Physics 100 (Stapleton)

Spring Car Project

Goal: Create a rubber band-powered car that reaches the highest possible maximum velocity.

Restrictions:

* Cars must be made “from scratch.” No pre-made parts are allowed. You can use raw materials and basic building blocks, but no complex part (e.g. a wheel) may be used for its intended purpose.
* The only power source is spring potential energy.
* The car must be propelled by at least one “drive wheel” rotating and pushing the road surface backward. This drive wheel must be part of the car.
* The car’s mass must remain constant throughout each velocity measurement trial. Parts may not fall off.
* The car must be supported by at least three wheels on at least two axles. One axle must have at least two wheels that support the car. Another axle must have at least one wheel that supports the car.
* You must be able to fully wind the car by rolling it backward.
* Maximum velocity will be measured perpendicular to the parallel lines between floor tiles (or some other parallel lines).
* Velocity will be measured using a fixed point on the car’s chassis.
* Velocity must be measured in some interior location within the school. The surface must be hard, smooth, and level.
* There is no restriction on size, but students will need to furnish their own materials for large cars.
* At least 80% of the car’s volume (not including rubber bands) must be made of cardboard.

Provided Materials:

* Glue
* Steel Axles
* Cardboard
* Rubber Bands
* Thin plywood (approximately 3/16” thickness)

Available\* Equipment:

* Hand tools: scissors, pliers, saws, clamps, etc.
* Scroll saw
* Drill
* Laser Cutter
* 3-D Printer and Rhino software

Process: Design and improve a car, and keep a journal of your process.

1. Design a car
   1. Test your car
   2. Record observations
      1. What did you change?
      2. What happened?
2. Change your design
   1. Test your car
   2. Record observations
      1. What did you change?
      2. What happened?
3. Repeat step 2 many times
4. Conduct a thorough analysis of your design. The analysis will include:
   1. Graphs of…
      1. output force vs distance rolled
      2. spring potential energy vs distance rolled
      3. velocity vs distance rolled rolled
      4. kinetic energy vs distance rolled
      5. total energy vs distance rolled
   2. Measurement of the force of rolling friction
   3. Measurement of Efficiency (determined by maximum velocity)
5. Write a reflective essay on the design process.