**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**DATA TABLE:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of washers used** | **Trial Number** | **Time**  **(seconds)** | **Distance**  **(centimeters)** | **Average Velocity**  **(cm/s)** |
| **0** | **1** |  |  |  |
| **0** | **2** |  |  |  |
| **0** | **3** |  |  |  |
| **Average** |  |  |  |  |
| **3** | **1** |  |  |  |
| **3** | **2** |  |  |  |
| **3** | **3** |  |  |  |
| **Average** |  |  |  |  |
| **6** | **1** |  |  |  |
| **6** | **2** |  |  |  |
| **6** | **3** |  |  |  |
| **Average** |  |  |  |  |

**Control Variable: Round Balloon Circumference \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

**Analyze and Conclude:**

1. **State Newton’s second law. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**
2. **State Newton’s third law. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

1. **How did adding washers to the balloon jet affect its motion?**

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1. **Using Newton’s third law, explain the motion of the balloon jet.**

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1. **Using Newton’s second law, explain the motion of the balloon jet.**

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**For this lab you will need a classmate to:**

* **Be a timer**
* **Measure distance**
* **Release the balloon**
* **Record data**

**Problem: How does a jet-powered device move?**

**Materials:**

**String, 3m in length Stopwatch**

**Drinking straw Meter stick**

**Balloons Washers (6)**

**Masking tape**

**Procedure:**

1. Insert the string through the straw and tie each end of the string to the back of a separate chair. Pull the chairs apart until the string is tight and horizontal.
2. Blow up the balloon and then hold the balloon’s opening closed. In the data table, record the circumference of the balloon. (or measure with a string the circumference.)
3. Have a classmate attach the balloon lengthwise to the straw, using tape.
4. While continuing to hold the balloon’s opening closed, slide the balloon jet to the end of the string.
5. Release the balloon. Measure the time during which the balloon jet moves. Measure the distance that the balloon jet travels along the string. Record the distance and time values in the data table for 0 washers used, Trial 1.
6. Repeat Step 2 through 5 for Trial 2 and Trial 3.
7. Tape 3 washers to your balloon and repeat Step 2 through 6. Record your results in the data table for 3 washers used, Trials 1 and 2 and 3.
8. If time allows, tape 6 washers to your balloon and repeat Step 2 through 6. Record your results in the data table for 6 washers used, Trials 1 and 2 and 3.
9. Calculate and record the average velocity for each trial. The average velocity is equal to the distance divided by the time.