Renewable Energy

Lab 1 – Introduction To Energy 1
Kinetic Energy versus Potential Energy

Name_____
Name_____
Name_____

Introduction/Purpose:
In this exercise, we will compare gravitational potential energy and kinetic energy of a car on an approximately frictionless air track so that the energy loss caused by friction is negligible.

Apparatus: Air car, Air track, Scale, Sonic Ranger, Logger Pro Software

Theory:
In physics, we define work as the force on an object times the distance the object moves. So, energy is equivalent to the ability to produces pushes or pulls to move an object some distance. It comes in many forms. In this exercises, we will explore a couple of forms, gravitational potential energy and kinetic energy.

We will use the equation $p.e. = mgh$ to calculate the gravitational potential energy, where m is the mass of the car, g is the acceleration due to gravity near the surface of the earth (9.8 m/s^2), and h is the difference in height from some reference point. We will use $k.e. = 1/2mv^2$ to calculate the kinetic energy, where m is the mass of the car again and v is its speed. If we use SI units (meters for distance, kg for mass, and m/s for speed), the kinetic and potential energies will both come out in units of Joules.

Procedure:
1. Weigh the air car (and all attachments) and record the mass here: m= _____
2. Put the air car on the track, turn on the blower and sonic ranger and adjust so that you can easily measure the speed of the car along most or the entire track.
    a. The sonic ranger is controlled by Logger Pro, software which is on the desktop of the computer. It will automatically sense the sonic ranger and set up almost everything for you. You will need to adjust the length of the experiment from the default value of 5 seconds to 10 seconds or longer.
    b. The actual sonic ranger can be tilted and twisted so that it points at the flag on the air car during its trip along the track.
    c. The air track can be tilted from either end. It might be easiest to tilt the end closest to the sonic ranger up so that the car picks up speed as it goes away.
3. Start the air car with its center directly above the leg(s) that are tilted up, start the data collection, and let the car go, recording the position and speed as it goes down the track. You can choose to stop the car when it is directly over the other set of legs, in which case the height difference (*h* in *mgh)* is just the thickness of the riser block. If you choose to allow the car to go all the way to the end, you will need to use trig to

Renewable Energy

calculate the change in height (which is certainly possible). Record the height change here: h = _____ and the maximum speed here: v = _____

4. Calculate the max kinetic energy (1/2 mv^2). Record it here: KE = _____Joules
5. Calculate the initial potential energy (*mgh).* Record it here: PE = _____Joules
6. Compare the max KE and initial PE and discuss what is going on here.