

Kinetic and Gravitational Potential Energy 5E Lesson

The 5E model is a scientifically proven method to improve student engagement and learning in your classroom

- ✓ Engagement
- ✓ Exploration
- ✓ Explanation
- ✓ Elaborate
- ✓ Evaluate



Complete Teacher Instructions

Kinetic and Gravitational Potential Energy 5E Lesson

Grades 9-11	Kinetic and Gravitational Potential Energy	Ongoing Lesson
Lesson Objective: Students will learn about: - Kinetic energy - Gravitational potential energy - Mechanical energy - Work-Energy theorem - The law of conservation of energy - Other forms of energy - Energy efficiency - Real life applications		
Possible Student Misconceptions: - Energy is lost once it's used - Energy can be created and/or destroyed		
Materials: 1 device (smartphone, Chromebook, laptop, tablet, or computer) per 3 - A means of projecting a PowerPoint presentation - Internet access - The materials needed for the kinetic catapult challenge		
Teacher Notes: - All videos can be accessed directly from the PowerPoint. To retrieve them, click on the video icon while in slideshow mode and it will automatically open for you. If for any reason, right-click on the image and click Edit Hyperlink or something similar. - I've created a video walkthrough if needed. It can be accessed here - https://youtu.be/oCIKIP9SaDQ - I don't believe in long lessons. If you feel your students are losing their focus, stop the PowerPoint and give them a 5-minute break. If you'd like to see more of my video collection here - http://www.teachwithfergy.com/ are tons of brain-break videos to choose from all grouped by category.		

Kinetic and Gravitational Potential Energy – Engagement Phase

Engagement Phase Your students will be competing in the <i>Engagement - Kinetic Catapult Challenge</i> . This challenge is meant to get your students engaged in the process of physics as well as perform a little research in order to answer some introductory questions on kinetic energy.	Duration: 10 min Teacher Role: Engage and understand
Teacher Notes: - If this is something you don't have time for or you'd like something extra, you can have your students watch the following video. While they're watching, have them write down the equation for gravitational potential and kinetic energy. The video can be found here - http://www.teachwithfergy.com/gravitational-potential-and-kinetic-energy/ - If the video doesn't work for one reason or another, go to www.youtube.com and type in "Gravitational Potential and Kinetic Energy Doodle Science"	☐ C ☐ e ☐ A ☐ U ☐ o
Exploration Phase Exploration – Lab Station Activity In groups of 2-3, have your students complete <i>Exploration – Lab Station Activity</i>. Once they're done, they will submit their passport to you.	Duration: 10 min Teacher Role: Learn and understand
Teacher Notes: The complete instructions for my Lab Station activity can be found in the <i>START HERE – Instructions</i> file.	☐ S ☐ e ☐ c ☐ o ☐ S ☐ o ☐ r ☐ c
Explanation Phase PowerPoint Lessons - There are two lessons found in the folder – <i>Explanation – Lessons</i> - These lessons are designed to be completed over two – three days - There are multiple embedded videos and plenty of opportunity to engage, interact and check for your students' understanding throughout the lessons - The lessons cover the following topics: - Kinetic energy - Gravitational potential energy - Mechanical energy - Work-Energy theorem - The law of conservation of energy	Duration: 10 min Teacher Role: Conceptualize and present

- Other forms of energy - Energy efficiency - Real life applications	Goals - Students develop understanding of the content - Observations and experiences are discussed and critiqued - Students develop vocabulary - Students are able to connect the content presented to previous experiences
Teacher Notes: - All videos can be accessed directly from the PowerPoints. To retrieve them, click on the video icon while in slideshow mode and it will automatically open for you. If they don't open, right-click the image and select Edit Hyperlink or something similar. - I've created a video walkthrough if needed. It can be accessed here - https://youtu.be/oCIKIP9SaDQ - I have also enclosed a .PDF version of both the teacher and student versions	
Elaborate Phase Reading - Your students will complete – <i>Elaborate – Roller Coasters</i> - This activity will require your students to move beyond what was covered directly in the lesson and allow them to develop a deeper understanding of the topic and it's applicability	Duration: 1 hour Teacher Role – Facilitate learning and keep students focused
Teacher Notes: Students will work individually or in groups of two	Goal Students use their newly obtained knowledge to propose solutions and extend their learning to new situations
Evaluate Phase Have your students complete - <i>Evaluate – Quiz</i> All quiz questions will come from the lesson	Duration: 20 min. Teacher Role – Distribute and collect evaluation
Teacher Notes: - It's sometimes best to have the students peer evaluate - Placing students in small groups and having them exchange papers to mark will accomplish two things - Provide immediate feedback on the quiz they just completed - Significantly reduce your marking time - Peer evaluation is not needed, only suggested when appropriate	Goal Students are given the opportunity to demonstrate their understanding and evaluate their own progress

