

Potential & Kinetic Energy Web Quest!

Introduction: You are an energy engineer employed by Energy Quest Incorporated. You will encounter several links that are provided for research and online activities. These links will give more information and opportunities to test your knowledge regarding the different forms of energy and energy conversions.

Stop #1: Energy Go to this website http://www.eia.gov/kids/energy.cfm?page=about_forms_of_energy-basics

Read the following information provided from the above link. Answer the following questions.

1. *Energy forms are either _____ or _____. _____ energy comes in forms that are stored including — chemical, gravitational, mechanical, and nuclear. _____ energy forms are doing work — like electrical, heat, light, motion, and sound.*

What is energy?

2. _____ makes _____ possible. It _____ cars along the road and boats through the water. It bakes a cake in the oven, keeps ice frozen in the freezer, and _____ our homes.
3. Scientists define energy _____. Modern civilization is possible because we have learned how to _____ and then use it to do work for us.
4. What two forms of energy categorize the seven forms of energy? _____

5. Define kinetic energy: _____

6. Define potential energy: _____

7. Use the chart to organize the seven types of energy as potential or kinetic. **Give an example of each!**

Potential energy	Kinetic energy

Continued.....

Potential energy

Kinetic energy

Stop #2: Roller Coaster

Roller coasters, like other amusement park rides, are designed using physics laws.

View the following clip about roller coasters and the laws of physics.

<https://utah.pbslearningmedia.org/resource/hew06.sci.phys.maf.rollercoaster/energy-in-a-roller-coaster-ride/#.WYIj3anHDd>

1. Click on view; click on play and write observations of the exchange of energy between potential to kinetic energy.
2. Click on “step” to watch the roller coaster in slow motion. You will need to click your mouse to see the roller coaster move from step to step. Observe whether the roller coaster has more kinetic or more potential energy at each step and record your data.
Step 1:
Step 2:
Step 3:
Step 4:
Step 5:
Step 6:
3. Draw an outline of the track and label where you saw the highest kinetic (HiK), lowest kinetic (LoK), highest potential (HiP) and lowest potential (LoP).

Stop #3: Take the Potential vs. Kinetic Quiz

Go to <http://www.quia.com/cz/8072.html> .

1. Click on “Play this game” to begin.
2. Answer the questions
3. Click “ check answers”. Correct any incorrect answers
4. Click “ Next exercise” and answer the following questions
5. Click “ check answers”. Correct any incorrect answers
6. Click” next exercise” and answer the following questions
7. Once you have collected 3 coins, write down your score, then you may exit.

Score: _____

Stop #4: Skate Park

Go to the Phet website & open the “Energy Skate Park Basics” simulation:

<http://phet.colorado.edu/en/simulation/energy-skate-park-basics>

Vocab to remember:

Kinetic Energy (KE) is the energy of motion. Any object that is moving has kinetic energy.

Potential Energy (PE) is the energy an object has due to its position or condition. In this simulation, we will be focusing on a specific type of potential energy: gravitational potential energy (GPE).

Mechanical Energy is the total energy an object has: the sum of kinetic energy and potential energy.

The Law of Conservation of Energy states that energy cannot be created or destroyed, but can be transferred from one form to another. This means that if an object has a certain amount of energy, it will keep that energy unless the energy is transferred to another object.

1. Open the simulation and start with the “Intro” tab at the bottom bar. Check the “Grid” and “Bar Graph” boxes in the top right corner. Keep them open at all times.
2. Explore the simulation, trying the various track designs on the right bar. Observe how the skater's potential and kinetic energy change as he moves. Record your initial observations (at least 3) below:
 - a.) When does the skater have the highest potential energy?
 - b.) When does the skater have the lowest potential energy?
 - c.) When does the skater have the highest kinetic energy?
 - d.) When does the skater have the lowest kinetic energy?
3. Switch to the U-shaped track. Drag the skater to the top of one side, then let him go. Observe the energy bar graph as he goes back and forth. You may also explore the W-shaped track.
 - a.) If mass increases, what happens to kinetic energy?
 - b.) If mass increases, what happens to potential energy?
 - c.) If mass increases, what happens to mechanical (total) energy?

5. Complete the table based on what you observed (circle one answer for each KE and PE box):

Position (height) of skater	Kinetic Energy	Potential Energy
Top	high medium low	high medium low
Middle	high medium low	high medium low
Bottom	high medium low	high medium low

6. Circle the correct answer:

a.) As the skater goes up the hill, his kinetic energy: increases / decreases / stays constant

b.) As he goes up the hill, his potential energy: increases / decreases / stays constant

c.) As he goes up the hill, his mechanical energy: increases / decreases / stays constant

d.) As he goes down the hill, his kinetic energy: increases / decreases / stays constant

e.) As he goes down the hill, his potential energy: increases / decreases / stays constant

f.) As he goes down the hill, his mechanical energy: increases / decreases / stays constant

7. What is the relationship between kinetic and potential energy?

8. What evidence from the simulation supports your claim from question 7?

9. Check the "speed" box in the upper right corner. What is the relationship between speed and KE?

10. What happens to the total (mechanical) energy of the skater as time passes?

11. Switch to the "Friction" tab at the bottom of the page. Turn friction on using the button on the right side of the page. What is different about the skater's motion with friction, compared to without it?

12. Compare how a small amount of friction affects the motion of the skater to how a large amount of friction affects his motion.

13. Switch to the “track playground” tab at the bottom of the page. Make sure that friction is off on the right side of the page.

a.) Design your own track (something unique, not just a U or W), and draw it below:

b.) Label the points on your track where kinetic energy was high with the letters “HiK”. c.) Label the points on your track where kinetic energy was low with the letters “LoK”. d.) Label the points on your track where potential energy was high with the letters “HiP”. e.) Label the points on your track where potential energy was low with the letters “LoP”.

f.) How could you change your track to maximize the kinetic energy of the skater? Explain reason for your choice.

g.) How could you change your track so that the skater's kinetic energy stayed low? Explain reason for your choice.

Post-Lab Questions:

1. Describe a situation in a basketball game when a player has a lot of kinetic energy. Explain.
2. Describe a situation in a basketball game when a player has a lot of potential energy. Explain.
3. Based on what you observed in the simulation, what factors affect kinetic energy?
4. Based on what you observed in the simulation, what factors affect potential energy?
5. Based on what you read in the pre-lab reading, why does the mechanical (total) energy of the skater not change over time (unless friction is turned on)?
6. Re-read the law of conservation of energy at the beginning of this section of the webquest. What do you think happens to the skater's energy when friction is involved? (Look back to questions 11 and 12.)
7. An archer stands on the ground and fires an arrow at a target. A second archer stands at the top of a building and holds an arrow in his hand. Which arrow has more potential energy? Explain.
8. In the same scenario described in question 7, which arrow has more kinetic energy? Explain.