Physics Unit 3- Energy

Unit Overview: The students will learn about the relationship between energy and work. Students will be able to calculate the power produced from an amount of work or energy. The students will learn the interrelatedness of kinetic, potential, and internal energy. The students will use the conservation of energy to determine an object's height, velocity, or mass. Students will be able to calculate the energy or spring constant of a spring from its potential energy. The student will learn some real-world examples of energy conversions.

Essential Questions:

- How is work defined and calculated?
- What concept relates energy, time and work?
- What is the relationship between work and kinetic energy?
- What is conservation of energy?
- What are some examples of real-world energy conversions?
- How do springs store energy?
- How is energy conserved in a pendulum?
- What factors affect the period of a pendulum?

MST Standard 4 - Science

Key Idea 4

Students can observe and describe transmission of various forms of energy

Time Frame	Skills, Practices or Expectations	Specific Standards / Performance Indicators	Resources	Content Vocabulary	Measurement of Student Learning
2 weeks **12.05.22 - 12.16.22** **2 weeks** **12.19.22 - 1.06.23**	**<u>Work Energy Theorem</u>** ● Determine when work is done and calculate work done when a force is applied. ● Define and calculate power by relating energy, time and work. ● Understand and use the work energy theorem. **<u>Mechanical Energy</u>** ● Define and differentiate between kinetic and potential energies. ● Predict velocities, heights, and spring compressions based on energy conservation. ● Describe and explain the exchange among potential energy, kinetic energy, and internal energy for simple mechanical systems. ● Determine the energy stored in a spring. ● Observe and explain energy conversions in real-world situations.	4.1a,b,c,d,e,f,g,h,i	Castle Learning Interactive Simulations: http://phet.colorado.edu Holt Textbook Chapters 5 and 11	work power work energy theorem kinetic energy potential energy gravitational potential energy elastic potential energy spring constant mechanical energy internal energy elongation compression **Higher Level Questions** **From June 2014 Exam** 55–56 A 3.00-newton force causes a spring to stretch 60.0 centimeters. Calculate the spring constant of this spring. [Show all work, including the equation and substitution with units.] [2] 58–59 Calculate the average power required to lift a 490-newton object a vertical distance of 2.0 meters' in 10. seconds. [Show all work, including the equation and substitution with units.]	Ticket out the door Formative assessment using Castle Learning Unit test Weekly quizzes Homework using Castle Learning

Resources

http://ngss.nsta.org/Classroom-Resources.aspx

http://newyorkscienceteacher.com/sci/

English Language Learners (ELL) Enhancements To access hyperlinked material, you must be logged into your BPS Google Drive	**Listening** • **Cross- Linguistic Practices:** Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates.) • **Build background knowledge** • **Activating Prior Knowledge** Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content • **Activating Prior Knowledge** • **Visuals** - GIFs, pictures- will assist students in understanding what they are listening to. Use **visual thinking strategies** to set the lens for learning. • Video to review or introduce a topic – use **closed captioning** to help students see the words and pronunciations while they listen to the content. • **Word stretching / Vowel stretching** when instructing allows student to listen closely to the pronunciation of the word • **Performance Level Descriptors** this document provides teachers with a description of what output	**Speaking** • **Sentence Frames** - to begin a sentence - such as *Evolution is…* or *I think that evolution is…* • **Academic Conversation Starters:** Have a visual of a list of academic sentence starters that students can refer to in a discussion. Examples include- I expect ____ to happen. My data shows that… This helps students have a more science focused dialogue. • **Choral Reading** - To build fluency, self-confidence and motivation with reading/speaking • Create **movement** to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning • **Performance Level Descriptors** This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of speaking. Scroll for grades 9-12	**Reading** • **Supplementary Text** to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension. • **Visual Aids** - Pictures or models to support vocabulary words and concepts • Video to review or introduce a topic - use **closed captioning** to help students read along while they listen to the content • **4 Square / Frayer models** to help students gain a deeper understanding of vocabulary. • **Highlighting** important text to assist students in answering questions after the reading. • **Chunking**-Break reading of text into chunks or paragraphs • **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of reading. Scroll for grades 9-12. • **Vocabulary Morphology**- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student's vocabulary.	**Writing** • **Sentence Frames** - to begin a sentence- such as *Biodiversity is…* or *An example of competition is….* • **Cloze passages** with word banks • **Word banks** • **Graphic Organizers** to help break down the writing process and organize thoughts • **Standards-based sentence stems** • **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing. Scroll for grades 9-12.	**Instructional Accommodations (depending on the student's needs)** • **Extended time** for tests in class, projects and assignments • **Directions read.** Broken down as necessary • **Model** how to complete the activity in the lesson • **Oral simplification** of directions or questions • **Translated version** of test when available. Student may have both version English and native language version • Use of **approved bilingual glossaries** from NYS in each subject

	they can expect from students based on earned NYSESLAT levels in the modality of listening Scroll for grades 9-12.				
Special Education Modifications **Special Education students must have accommodations as per Individual Educational Plan (IEP)**	**<u>Instructional</u>** ● **Pre-teach** vocabulary ● Use **picture vocabulary** ● Scaffold **Depth of Knowledge** questions ● Provide copy of notes/**notes in "cloze"** form ● Use of **Think, Pair, and Share** strategy to help process information ● **Scaffold** written assignments with the use of **graphic organizers** ● Allow for **multiple ways to respond** (verbal, written, response board) ● Provide **model of performance task** ● **Modify informational text** to fit the needs of the students ● Provide a digital or paper i**nteractive notebook** ● Present complex **tasks in multiple ways** ● Provide **mnemonic strategies** for Physics concepts	**<u>Technology:</u>** ● **Audio** reading of text ● **Text to type** functions ● **Videos** to clarify/visualize Physics concepts ● **Record class lecture/discussions** and make accessible to student ● **Nearpod**- interactive presentations of notes ● **Playposit** - show a video clip about the topic and add your own questions for them to answer as they watch ● Allow students to type answers in chat on **Teams** **<u>Other:</u>** ● Arrange seating for maximum engagement and minimum distraction ● Accessible lab space (counter level)		**<u>In Class Assessments</u>** ● Provide **review packet or review sheet** of concepts covered on the test ● Practice similar questions prior to the test ● Provide **multiple options** for projects ● Give a **timeline** of when things are due and remind them of the process often. ● **Use of timer** in class ● Break all complex tasks into chunks	
BPS Science K-12 Schoology Group Resources Grades 9-12 Resources Physics Physics Curriculum Materials	**<u>SUTW Strategies</u>** ● Informal Outline ● Color-Coding – Informative/Explanatory Text ● Two-column notes ● I-V-F Topic Sentence progressing to Four Step Summary Paragraph ● CUPS – Capitalization, Usage, Punctuation, Spelling ● Transitions				