Each phase is clearly described

Two Complete Lessons

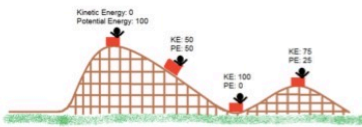
Check Your Understanding

A diver, of mass 57.8 kg, climbs up a diving board ladder and then walks to the edge of the board. He then steps off the board and falls vertically from rest to the water 3.00 m below. Determine the diver's gravitational potential energy at the edge of the diving board, relative to the water.

Answer: $1.70 \times 10^3 \text{ J}$

Energy Is Conserved

- If you raise an object to the top of a hill, you are giving it potential energy (E_p)
- _____
- As kinetic energy increases, speed increases. This is why the object will be going faster at the bottom of the hill than at the top



Energy Efficiency

- Energy efficiency can be calculated as follows:

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{energy input}} \times 100\%$$

- Keep in mind that Work Done = Energy Input
- Different energy sources used to produce electricity (fossil fuels, wind, etc.) have different efficiencies based on the above equation. Rank the following from least to most efficient

Solar, Nuclear, Wind, Fossil Fuels, Hydroelectric



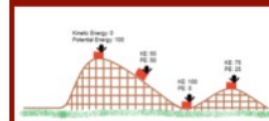
← Make sure your students are on track

Student copies with blanks

Videos embedded right into your slideshow

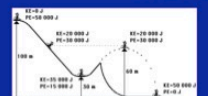
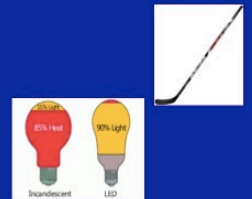
Kinetic & Gravitational Potential Energy

- Mechanical Energy
- Kinetic Energy
- Work-Energy Theorem
- Gravitational Potential Energy
- Energy is Conserved
- Energy Conservation Application
- Summary



The Law of Conservation of Energy and Efficiency

- The Law of Conservation of Energy
- Total Mechanical Energy
- Other Forms of Energy
- Energy Efficiency
- Sports Application



Interactive and Engaging Activities

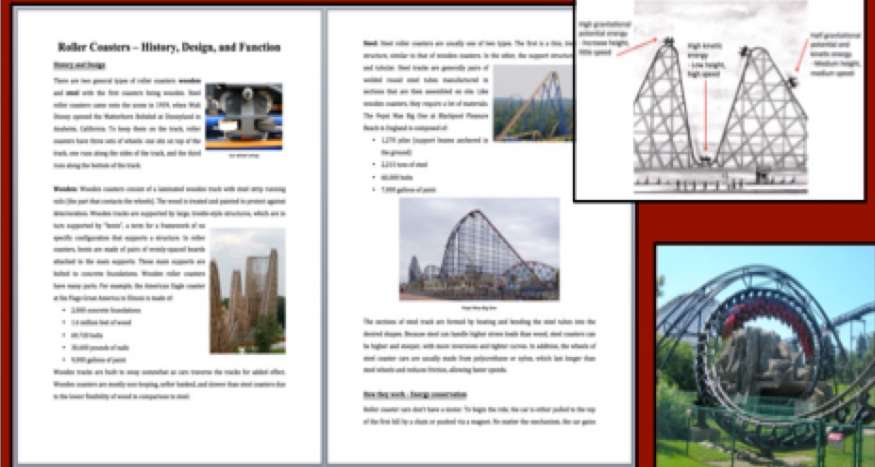
Kinetic Energy & Gravitational Potential Energy Lab Station Activity



7 Lab Station Activities to get your kids out of their seats and engaged in their learning

Roller Coasters – History, Design, and Function

Scientific Reading Comprehension Article and Extension Activity



Improve your students **Literacy** and **Analysis Skills**, use as an **Emergency Substitute Plan** or create **Applicability** in your classroom

Get away from tired practices and unengaged students



Provide a Scientifically-Proven means of instruction



Incorporate Technology and Increase Collaboration

