Title: Hot Wheels Unit Conversion and Collision Lab Name:

Number of Group Members: 3

Objective: Hot Wheels cars have low friction wheels. When traveling for short distances on level and smooth terrain, the hot wheels car will maintain a relatively constant velocity. In this lab activity you will collect data to determine speeds of a Hot Wheels car in various scenarios. You will also use velocity, position, and the kinematic equations to predict outcomes of fictitious colliding and racing vehicles.

Materials:

3 pieces of orange track, masking tape, Hot Wheels car, one meter stick, stop watch (ipad)

Procedures:

Start by connecting two orange track lengths and creating an inclined plane on which a Hot Wheels car can gain speed. Provide a smooth and level distance of 1 meter at the bottom of the ramp without any obstructions. One group member will release the car from the top of the ramp while the remaining members will clock the time the car to travel 1 meters upon reaching the bottom of the ramp. Start your stop watch when the car leaves the ramp and stop your watch when the car has completed a distance of 1 meters. Average the time recorded by your group member to determine the average speed of the hot wheels car then determine the speed of the car by dividing .5 meter by the average time. Repeat this process once more, but decrease the ramp height from where the car was released by half. Report speed in meters/second.

1. Car speed after maximum height release: _____ m/s

   Car speed after half the maximum height release: _____ m/s

2. Convert the speeds in m/s to miles per hour. 1 mile = 1609 meter
   Show your work!

   Car speed after maximum height release: _____ mph

   Car speed after half the maximum height release: _____ mph

3. Hot Wheels cars typically are built on a 1:64 scale. If the car was scaled to life size, what would be the speeds reached by the car in m/s and mph?

   Car speed after maximum height release: _____ m/s _____ mph

   Car speed after half the maximum height release: _____ m/s _____ mph

4. Assume two cars travel toward one another head on at the constant speeds you first calculated. The faster car begins at position 0 meters, the slower car begins at position 100 meters.
   a. At what time will the cars collide? Show your work.

   b. At what position will the cars collide? Show your work.

   c. Sketch a graph of the motion of both cars with position on the y-axis and time on the x-axis:

      *Use a separate piece of graph paper.

5. Suppose the slower car started 15 meters ahead of the faster car while both traveling in the same direction. Assume the cars are staggered so as not to crash and that the faster car begins at position 0 meters.

   a. At what time would the faster car overtake the slower car? Show your work.

   b. At what position would the faster car overtake the slower car? Show your work.

   c. Sketch a graph of the motion of both cars with position on the y-axis and time on the x-axis:

      *Use a separate piece of graph paper.