

Phoenixville Area School District UbD Science Unit Plan

Grade Level: 8th Grade

Unit Name: Energy (Review)

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Stage 1 Desired Results		
	<i>Transfer</i>	
<p>Overarching NGSS & PA</p> <p>Standards:</p> <p>3.2.6-8.A Develop models to describe the atomic composition of simple molecules and extended structures.</p> <p>3.2.6-8.C Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.</p> <p>3.2.6-8.D Analyze and interpret data on the properties of substances before and after the substances interact to</p>	<p><i>Students will be able to independently use their learning to...</i></p> <ol style="list-style-type: none"> 1. Ask questions and/or define problems 2. Develop and/or use models 3. Plan and/or carry out investigations 4. Analyze and interpret data using computational thinking 5. Obtain, evaluate, and communicate information (supported by evidence) 6. Construct explanations and design solutions 	
	<i>Meaning-Making</i>	
	<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> • All matter is made of atoms. • Pure substances (elements) have unique physical and chemical properties. • Phase changes occur based on variations of temperature and/or pressure. • Heat is the transfer of thermal energy from one substance to another. • During a chemical reaction the amount of atoms present in the reactant and product remains the same. • Chemical reactions release or absorb/store energy. • There are two main types of energy: Kinetic and Potential. • Kinetic energy contains Sound, Radiant, Electrical, Thermal, and Motion. • Potential energy contains Gravitational, Tension, Nuclear, and Chemical. • Energy is neither created nor destroyed, just changes form. • Energy transformations are when energy changes from form to form. • Force is needed for energy to be in motion. 	<p>ESSENTIAL QUESTIONS <i>Students will keep considering...</i></p> <p>How do particles combine to form matter?</p> <p>How do substances combine or change to make a new substance?</p> <p>What is energy?</p> <p>What is the difference between kinetic and potential?</p> <p>What is meant by conservation of energy?</p> <p>How is energy used in different forms?</p> <p>What is an energy transformation?</p>

Knowledge and Skills Acquisition

determine if a chemical reaction has occurred.

3.2.6-8.E

Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

3.2.6-8.F

Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*

3.2.6-8.M

Apply scientific principles to design, construct, and test a device that either minimizes or maximizes

Students will understand that...

- Atoms can be arranged in different ways to form molecules.
- The molecules in solids, liquids and gases move at different speeds and spread away from each other as energy is increased.
- Chemical reactions can be defined as endothermic or exothermic.
- Energy is neither created nor destroyed, just changes form.
- Energy is the ability to do work.
- Potential energy is stored energy waiting to be used and changed into kinetic
- Kinetic energy is energy in motion.
- There are different forms of energy.
- Potential contains energies that do not use motion to move, but store energy to be used any time.
- Kinetic energy contains energy that is being used and will need to be restored at a certain time.
- Energy Transfers occur when one form changes into another. Transfers can have more than one transfer. Turning on a light switch is motion to electric to radiant and heat.
- Some energy transfers that can have multiple outcomes.

Students will be skilled at...

- Modeling the atomic structure of different substances and phases.
- Determining if a chemical reaction has taken place.
- Identifying whether a chemical reaction was endo or exothermic.
- Demonstrate how the law of conservation of mass using a model.
- Design and test an experiment that releases or absorbs heat.
- Identify what the definition of energy is in general terms.
- Identify the different forms of energy and what main type they belong to.
- Describe the transformation of everyday energy transformations.
- Develop their own transformations and explain how energy is changing.
- Provide evidence in when energy has changed into a different form
- Conducting investigations and describing how energy is changing.

KEY VOCABULARY

<ul style="list-style-type: none"> • Phase/State • Atom • Molecule • Conservation • Exothermic • Endothermic • Energy • Kinetic Energy • Potential Energy • Work • Force 	<ul style="list-style-type: none"> • Motion • Sound • Chemical • Radial • Electrical • Thermal • Nuclear • Tension • Gravitational • Mechanical
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thermal energy transfer.

3.2.6-8.N

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.

3.2.6-8.P

Develop a model to describe that when the arrangement of objects interacting at a distance change, different amounts of potential energy are stored in the system.

Which branch(es) of science apply:

- Design and conduct an experiment to determine the energy form from potential to kinetic.
- Compare different forms and how they are similar and different.

