Name_____ Date_____ Period_____

Wheel Lab

The purpose of this lab is to examine the relationship between position and time in a wheel that rolls down an incline; and to determine the mathematical relationship between the velocity achieved and time traveled as the wheel rolls down an incline.

Procedure: Write a detailed procedure for you data collection process.

Table 1

Time (s)	Position (cm)

Apparatus: Draw a picture of your set-up.

Evaluation of Data:

1. Open Graphical Analysis and enter the time data on the x-axis and position data on the y-axis. Make sure you label your x- and y- axes. Once you have entered the data and labeled the axes, get your teacher's approval before printing the graph.

2. Describe the shape of your position-time graph. _____Can you use y=mx+b to describe the relationship between position and time of your wheel? _____Why or why not?

3. Looking at your position-time graph, compare the slope of the first time interval with the slope of the last time interval. Which slope is steeper?_____ Since the slope of a position-time graph tells you the velocity, what does this tell you about the velocity of thewheel as it goes down the incline?

4. The slope of each line segment on your position-time graph must be calculated in order to ultimately determine the relationship between velocity and time. Show your work below for the calculations of slope for the first three segments on your position-time graph. You may complete the remainder of the calculations in your calculator and record the velocities in the Table 2. Round your velocities to the nearest hundredth.

Segment 1 Segment 2 Segment 3

5. The velocities calculated represent the average velocity over the time interval. In order to ultimately determine the relationship between velocity and time, you will also need to calculate the average time for each interval. Show your work for the first three segments in the space below. You may complete the remainder of the calculations in your calculator and record the times in the Table 2. Round to the nearest hundredth.

Segment 1 Segment 2 Segment 3

Use Graphical Analysis to make a velocity-time graph of your data from Table 2. Put time on the x-axis and velocity on the y-axis. If your data are linear (most of the points fall along a straight line) remove the connecting line and add a line of best fit. Once your graphs have been approved, print a copy for each person in your group. Record the slope and y-intercept below (be sure to include units):

Slope_____

y-intercept_____

Table 2

Time (s)	Velocity (cm/s)

6. Develop a mathematical model for the relationship between velocity and time. Begin your model with y=mx+b and follow the steps shown on the "How to Make a Mathematical Model" hand-out.

7. Use the 5% Rule to determine if the y-intercept is significant to this relationship? Show your work below.

8. Rewrite your model as determined by the 5% rule.

9. Use your mathematical model to predict the velocity of your wheel after 20 seconds. Use your Mathematical Model and show your work.

10. How long would it take your wheel to achieve a speed of 10 cm/s? Use your Mathematical Model and show your work.

Conclusion

11. What does the slope of the velocity-time graph represent?

12. What might a negative slope represent?

13. What does the y-intercept of the line represent?

14. What is the general model that describes the relationship between velocity and time? What does each variable represent?