

# Experiment #1

79320

## Designing Vehicles

**Objectives:** Design and modify a vehicle for a specific purpose. Correctly identify and describe the difference between potential and kinetic energy in a racer/ramp system.



### Materials You Will Need:

- K'NEX parts and materials included in the STEM Explorations: Vehicles Set. **NOTE: DO NOT use rubber bands or motors for this experiment**
- 2 pieces of cardboard, plywood or hardboard that can be used as ramps
- books or boxes to use as ramp supports
- measuring tape
- masking tape
- paper or notebook

### PROCESS:

1. Build a 4-wheeled vehicle model of your own design. Alternatively, you could build the short rubber band racer (**without the rubber band**) model from the included step-by-step building instructions.
2. Exploring Potential and Kinetic Energy:
  - a. Set up two ramps, one with a height of 10 centimeters and one with a height of 60 centimeters
  - b. Release your built vehicle from the top of the shorter ramp. Why did it roll down the ramp?
  - c. Now release your built vehicle from the top of the taller ramp. Did you notice any difference in the performance of the vehicle? What do you think caused that difference? Can you describe the difference in terms of energy in your notebook?

- d. There are two terms we can use to describe the different types of energy in the racer/ramp system.
- i. Potential Energy is the energy of position and can also be referred to as stored or future energy. This is the type of energy that your vehicle has as you hold it at the top of each ramp.
  - ii. Kinetic Energy is the energy of motion. This is the type of energy that your vehicle has as it is in motion.
3. Now let's explore how different ramp heights make a difference to the distance the vehicle travels.
4. Choose one of the following questions to investigate. Briefly prepare a justification for your choice.
- a. Will a heavy vehicle roll further than a light vehicle?
  - b. Does the starting location on the ramp affect the distance a vehicle will travel?
  - c. Does the length of the vehicle affect how far the vehicle will travel?
  - d. Do wider wheels affect the distance a vehicle will travel?
5. As with previous investigations, be sure you design and describe a "fair test" by keeping everything the same, except the variable you are testing. You must design a data chart of some kind in your notebook, report the results, and make recommendations about what you found.
6. What question will you investigate?
7. What other things do you think you could do to make your vehicle go further? Make 3 different modifications to your vehicle (i.e. add more parts, change the wheels, etc.) and release it from the taller ramp after each modification. Compare the distances it traveled each time and describe what you think caused the differences, if any.

8. What variables will you hold constant?

9. What variable will you measure?