Motion 6 - Energy

There are many types of energy; mechanical, electric, magnetic, gravitational, chemical, ionization, nuclear, chromodynamic, elastic, mechanical waves, sound waves, radiant, rest, and thermal energy, to give the list on `en.wikipedia.org`.

The most wondrous thing in all of science is that if you add all of those together, then for any given system, the total energy is conserved!

Kinetic and Potential Energy

The two most common types of energy are kinetic energy and potential energy.

Kinetic energy is the energy objects have because of their movement. ALL moving things have kinetic energy. The formula for kinetic energy (KE) is:

$$KE = \frac{1}{2}mv^2$$

where m is mass, and v is velocity.

Potential energy is the energy objects have because of their height above the earth. The higher something is the farther it has to fall, hence it has more energy. The forumula for potential energy (PE) is:

$$PE = mgh$$

where, m is mass, g is the acceleration due to gravity (9.8 m/s^2), and h is the height.

Conservation of Energy

Energy is the ability to do work.

Conservation of energy means that the ability, or amount, of work a system can do, doesn't change, EVEN if how that ability is stored does change. This means that:

$$KE + PE = \text{A constant number}$$

Assuming no energy enters or leaves the system.

Activity - Construct a roller coaster

Roller coasters are great examples of conservation of energy because the lift you up to a certain height, then let you go. Once they let you go everything that happens is simply exchanging potential energy for kinetic energy.

When the car is farther from the ground, it is moving slower! When the car is closer to the ground, the car is moving faster!

You will record one of the run throughs of your roller coaster, and then calculate the height and speed for three different points.

Step 1 - Build a roller coaster

- Ask for 2 sections of foam tube.
- Ask for a piece of tape.
- Ask for a couple pieces of string.
- Ask for the steel, wood, and glass marble.
- Ask for a cup
- Build a roller coaster
    - You can use anything you want as a prop to help support your roller coaster.
    - You should have AT LEAST 2 fun features, loop-de-loop, jump, corkscrew, etc.
- Record a run through of your roller coaster with each of the three marbles, and a meter stick in the background somewhere.

Step 2 - Calculate the total energy in your lab notbook

Using the video you took, fill out the following table for ONE of your marble runs:

	Height (y)	$PE = mgh$	Velocity	$KE = \frac{1}{2}mv^2$	$PE + KE$
Beginning					
Middle					
End					

Note, $g = 9.8\,\mathrm{m/s^2}$