticket out the door, graphic organizers, quick writes, google forms online checks, aspire-like bellringers, etc.
What type of District Formative Assessment will be given?
TBD

Overview of <u>All</u> Choices of Lessons for Unit
This is not a lesson plan!.
Shaded Activity/Activities are COPYRIGHT PROTECTED and cannot be shared outside of Springdale Schools. Sorry for any inconvenience.

Standard(s) #	Formative Assessment(s) (Indicate which is the CFA)	Main Instructional Strategy	Activity/Activities
PSI-PS3-1			
PSI-PS3-2			

PSI-PS3-3				
PSI-PS3-4				

Common Resources	
Title and Description of Usage	**Location**
This is an option for a lab notebook that is virtual.	Blank Digital Lab Notebook
A FREE video analysis and modeling tool that is open source!!	Tracker