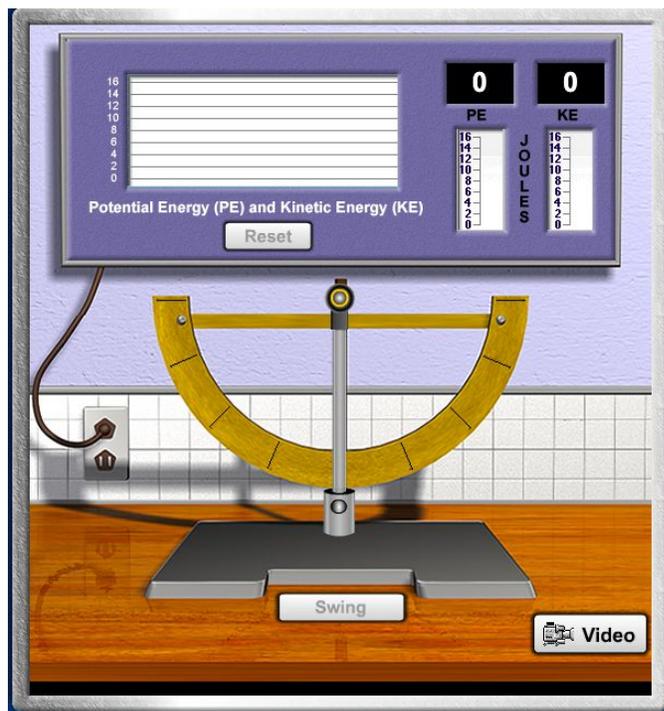


Potential Energy: How Are Potential Energy and Kinetic Energy Related?

Introduction

The law of conservation of energy states that within a given system the total amount of energy always stays the same—it is neither created nor destroyed; instead, energy is transformed from one form to another. When energy is stored in one form or another, it is called potential energy. Potential energy can be stored in the chemical bonds between atoms in a molecule and in the nuclei of atoms. Energy can also be stored based on the position of an object. Indeed, potential energy can be referred to as energy of position. When potential energy is transformed into motion, it becomes kinetic energy. Kinetic energy can be detected when objects move. Kinetic energy is known as energy of motion.

For example, think about climbing a hill. When you are at the bottom of a hill, you have low potential energy based on your position. To increase your potential energy, you climb to the top of the hill. As you are climbing, you are moving, so you are using kinetic energy; you are transforming kinetic energy into increased potential energy; and you are changing position. Since you have climbed higher, you have greater potential energy. In this investigation you will explore the relationship between potential energy and kinetic energy by swinging a pendulum and observing graphs as they illustrate their energy (see figure to the right).



Your Task

Use what you know about the conservation of energy and models to design and carry out an investigation that will allow you to develop a rule that explains how potential and kinetic energy are related.

The guiding question of this investigation is: **How are potential and kinetic energy related?**

Materials

You can use the following link for the *Virtual Pendulum Lab* during your investigation:
http://glencoe.com/sites/common_assets/science/virtual_labs/PS05/PS05.html

Getting Started

To answer the guiding question, you will need to design and conduct an investigation that explores the relationship between the potential energy and the kinetic energy of a virtual pendulum. To accomplish this task, you must determine what type of data you need to collect, how you will collect it, and how you will analyze it.

To determine *what type of data you need to collect*, think about the following questions:

- How can you manipulate the potential energy of the pendulum?
- How will you measure the kinetic and potential energy of the pendulum?
- What type of measurements or observations will you need to record during your investigation?

To determine *how you will collect your data*, think about the following questions:

- How often will you collect data and when will you do it?
- How will you make sure that your data are of high quality (i.e., how will you reduce error)?
- How will you keep track of the data you collect and how will you organize it?

To determine *how you will analyze your data*, think about the following questions:

- What type of calculations will you need to make?
- What type of graph could you create to help make sense of your data?

Report

Once you have completed your research, you will need to prepare an investigation report that consists of four sections (be sure to have section headings):

1. Introduction: Give some background information on the topic. Explain what question were you trying to answer and include a hypothesis. (Background info, research question and hypothesis)
2. Procedure: What did you do during your investigation and why did you conduct your investigation in this way? (How you collected and analyzed data)
3. Data: Include a data table and/or graph to show your results. Be sure to include a title for your table or graph with labels for the variables.
4. Conclusion: What is your argument? (Claim - Evidence - Reasoning)

Your report should answer these questions in two pages or less. The report must be typed, and any diagrams, figures, or tables should be embedded into the document. Type your report on Google Docs (12 point font, double-spaced) and share it with your teacher. Your report will be graded based on the rubric in the class syllabus.