Energy Explorations Outline

Station 8

# Kinetic/Potential Energy Station

**Materials:**

Various Toys

Table Signs (Elastic Potential Energy, Gravitational Potential Energy, Both Elastic & Gravitational)

**I. Introductions**

**II. Review of important ideas**

**A. Law of Conservation of Energy**

* Energy cannot be created or destroyed, it only changes form
* The total amount of energy in a system remains constant
* Energy can be transferred between objects
* All energy is in one of two categories at all times: Kinetic or Potential
* Energy can be transferred from potential to kinetic or kinetic to potential

**B. Kinetic Energy**

* Energy in motion. It is the motion of waves, electrons, atoms, molecules, substances and objects.
* Energy being transferred

**C. Potential Energy**

* Stored energy and the energy of position, or gravitational energy.
* Energy not being transferred
* Energy that is ready

**D. Mechanical Energy**

* The kinetic energy of a moving object is usually referred to as MECHANICAL ENERGY.
* Mechanical energy can be stored in two ways:
* **Gravitational Potential Energy (GPE)** – Mechanical energy stored due to location or position above a certain “ground” level (Some examples of GPE: car parked on a hill, water behind a dam, boulder on the edge of a cliff, zip line)
* **Elastic Potential Energy (EPE)** – Mechanical energy stored by a mechanism or an object that is stretched, bent, or deformed (Some examples of EPE: stretched rubber band, catapult, stretched spring, bow and arrow)

## III. Demos

1. **GPE & EPE Leader Demos**

Before passing out all the toys, leaders review examples of GPE and EPE. Students will determine if the toy is GPE, EPE, or both. Have students tell why each toy is an example of GPE or EPE and the point that potential energy is transferred to kinetic energy.

* Toy car at the top of a ramp-the car sitting at the top of the ramp is GPE. When it is let go, it becomes KE.
* Rubber band (stretched)-the stretched rubber band is EPE. When it is let go, it becomes KE.
* Popper (*demonstrate a couple of times, then set it aside*)-The popper has **BOTH** EPE and GPE. When the popper is turned inside out on the table, it is EPE. When it “pops” it returns to its half ball configuration and pops off the table as KE. At the height of its “pop” it now has GPE and drops back to the table.

1. **Toys -** All of these toys store and release mechanical energy. One at a time, have students demonstrate the toys. For each toy ask the following questions and move the toy to the side of the table that has the EPE sign, GPE sign or both:

* Does the toy store its potential mechanical energy as Gravitational (GPE) or Elastic (EPE)?
* What must be done to the toy to store the energy?
* What is the motion of the toy when the potential energy is transferred to kinetic energy?

**Toys:**

1. **Pull Back Car (or Mouse)** – a mechanism is wound as the car is pulled back (EPE), kinetic energy is wheels turn and car moves forward (KE)
2. **Jacob’s Ladder** – the bottom of the top piece is turned so it is on top (GPE), the remaining wooden pieces flip and clack
3. **Wind-Up Sneakers & Chatter Teeth** – a mechanism or coil is wound (EPE), as the mechanism unwinds gears transfer energy and the sneakers move (KE)
4. **Water Timer** – the water timer is turned so that the water is on top (GPE), the water drops fall and turn the wheel (KE) (The colored water is more dense than the clear oil.)
5. **Marble Run** – the marble is lifted to the top of the run (GPE), the marble rolls downward through the different parts of the run (KE)
6. **Foam Ice Cream Cone** – push foam ball on end to compress spring (EPE), release and spring shoots foam ball (KE); when the foam ball is at the height of its flight, it has GPE
7. **Bouncy Ball** – dropping the ball from a height (GPE), when the ball hits the ground it temporarily compresses (EPE) and returns to its original shape to bounce up off the ground storing GPE again.

Is there a way any of the other toys could be both GPE and EPE?

* The pull-back car/mouse (EPE) could be place at the top of the ramp.

**IV. Closing**

A. Fill in booklet or worksheet

B. Farewells

C. Straighten up, re-set

**Answer to questions in student booklet:**

Energy that is stored or the energy of position is  **POTENTIAL** energy.

Energy in motion is  **KINETIC** energy.