**Predicting Velocity Lab 2.1**

Questions: Can you predict the velocity of a car rolling down a ramp? What is the equation for calculating velocity?

Procedure: At each location on the ramp record the position of the photogate and the time it takes for the car to pass through it. The distance traveled will be the same for every position as it is the width of the car’s wing (5.0 cm). Calculate the velocity of the car using the car wing length (5.0 cm) as distance and the time measurement.

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| --- | --- | --- | --- |
| **Position of Photogate (cm)** | **Time from Photogate (sec)** | **Distance Traveled (cm)** | **Velocity of Car (cm/sec)** |
| 10 |  | 5.0 |  |
| 15 |  | 5.0 |  |
| 20 |  | 5.0 |  |
| 25 |  | 5.0 |  |
| 30 |  | 5.0 |  |
| 35 |  | 5.0 |  |
| 40 |  | 5.0 |  |
| 45 |  | 5.0 |  |
| 50 |  | 5.0 |  |
| 55 |  | 5.0 |  |
| 60 |  | 5.0 |  |
| 65 |  | 5.0 |  |
| 70 |  | 5.0 |  |
| 75 |  | 5.0 |  |

1. Do you notice a trend in measurements? How does the velocity of the car change as it moves down the ramp?
2. Graph the velocity of the car vs. position. Place the velocity of the car on the y-axis and the position of the photogate on the x-axis. Include a title for your graph and label the axes. Include units.



1. What does the graph show about the velocity of the car?
2. Choose and record a position on the ramp where you did NOT measure the speed of the car. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. Use your graph to find the predicted velocity of the car at that position. Do this by locating the position you chose from #4 on the horizontal axis, travel vertically to your line-of-best-fit, then travel horizontally to the y-axis. Where you land on the y-axis is your predicted velocity. Record your predicted velocity =\_\_\_\_\_\_\_\_\_\_\_\_.
4. Place the photogate at the distance you selected in # 4 and record the time it takes for the car to pass through the photogate. Time = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. Use the wing length (5.0 cm) and the time from # 6 to calculate the actual velocity at that point. \_\_\_\_\_\_\_\_\_\_.
6. How does the predicted velocity (from your graph) compare with the actual velocity you calculated?
7. Find the difference between the predicted velocity and the actual velocity. Difference = \_\_\_\_\_\_\_\_\_\_\_.
8. Take this difference and divide it by the predicted velocity, then multiply by 100. Percent Error = \_\_\_\_\_\_\_\_\_\_\_.
9. Use the percent error to calculate the percent correct. (100 – Percent Error = Percent Correct) \_\_\_\_\_\_\_\_\_\_.
10. Pete is driving down 12th avenue. He drives 150 meters in 18 seconds. What is his speed in meters/second?
11. A person jogs 4.0 km in 32 minutes, then 2.0 km in 22 minutes, and finally 1.0 km in 16 minutes. What is the jogger’s average speed in km per minute?
12. A plane’s average speed between two cities is 600 km/hr. If the trip takes 2.5 hours to complete, how far does the plane fly?
13. A roller coaster’s velocity at the top of a hill is 10 m/s. Two seconds later it reaches the bottom of the hill with a velocity of 26 m/s. What is the acceleration of the coaster?
14. A car traveling at 15 m/s starts to decelerate steadily. It comes to a complete stop in 10 seconds. What is the acceleration of the car?
15. How long will it take a car to go from a complete stop to 44 km/hr if they are accelerating at 5 km/hr2?
16. How long will it take a car to accelerate from 15.2 m/s to 23.5 m/s if the car has an average acceleration of 3.2 m/s2?