Hot Wheels Kinematics Lab 3 Name: _____

Materials:

Ramp, Hot Wheels Car, Stopwatch, Meter Stick, Photogate and Labquest

Hypothesis:

The slope of the velocity-time graph is acceleration.

Procedures:

A toy car is released from rest at the top of a ramp. Collect distance and time data using a meter stick and stopwatch. Use the kinematic equation $d = \frac{1}{2}at^2$ to find the acceleration of the car. Then with a photogate and labquest measure the instantaneous velocity of the car at specific distances. Measure the elapsed time required for the car to travel the specific distances. Create a velocity-time graph. Find the slope of the velocity-time graph and compare it to the acceleration you calculated previously. If the slope of the velocity-time graph is the same as the acceleration, the hypothesis is supported.

Instructions:

Begin by measuring the diagonal length of the ramp from where the car begins until where it reaches the bottom. You must be consistent throughout the experiment about where the car begins and ends.

Distance of the car's diagonal path: _____ meters

Measure and record the amount of time it takes the car to travel down the ramp. Complete three trials and write the times in the spaces below. Find the average of the three trails.

$t_1 =$ _____ $seconds$ $t_2 =$ _____ $seconds$ $t_3 =$ _____ $seconds$

$$t_{average} = \frac{t_1 + t_2 + t_3}{3} = \_\_\_\_\_ \quad seconds$$

Determine the acceleration of the hot wheels car in m/s/s by using the information you have gathered about distance and time. You will need the following kinematic equation: $\Delta x = v_i t + \frac{1}{2}\bar{a}t^2$

Show your work.

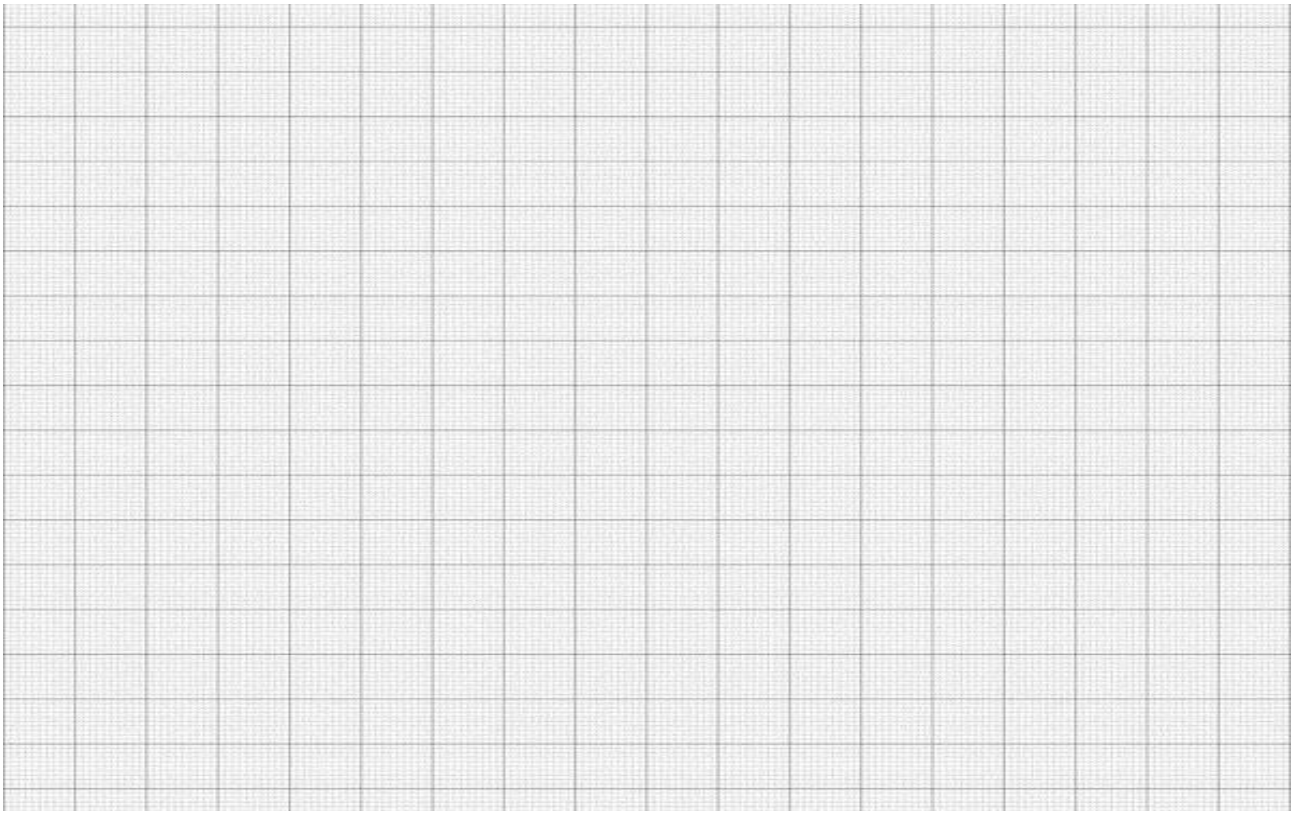
Hint: distance = Δx and $v_i = 0\frac{m}{s}$. $\bar{a} =$ _____ m/s/s

Data Collection:

Using the photogate and labquest, determine the instantaneous velocity of the car at each of the premeasured distances. You will also need to record the elapsed time for the car to travel each of the premeasured distances with a stopwatch. Fill in the table below with your collected data.

Distance (m)		Instantaneous Velocity (m/s)	Time (s)	
0.5				
1				
1.5				
2				

Create a velocity-time graph based on the data in your table. Velocity should be on the y-axis and time on the x-axis. Fit a line to the data using an online applet or calculator. Find the slope of the line.



Time (s)

Slope of the velocity-time graph: _____ m/s/s

Questions:

1. Which of the following variables should you control (i.e. not vary) when collecting data?

a. The incline angle of the ramp

b. The car's initial velocity when released

c. Use the same car and ramp for each trial

d. All of the above should have been controlled

2. Did you find support for the lab hypothesis? Explain. Restate the hypothesis in your answer.

3. What are potential sources of error you may have encountered when collecting data?