*Name: Date:*

***Zoom Zoom 1D Lab***

**Background**

From previous experience you know that average velocity is equivalent to displacement for a given interval of time.  The ratio of a change in velocity to a change in time yields acceleration. By using other variables final velocity and acceleration can be determined.

**Objective**

* Identify how to determine an object’s velocity
* Determine lab procedure to calculate an object’s final velocity and acceleration
* Observe and analyze the motion of a uniformly accelerated body moving in a straight line

**Pre-lab questions:**

Complete the following questions on a separate paper.

1. What is a reference point?
2. What is the difference between speed and velocity?
3. What must you know to determine acceleration?
4. What variables must be known in order to calculate final velocity and acceleration?
5. Read the procedures, what information can be assumed to complete the calculations?
6. Which item do you hypothesize to have the greatest and lowest final velocity?
7. Which item do you hypothesize to have the greatest and lowest acceleration?

**Materials**

* Toy cars
* Balloons
* Meter stick
* Stopwatch
* Masking Tape or marking material

**Additional Comments:**

Each station will require a unique method to initiate the action of the car. One group will be using “track-cars” that will use a inflated balloon on top for motion. Next, there will be small cars that must be manually accelerated. Also, there is a toy that uses a crank lever to release the toy, and last, there is a remote control car that will be tested.

**Procedure**

1. Place a piece of masking tape on the floor and label it reference point.
2. Measure two meters and place another piece of tape for the finish line.
3. Determine the direction between the start and finish points.
4. Place the front of the car at the starting point
5. Determine group members to count down, initiate action of the car, and time.
6. Have the car travel the displacement while keeping track of the time.
7. At the moment the car stops, group member 3 will stop timing.
8. Calculate unknown data.
9. Repeat procedures for three trials rotating responsibilities.
10. Calculate average final velocity and acceleration for each toy
11. Design graphs that best compare the calculated acceleration and final velocity for each toy.

**Data Tables:**

***Balloon Car***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trial** | **Initial Velocity** | **Displacement** | **Time** | **Final Velocity** | **Acceleration** |
| **1** |  |  |  |  |  |
| **2** |  |  |  |  |  |
| **3** |  |  |  |  |  |
| **Average:** | | | |  |  |

***Show Calculations:***

Trial 1:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

Trial 2:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

Trial 3:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

***Hot Wheels Car***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trial** | **Initial Velocity** | **Displacement** | **Time** | **Final Velocity** | **Acceleration** |
| **1** |  |  |  |  |  |
| **2** |  |  |  |  |  |
| **3** |  |  |  |  |  |
| **Average:** | | | |  |  |

***Show Calculations:***

Trial 1:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

Trial 2:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

Trial 3:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

***Crank Operated Bikes***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trial** | **Initial Velocity** | **Displacement** | **Time** | **Final Velocity** | **Acceleration** |
| **1** |  |  |  |  |  |
| **2** |  |  |  |  |  |
| **3** |  |  |  |  |  |
| **Average:** | | | |  |  |

***Show Calculations:***

Trial 1:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

Trial 2:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

Trial 3:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

***Remote Control Car***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Trial** | **Initial Velocity** | **Displacement** | **Time** | **Final Velocity** | **Acceleration** |
| **1** |  |  |  |  |  |
| **2** |  |  |  |  |  |
| **3** |  |  |  |  |  |
| **Average:** | | | |  |  |

***Show Calculations:***

Trial 1:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

Trial 2:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

Trial 3:

|  |  |
| --- | --- |
| Final Velocity | Acceleration |
|  |  |

**Results:**

|  |  |  |
| --- | --- | --- |
| **Method** | **Final Velocity** | **Acceleration** |
| *Balloon Car* |  |  |
| *Crank Operated Bike* |  |  |
| *Hot Wheels Car* |  |  |
| *Remote Control Car* |  |  |

**Graph:**

Draw two graphs that compare the data shown above. Make sure to label all axes, show units, include legends, and have appropriate titles.

**Zoom Zoom 1D Lab *Name:***

Conclusion questions:

1. In one paragraph, summarize the lab.
2. Which item proved to have the greatest final velocity and acceleration?
3. Explain errors for each toy used.
4. What was the largest challenge within the lab?
5. If the track was twice as long what would happen to your recorded data?
6. Acceleration was calculated to have been constant for each station, explain why this is an assumption and not realistic.
7. Identify real world objects that require meeting certain accelerations.
8. Research a real world (large) object that is known to have high acceleration and complete calculations to identify its acceleration.
9. On separate piece of paper, create your own version of this lab, include materials, procedures, and data to be recorded.