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Stage 2 – Evidence

Evaluative Criteria	<i>Assessment Evidence</i>	
	PERFORMANCE TASK(S):	
Lab Report Rubric Performance Rubric	Projects, Labs, and Investigations: <ul style="list-style-type: none"> • Project: Model of an Atom (Old 7th Grade) <ul style="list-style-type: none"> ○ Use household items to build a model of atom. ○ Label and describe all parts. • Project: Model and/or demonstration of a form of energy (Old 7th Grade) <ul style="list-style-type: none"> ○ Students are assigned a type of energy to demonstrate and explain in class. ○ Assignments are made based on formative assessment data. ○ Energy demonstration and presentation will be set up as stations. ○ While viewing stations, students identify the form of energy and explain how it is or is not a good representation. • Lab: PhET Simulation – Molecules and Thermal Energy <ul style="list-style-type: none"> ○ Apply and remove heat to different substances and observe the interaction of molecules. ○ Complete the lab sheet based on collected data and observation. • Lab: Building Molecules with Lego (Old 7th Grade) <ul style="list-style-type: none"> ○ Students are given 3 different molecules and tasked with using Legos to build them. ○ Once built, record on lab sheet. ○ Use the molecules to create a compound. • Lab: PhET Simulation – Building Molecules <ul style="list-style-type: none"> ○ Create 6 different types of molecules based on bonds. ○ Complete the assigned lab sheet. • Project: Photosynthesis & Cellular Respiration <ul style="list-style-type: none"> ○ Students use the equations for Photosynthesis and Cellular Respiration to demonstrate the Law of Conservation of Mass. ○ May be demonstrated as a poster or PowerPoint. ○ The total number of atoms and total number of elements will be clearly identified on both sides of the equations. • Lab: Lab: Exo/Endothermic - Elephant Toothpaste & Instant Ice Packs <ul style="list-style-type: none"> ○ Students conduct two different labs measuring the temperature change of each. ○ Data should be collected at one-minute intervals. ○ Analyze data and determine what type of reaction took place. ○ Hypothesize where the heat went to when cooling off. 	Differentiation Considerations: Different modes of presentation <ul style="list-style-type: none"> • PowerPoint • poster • Student choice Use of notes and resources Chunked Assignment Adapted Assessment Chunked Assignment Checklists

	<ul style="list-style-type: none"> • Lab: PE/KE PhET Simulation – Energy Skate Park <ul style="list-style-type: none"> ○ Students observe the changes from PE to KE while building a virtual skate park. ○ Determine the relationship based on the graph. ○ Hypothesize and discuss the relationship to thermal energy. ○ Complete lab sheet. • Project: PE/KE Roller Coasters (Old 7th Grade) <ul style="list-style-type: none"> ○ Build a roller coaster for a marble using pipe insulation. ○ Determine the PE for the marble. Determine the KE for the marble. ○ Discuss and determine if the relationship was 1:1. ○ Hypothesize where the missing energy went. • Project: Mouse Trap Cars – Energy conversion to kinetic, thermal, sound <ul style="list-style-type: none"> ○ Inquiry based project. Students will be given materials and told to make a car that can travel 1 meter. ○ Identify the types of energy conversions taking place. <p>Alternative Projects/Labs/Presentations:</p>	
<p>What criteria will be used in each assessment to evaluate attainment of the desired results?</p> <p>Graded tests and quizzes.</p> <p>Pre-Assessment via online game (quizizz, kahoot! Etc).</p> <p>Mastery Path Progress</p> <p>Rubrics related to each.</p>	<p style="text-align: center;">OTHER EVIDENCE:</p> <p>Teacher Summative:</p> <ul style="list-style-type: none"> • Matter, Atoms, Molecules • Phases/States of Matter, Types of Energy, Conservation of Energy • Chemical Energy, Chemical Reactions, Conservation of Mass (Balancing Equation) <p>Common Summative:</p> <ul style="list-style-type: none"> • Unit Test <p>Participation in hands-on labs</p> <ol style="list-style-type: none"> a. Checklists of collaborative behaviors in labs and activities <p>Science Notebook/Portfolio</p> <ol style="list-style-type: none"> a. Concept maps b. Vocabulary/Glossary entries c. Guided Research d. Lab Reports described above e. Daily Journal Entries <p>Checklists of collaborative behaviors in class discussions</p>	<p>Differentiation Considerations:</p> <p>Adapted/Modified Quizzes</p> <p>Homogeneously grouped labs to allow for teacher support</p> <p>Pictures to support vocabulary</p> <p>Flexible grouping</p> <p>Peer Mentors</p> <p>Guided Notes/Printed PowerPoint Slides</p> <p>Pictures and videos to support vocabulary</p> <p>Sentence Starters</p> <p>Product modification in place of writing:</p> <ul style="list-style-type: none"> • Drawing • Verbal explanation

	Self-assessments for Performance Tasks	
	Class Participation	